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Method for creating a flexible staple line

Abstract

A method for creating a flexible fastener line is disclosed. The fastener line comprises fasteners oriented in directions which are transverse or oblique to a tissue incision created by a cutting member. The fasteners can translate and/or rotate within the tissue when the tissue is stretched thereby creating flexibility within the tissue.

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4619391	12/1985	Sharkany et al.	N/A	N/A
4624401	12/1985	Gassner et al.	N/A	N/A
D287278	12/1985	Spreckelmeier	N/A	N/A
4628459	12/1985	Shinohara et al.	N/A	N/A
4628636	12/1985	Folger	N/A	N/A
4629107	12/1985	Fedotov et al.	N/A	N/A
4632290	12/1985	Green et al.	N/A	N/A
4633861	12/1986	Chow et al.	N/A	N/A
4633874	12/1986	Chow et al.	N/A	N/A
4634419	12/1986	Kreizman et al.	N/A	N/A
4635638	12/1986	Weintraub et al.	N/A	N/A
4641076	12/1986	Linden	N/A	N/A
4642618	12/1986	Johnson et al.	N/A	N/A
4642738	12/1986	Meller	N/A	N/A
4643173	12/1986	Bell et al.	N/A	N/A
4643731	12/1986	Eckenhoff	N/A	N/A
4646722	12/1986	Silverstein et al.	N/A	N/A
4646745	12/1986	Noiles	N/A	N/A
4651734	12/1986	Doss et al.	N/A	N/A
4652820	12/1986	Maresca	N/A	N/A
4654028	12/1986	Suma	N/A	N/A
4655222	12/1986	Florez et al.	N/A	N/A
4662555	12/1986	Thornton	N/A	N/A
4663874	12/1986	Sano et al.	N/A	N/A
4664305	12/1986	Blake, III et al.	N/A	N/A
4665916	12/1986	Green	N/A	N/A
4667674	12/1986	Korthoff et al.	N/A	N/A
4669647	12/1986	Storace	N/A	N/A
4671278	12/1986	Chin	N/A	N/A
4671280	12/1986	Dorband et al.	N/A	N/A
4671445	12/1986	Barker et al.	N/A	N/A
4672964	12/1986	Dee et al.	N/A	N/A
4675944	12/1986	Wells	N/A	N/A
4676245	12/1986	Fukuda	N/A	N/A
4679460	12/1986	Yoshigai	N/A	N/A
4679719	12/1986	Kramer	N/A	N/A

4684051	12/1986	Akopov et al.	N/A	N/A
4688555	12/1986	Wardle	N/A	N/A
4691703	12/1986	Auth et al.	N/A	N/A
4693248	12/1986	Failla	N/A	N/A
4698579	12/1986	Richter et al.	N/A	N/A
4700703	12/1986	Resnick et al.	N/A	N/A
4705038	12/1986	Sjostrom et al.	N/A	N/A
4708141	12/1986	Inoue et al.	N/A	N/A
4709120	12/1986	Pearson	N/A	N/A
4715520	12/1986	Roehr, Jr. et al.	N/A	N/A
4719917	12/1987	Barrows et al.	N/A	N/A
4721099	12/1987	Chikama	N/A	N/A
4722340	12/1987	Takayama et al.	N/A	N/A
4724840	12/1987	McVay et al.	N/A	N/A
4726247	12/1987	Hormann	N/A	N/A
4727308	12/1987	Huljak et al.	N/A	N/A
4728020	12/1987	Green et al.	N/A	N/A
4728876	12/1987	Mongeon et al.	N/A	N/A
4729260	12/1987	Dudden	N/A	N/A
4730726	12/1987	Holzwarth	N/A	N/A
4741336	12/1987	Failla et al.	N/A	N/A
4743214	12/1987	Tai-Cheng	N/A	N/A
4744363	12/1987	Hasson	N/A	N/A
4747820	12/1987	Hornlein et al.	N/A	N/A
4750902	12/1987	Wuchinich et al.	N/A	N/A
4752024	12/1987	Green et al.	N/A	N/A
4754909	12/1987	Barker et al.	N/A	N/A
4755070	12/1987	Cerutti	N/A	N/A
4761326	12/1987	Barnes et al.	N/A	N/A
4763669	12/1987	Jaeger	N/A	N/A
4767044	12/1987	Green	N/A	N/A
D297764	12/1987	Hunt et al.	N/A	N/A
4773420	12/1987	Green	N/A	N/A
4777780	12/1987	Holzwarth	N/A	N/A
4781186	12/1987	Simpson et al.	N/A	N/A
4784137	12/1987	Kulik et al.	N/A	N/A
4787387	12/1987	Burbank, III et al.	N/A	N/A
4788485	12/1987	Kawagishi et al.	N/A	N/A
D298967	12/1987	Hunt	N/A	N/A
4788978	12/1987	Strekopytov et al.	N/A	N/A
4790225	12/1987	Moody et al.	N/A	N/A
4790314	12/1987	Weaver	N/A	N/A
4805617	12/1988	Bedi et al.	N/A	N/A
4805823	12/1988	Rothfuss	N/A	N/A
4807628	12/1988	Peters et al.	N/A	N/A
4809695	12/1988	Gwathmey et al.	N/A	N/A
4815460	12/1988	Porat et al.	N/A	N/A
4817643	12/1988	Olson	N/A	N/A
4817847	12/1988	Redtenbacher et al.	N/A	N/A
4819495	12/1988	Hormann	N/A	N/A

4819853	12/1988	Green	N/A	N/A
4821939	12/1988	Green	N/A	N/A
4827552	12/1988	Bojar et al.	N/A	N/A
4827911	12/1988	Broadwin et al.	N/A	N/A
4828542	12/1988	Hermann	N/A	N/A
4828944	12/1988	Yabe et al.	N/A	N/A
4830855	12/1988	Stewart	N/A	N/A
4832158	12/1988	Farrar et al.	N/A	N/A
4833937	12/1988	Nagano	N/A	N/A
4834096	12/1988	Oh et al.	N/A	N/A
4834720	12/1988	Blinkhorn	N/A	N/A
4838859	12/1988	Strassmann	N/A	N/A
4844068	12/1988	Arata et al.	N/A	N/A
4848637	12/1988	Pruitt	N/A	N/A
4856078	12/1988	Konopka	N/A	N/A
4860644	12/1988	Kohl et al.	N/A	N/A
4862891	12/1988	Smith	N/A	N/A
4863423	12/1988	Wallace	N/A	N/A
4865030	12/1988	Polyak	N/A	N/A
4868530	12/1988	Ahs	N/A	N/A
4868958	12/1988	Suzuki et al.	N/A	N/A
4869414	12/1988	Green et al.	N/A	N/A
4869415	12/1988	Fox	N/A	N/A
4873977	12/1988	Avant et al.	N/A	N/A
4875486	12/1988	Rapoport et al.	N/A	N/A
4880015	12/1988	Nierman	N/A	N/A
4890613	12/1989	Golden et al.	N/A	N/A
4892244	12/1989	Fox et al.	N/A	N/A
4893622	12/1989	Green et al.	N/A	N/A
4894051	12/1989	Shiber	N/A	N/A
4896584	12/1989	Stoll et al.	N/A	N/A
4896678	12/1989	Ogawa	N/A	N/A
4900303	12/1989	Lemelson	N/A	N/A
4903697	12/1989	Resnick et al.	N/A	N/A
4909789	12/1989	Taguchi et al.	N/A	N/A
4915100	12/1989	Green	N/A	N/A
4919679	12/1989	Averill et al.	N/A	N/A
4921479	12/1989	Grayzel	N/A	N/A
4925082	12/1989	Kim	N/A	N/A
4928699	12/1989	Sasai	N/A	N/A
4930503	12/1989	Pruitt	N/A	N/A
4930674	12/1989	Barak	N/A	N/A
4931047	12/1989	Broadwin et al.	N/A	N/A
4931737	12/1989	Hishiki	N/A	N/A
4932960	12/1989	Green et al.	N/A	N/A
4933800	12/1989	Yang	N/A	N/A
4933843	12/1989	Scheller et al.	N/A	N/A
D309350	12/1989	Sutherland et al.	N/A	N/A
4938408	12/1989	Bedi et al.	N/A	N/A
4941623	12/1989	Pruitt	N/A	N/A

4943182	12/1989	Hoblingre	N/A	N/A
4944443	12/1989	Oddsen et al.	N/A	N/A
4946067	12/1989	Kelsall	N/A	N/A
4948327	12/1989	Crupi, Jr.	N/A	N/A
4949707	12/1989	LeVahn et al.	N/A	N/A
4949927	12/1989	Madocks et al.	N/A	N/A
4950268	12/1989	Rink	N/A	N/A
4951860	12/1989	Peters et al.	N/A	N/A
4951861	12/1989	Schulze et al.	N/A	N/A
4954960	12/1989	Lo et al.	N/A	N/A
4955959	12/1989	Tompkins et al.	N/A	N/A
4957212	12/1989	Duck et al.	N/A	N/A
4962681	12/1989	Yang	N/A	N/A
4962877	12/1989	Hervas	N/A	N/A
4964559	12/1989	Deniega et al.	N/A	N/A
4964863	12/1989	Kanshin et al.	N/A	N/A
4965709	12/1989	Ngo	N/A	N/A
4970656	12/1989	Lo et al.	N/A	N/A
4973274	12/1989	Hirukawa	N/A	N/A
4973302	12/1989	Armour et al.	N/A	N/A
4976173	12/1989	Yang	N/A	N/A
4978049	12/1989	Green	N/A	N/A
4978333	12/1989	Broadwin et al.	N/A	N/A
4979952	12/1989	Kubota et al.	N/A	N/A
4984564	12/1990	Yuen	N/A	N/A
4986808	12/1990	Broadwin et al.	N/A	N/A
4987049	12/1990	Komamura et al.	N/A	N/A
4988334	12/1990	Hornlein et al.	N/A	N/A
4995877	12/1990	Ams et al.	N/A	N/A
4995959	12/1990	Metzner	N/A	N/A
4996975	12/1990	Nakamura	N/A	N/A
5001649	12/1990	Lo et al.	N/A	N/A
5002543	12/1990	Bradshaw et al.	N/A	N/A
5002553	12/1990	Shiber	N/A	N/A
5005754	12/1990	Van Overloop	N/A	N/A
5009222	12/1990	Her	N/A	N/A
5009661	12/1990	Michelson	N/A	N/A
5012411	12/1990	Policastro et al.	N/A	N/A
5014898	12/1990	Heidrich	N/A	N/A
5014899	12/1990	Presty et al.	N/A	N/A
5015227	12/1990	Broadwin et al.	N/A	N/A
5018515	12/1990	Gilman	N/A	N/A
5018657	12/1990	Pedlick et al.	N/A	N/A
5019077	12/1990	De Bastiani et al.	N/A	N/A
5024652	12/1990	Dumenek et al.	N/A	N/A
5024671	12/1990	Tu et al.	N/A	N/A
5025559	12/1990	McCullough	N/A	N/A
5027834	12/1990	Pruitt	N/A	N/A
5030226	12/1990	Green et al.	N/A	N/A
5031814	12/1990	Tompkins et al.	N/A	N/A

5033552	12/1990	Hu	N/A	N/A
5035040	12/1990	Kerrigan et al.	N/A	N/A
5037018	12/1990	Matsuda et al.	N/A	N/A
5038109	12/1990	Goble et al.	N/A	N/A
5038247	12/1990	Kelley et al.	N/A	N/A
5040715	12/1990	Green et al.	N/A	N/A
5042707	12/1990	Taheri	N/A	N/A
5056953	12/1990	Marot et al.	N/A	N/A
5060658	12/1990	Dejter, Jr. et al.	N/A	N/A
5061269	12/1990	Muller	N/A	N/A
5062491	12/1990	Takeshima et al.	N/A	N/A
5062563	12/1990	Green et al.	N/A	N/A
5065929	12/1990	Schulze et al.	N/A	N/A
5071052	12/1990	Rodak et al.	N/A	N/A
5071430	12/1990	de Salis et al.	N/A	N/A
5074454	12/1990	Peters	N/A	N/A
5077506	12/1990	Krause	N/A	N/A
5079006	12/1991	Urquhart	N/A	N/A
5080556	12/1991	Carreno	N/A	N/A
5083695	12/1991	Foslien et al.	N/A	N/A
5084057	12/1991	Green et al.	N/A	N/A
5088979	12/1991	Filipi et al.	N/A	N/A
5088997	12/1991	Delahuerga et al.	N/A	N/A
5089606	12/1991	Cole et al.	N/A	N/A
5094247	12/1991	Hernandez et al.	N/A	N/A
5098004	12/1991	Kerrigan	N/A	N/A
5098360	12/1991	Hirota	N/A	N/A
5100042	12/1991	Gravener et al.	N/A	N/A
5100420	12/1991	Green et al.	N/A	N/A
5100422	12/1991	Berguer et al.	N/A	N/A
5104025	12/1991	Main et al.	N/A	N/A
5104397	12/1991	Vasconcelos et al.	N/A	N/A
5104400	12/1991	Berguer et al.	N/A	N/A
5106008	12/1991	Tompkins et al.	N/A	N/A
5108368	12/1991	Hammerslag et al.	N/A	N/A
5109722	12/1991	Hufnagle et al.	N/A	N/A
5111987	12/1991	Moeinzadeh et al.	N/A	N/A
5116349	12/1991	Aranyi	N/A	N/A
D327323	12/1991	Hunt	N/A	N/A
5119009	12/1991	McCaleb et al.	N/A	N/A
5122156	12/1991	Granger et al.	N/A	N/A
5124990	12/1991	Williamson	N/A	N/A
5129570	12/1991	Schulze et al.	N/A	N/A
5137198	12/1991	Nobis et al.	N/A	N/A
5139513	12/1991	Segato	N/A	N/A
5141144	12/1991	Foslien et al.	N/A	N/A
5142932	12/1991	Moya et al.	N/A	N/A
5151102	12/1991	Kamiyama et al.	N/A	N/A
5155941	12/1991	Takahashi et al.	N/A	N/A
5156151	12/1991	Imran	N/A	N/A

5156315	12/1991	Green et al.	N/A	N/A
5156609	12/1991	Nakao et al.	N/A	N/A
5156614	12/1991	Green et al.	N/A	N/A
5158222	12/1991	Green et al.	N/A	N/A
5158567	12/1991	Green	N/A	N/A
D330699	12/1991	Gill	N/A	N/A
5163598	12/1991	Peters et al.	N/A	N/A
5163842	12/1991	Nonomura	N/A	N/A
5164652	12/1991	Johnson et al.	N/A	N/A
5168605	12/1991	Bartlett	N/A	N/A
5170925	12/1991	Madden et al.	N/A	N/A
5171247	12/1991	Hughett et al.	N/A	N/A
5171249	12/1991	Stefanchik et al.	N/A	N/A
5171253	12/1991	Klieman	N/A	N/A
5173053	12/1991	Swanson et al.	N/A	N/A
5173133	12/1991	Morin et al.	N/A	N/A
5176677	12/1992	Wuchinich	N/A	N/A
5176688	12/1992	Narayan et al.	N/A	N/A
5181514	12/1992	Solomon et al.	N/A	N/A
5187422	12/1992	Izenbaard et al.	N/A	N/A
5188102	12/1992	Idemoto et al.	N/A	N/A
5188111	12/1992	Yates et al.	N/A	N/A
5188126	12/1992	Fabian et al.	N/A	N/A
5190517	12/1992	Zieve et al.	N/A	N/A
5190544	12/1992	Chapman et al.	N/A	N/A
5190560	12/1992	Woods et al.	N/A	N/A
5190657	12/1992	Heagle et al.	N/A	N/A
5192288	12/1992	Thompson et al.	N/A	N/A
5193731	12/1992	Aranyi	N/A	N/A
5195505	12/1992	Josefsen	N/A	N/A
5195968	12/1992	Lundquist et al.	N/A	N/A
5197648	12/1992	Gingold	N/A	N/A
5197649	12/1992	Bessler et al.	N/A	N/A
5197966	12/1992	Sommerkamp	N/A	N/A
5197970	12/1992	Green et al.	N/A	N/A
5200280	12/1992	Karasa	N/A	N/A
5201750	12/1992	Hocherl et al.	N/A	N/A
5205459	12/1992	Brinkerhoff et al.	N/A	N/A
5207672	12/1992	Roth et al.	N/A	N/A
5207697	12/1992	Carusillo et al.	N/A	N/A
5209747	12/1992	Knoepfler	N/A	N/A
5209756	12/1992	Seedhom et al.	N/A	N/A
5211649	12/1992	Kohler et al.	N/A	N/A
5211655	12/1992	Hasson	N/A	N/A
5217457	12/1992	Delahuerga et al.	N/A	N/A
5217478	12/1992	Rexroth	N/A	N/A
5219111	12/1992	Bilotti et al.	N/A	N/A
5220269	12/1992	Chen et al.	N/A	N/A
5221036	12/1992	Takase	N/A	N/A
5221281	12/1992	Klicek	N/A	N/A

5222945	12/1992	Basnight	N/A	N/A
5222963	12/1992	Brinkerhoff et al.	N/A	N/A
5222975	12/1992	Crainich	N/A	N/A
5222976	12/1992	Yoon	N/A	N/A
5223675	12/1992	Taft	N/A	N/A
D338729	12/1992	Sprecklemeier et al.	N/A	N/A
5234447	12/1992	Kaster et al.	N/A	N/A
5236269	12/1992	Handy	N/A	N/A
5236424	12/1992	Imran	N/A	N/A
5236440	12/1992	Hlavacek	N/A	N/A
5236629	12/1992	Mahabadi et al.	N/A	N/A
5239981	12/1992	Anapliotis	N/A	N/A
5240163	12/1992	Stein et al.	N/A	N/A
5242456	12/1992	Nash et al.	N/A	N/A
5242457	12/1992	Akopov et al.	N/A	N/A
5244462	12/1992	Delahuerga et al.	N/A	N/A
5246156	12/1992	Rothfuss et al.	N/A	N/A
5246443	12/1992	Mai	N/A	N/A
5251801	12/1992	Ruckdeschel et al.	N/A	N/A
5253793	12/1992	Green et al.	N/A	N/A
5258007	12/1992	Spetzler et al.	N/A	N/A
5258008	12/1992	Wilk	N/A	N/A
5258009	12/1992	Conners	N/A	N/A
5258010	12/1992	Green et al.	N/A	N/A
5258012	12/1992	Luscombe et al.	N/A	N/A
5259366	12/1992	Reydel et al.	N/A	N/A
5259835	12/1992	Clark et al.	N/A	N/A
5260637	12/1992	Pizzi	N/A	N/A
5261135	12/1992	Mitchell	N/A	N/A
5261877	12/1992	Fine et al.	N/A	N/A
5261922	12/1992	Hood	N/A	N/A
5263629	12/1992	Trumbull et al.	N/A	N/A
5263937	12/1992	Shipp	N/A	N/A
5263973	12/1992	Cook	N/A	N/A
5264218	12/1992	Rogozinski	N/A	N/A
5268622	12/1992	Philipp	N/A	N/A
5269794	12/1992	Rexroth	N/A	N/A
5271543	12/1992	Grant et al.	N/A	N/A
5271544	12/1992	Fox et al.	N/A	N/A
RE34519	12/1993	Fox et al.	N/A	N/A
5275322	12/1993	Brinkerhoff et al.	N/A	N/A
5275323	12/1993	Schulze et al.	N/A	N/A
5275608	12/1993	Forman et al.	N/A	N/A
5279416	12/1993	Malec et al.	N/A	N/A
5281216	12/1993	Klicek	N/A	N/A
5281400	12/1993	Berry, Jr.	N/A	N/A
5282806	12/1993	Haber et al.	N/A	N/A
5282826	12/1993	Quadri	N/A	N/A
5282829	12/1993	Hermes	N/A	N/A
5284128	12/1993	Hart	N/A	N/A

5285381	12/1993	Iskarous et al.	N/A	N/A
5285945	12/1993	Brinkerhoff et al.	N/A	N/A
5286253	12/1993	Fucci	N/A	N/A
5289963	12/1993	McGarry et al.	N/A	N/A
5290271	12/1993	Jernberg	N/A	N/A
5290310	12/1993	Makower et al.	N/A	N/A
5291133	12/1993	Gokhale et al.	N/A	N/A
5292053	12/1993	Bilotti et al.	N/A	N/A
5293024	12/1993	Sugahara et al.	N/A	N/A
5297714	12/1993	Kramer	N/A	N/A
5300087	12/1993	Knoepfler	N/A	N/A
5302148	12/1993	Heinz	N/A	N/A
5303606	12/1993	Kokinda	N/A	N/A
5304204	12/1993	Bregen	N/A	N/A
D347474	12/1993	Olson	N/A	N/A
5307976	12/1993	Olson et al.	N/A	N/A
5308353	12/1993	Beurrier	N/A	N/A
5308358	12/1993	Bond et al.	N/A	N/A
5308576	12/1993	Green et al.	N/A	N/A
5309387	12/1993	Mori et al.	N/A	N/A
5309927	12/1993	Welch	N/A	N/A
5312023	12/1993	Green et al.	N/A	N/A
5312024	12/1993	Grant et al.	N/A	N/A
5312329	12/1993	Beaty et al.	N/A	N/A
5313935	12/1993	Kortenbach et al.	N/A	N/A
5313967	12/1993	Lieber et al.	N/A	N/A
5314424	12/1993	Nicholas	N/A	N/A
5314445	12/1993	Heidmueller et al.	N/A	N/A
5314466	12/1993	Stern et al.	N/A	N/A
5318221	12/1993	Green et al.	N/A	N/A
5318589	12/1993	Lichtman	N/A	N/A
5320627	12/1993	Sorensen et al.	N/A	N/A
D348930	12/1993	Olson	N/A	N/A
5326013	12/1993	Green et al.	N/A	N/A
5329923	12/1993	Lundquist	N/A	N/A
5330486	12/1993	Wilk	N/A	N/A
5330487	12/1993	Thornton et al.	N/A	N/A
5330502	12/1993	Hassler et al.	N/A	N/A
5331971	12/1993	Bales et al.	N/A	N/A
5332142	12/1993	Robinson et al.	N/A	N/A
5333422	12/1993	Warren et al.	N/A	N/A
5333772	12/1993	Rothfuss et al.	N/A	N/A
5333773	12/1993	Main et al.	N/A	N/A
5334183	12/1993	Wuchinich	N/A	N/A
5336130	12/1993	Ray	N/A	N/A
5336229	12/1993	Noda	N/A	N/A
5336232	12/1993	Green et al.	N/A	N/A
5338317	12/1993	Hasson et al.	N/A	N/A
5339799	12/1993	Kami et al.	N/A	N/A
5341724	12/1993	Vatel	N/A	N/A

5341807	12/1993	Nardella	N/A	N/A
5341810	12/1993	Dardel	N/A	N/A
5342380	12/1993	Hood	N/A	N/A
5342381	12/1993	Tidemand	N/A	N/A
5342385	12/1993	Norelli et al.	N/A	N/A
5342395	12/1993	Jarrett et al.	N/A	N/A
5342396	12/1993	Cook	N/A	N/A
5343382	12/1993	Hale et al.	N/A	N/A
5343391	12/1993	Mushabac	N/A	N/A
5344059	12/1993	Green et al.	N/A	N/A
5344060	12/1993	Gravener et al.	N/A	N/A
5344454	12/1993	Clarke et al.	N/A	N/A
5346504	12/1993	Ortiz et al.	N/A	N/A
5348259	12/1993	Blanco et al.	N/A	N/A
5350104	12/1993	Main et al.	N/A	N/A
5350355	12/1993	Sklar	N/A	N/A
5350388	12/1993	Epstein	N/A	N/A
5350391	12/1993	Iacovelli	N/A	N/A
5350400	12/1993	Esposito et al.	N/A	N/A
5352229	12/1993	Goble et al.	N/A	N/A
5352235	12/1993	Koros et al.	N/A	N/A
5352238	12/1993	Green et al.	N/A	N/A
5353798	12/1993	Sieben	N/A	N/A
5354215	12/1993	Viracola	N/A	N/A
5354250	12/1993	Christensen	N/A	N/A
5354303	12/1993	Spaeth et al.	N/A	N/A
5355897	12/1993	Pietrafitta et al.	N/A	N/A
5356006	12/1993	Alpern et al.	N/A	N/A
5356064	12/1993	Green et al.	N/A	N/A
5358506	12/1993	Green et al.	N/A	N/A
5358510	12/1993	Luscombe et al.	N/A	N/A
5359231	12/1993	Flowers et al.	N/A	N/A
D352780	12/1993	Glaeser et al.	N/A	N/A
5359993	12/1993	Slater et al.	N/A	N/A
5360305	12/1993	Kerrigan	N/A	N/A
5360428	12/1993	Hutchinson, Jr.	N/A	N/A
5361902	12/1993	Abidin et al.	N/A	N/A
5364001	12/1993	Bryan	N/A	N/A
5364002	12/1993	Green et al.	N/A	N/A
5364003	12/1993	Williamson, IV	227/19	A61B 17/0644
5366133	12/1993	Geiste	N/A	N/A
5366134	12/1993	Green et al.	N/A	N/A
5366479	12/1993	McGarry et al.	N/A	N/A
5368015	12/1993	Wilk	N/A	N/A
5368592	12/1993	Stern et al.	N/A	N/A
5368599	12/1993	Hirsch et al.	N/A	N/A
5369565	12/1993	Chen et al.	N/A	N/A
5370645	12/1993	Klicek et al.	N/A	N/A
5372124	12/1993	Takayama et al.	N/A	N/A

5372596	12/1993	Klicek et al.	N/A	N/A
5372602	12/1993	Burke	N/A	N/A
5374277	12/1993	Hassler	N/A	N/A
5375588	12/1993	Yoon	N/A	N/A
5376095	12/1993	Ortiz	N/A	N/A
5379933	12/1994	Green et al.	N/A	N/A
5381649	12/1994	Webb	N/A	N/A
5381782	12/1994	DeLaRama et al.	N/A	N/A
5381943	12/1994	Allen et al.	N/A	N/A
5382247	12/1994	Cimino et al.	N/A	N/A
5383460	12/1994	Jang et al.	N/A	N/A
5383738	12/1994	Herbermann	N/A	N/A
5383874	12/1994	Jackson et al.	N/A	N/A
5383880	12/1994	Hooven	N/A	N/A
5383881	12/1994	Green et al.	N/A	N/A
5383882	12/1994	Buess et al.	N/A	N/A
5383888	12/1994	Zvenyatsky et al.	N/A	N/A
5383895	12/1994	Holmes et al.	N/A	N/A
5388568	12/1994	van der Heide	N/A	N/A
5389072	12/1994	Imran	N/A	N/A
5389098	12/1994	Tsuruta	606/49	A61B 17/07207
5389102	12/1994	Green et al.	N/A	N/A
5389104	12/1994	Hahnen et al.	N/A	N/A
5391180	12/1994	Tovey et al.	N/A	N/A
5392979	12/1994	Green et al.	N/A	N/A
5395030	12/1994	Kuramoto et al.	N/A	N/A
5395033	12/1994	Byrne et al.	N/A	N/A
5395034	12/1994	Allen et al.	N/A	N/A
5395312	12/1994	Desai	N/A	N/A
5395384	12/1994	Duthoit et al.	N/A	N/A
5397046	12/1994	Savage et al.	N/A	N/A
5397324	12/1994	Carroll et al.	N/A	N/A
5400267	12/1994	Denen et al.	N/A	N/A
5403276	12/1994	Schechter et al.	N/A	N/A
5403312	12/1994	Yates et al.	N/A	N/A
5404106	12/1994	Matsuda	N/A	N/A
5404870	12/1994	Brinkerhoff et al.	N/A	N/A
5404960	12/1994	Wada et al.	N/A	N/A
5405072	12/1994	Zlock et al.	N/A	N/A
5405073	12/1994	Porter	N/A	N/A
5405344	12/1994	Williamson et al.	N/A	N/A
5405360	12/1994	Tovey	N/A	N/A
5407293	12/1994	Crainich	N/A	N/A
5408409	12/1994	Glassman et al.	N/A	N/A
5409498	12/1994	Braddock et al.	N/A	N/A
5409703	12/1994	McAnalley et al.	N/A	N/A
D357981	12/1994	Green et al.	N/A	N/A
5411481	12/1994	Allen et al.	N/A	N/A
5411508	12/1994	Bessler et al.	N/A	N/A

5413107	12/1994	Oakley et al.	N/A	N/A
5413267	12/1994	Solyntjes et al.	N/A	N/A
5413268	12/1994	Green et al.	N/A	N/A
5413272	12/1994	Green et al.	N/A	N/A
5413573	12/1994	Koivukangas	N/A	N/A
5415334	12/1994	Williamson et al.	N/A	N/A
5415335	12/1994	Knodell, Jr.	N/A	N/A
5417203	12/1994	Tovey et al.	N/A	N/A
5417361	12/1994	Williamson, IV	N/A	N/A
5419766	12/1994	Chang et al.	N/A	N/A
5421829	12/1994	Olichney et al.	N/A	N/A
5422567	12/1994	Matsunaga	N/A	N/A
5423471	12/1994	Mastri et al.	N/A	N/A
5423809	12/1994	Klicek	N/A	N/A
5423835	12/1994	Green et al.	N/A	N/A
5425355	12/1994	Kulick	N/A	N/A
5425745	12/1994	Green et al.	N/A	N/A
5427298	12/1994	Tegtmeier	N/A	N/A
5431322	12/1994	Green et al.	N/A	N/A
5431323	12/1994	Smith et al.	N/A	N/A
5431645	12/1994	Smith et al.	N/A	N/A
5431654	12/1994	Nic	N/A	N/A
5431666	12/1994	Sauer et al.	N/A	N/A
5431668	12/1994	Burbank, III et al.	N/A	N/A
5433721	12/1994	Hooven et al.	N/A	N/A
5437681	12/1994	Meade et al.	N/A	N/A
5438302	12/1994	Goble	N/A	N/A
5438997	12/1994	Sieben et al.	N/A	N/A
5439155	12/1994	Viola	N/A	N/A
5439156	12/1994	Grant et al.	N/A	N/A
5439479	12/1994	Shichman et al.	N/A	N/A
5441191	12/1994	Linden	N/A	N/A
5441193	12/1994	Gravener	N/A	N/A
5441483	12/1994	Avitall	N/A	N/A
5441494	12/1994	Ortiz	N/A	N/A
5441499	12/1994	Fritzsch	N/A	N/A
5443197	12/1994	Malis et al.	N/A	N/A
5443198	12/1994	Viola et al.	N/A	N/A
5443463	12/1994	Stern et al.	N/A	N/A
5444113	12/1994	Sinclair et al.	N/A	N/A
5445155	12/1994	Sieben	N/A	N/A
5445304	12/1994	Plyley et al.	N/A	N/A
5445604	12/1994	Lang	N/A	N/A
5445644	12/1994	Pietrafitta et al.	N/A	N/A
5446646	12/1994	Miyazaki	N/A	N/A
5447265	12/1994	Vidal et al.	N/A	N/A
5447417	12/1994	Kuhl et al.	N/A	N/A
5447513	12/1994	Davison et al.	N/A	N/A
5449355	12/1994	Rhum et al.	N/A	N/A
5449365	12/1994	Green et al.	N/A	N/A

5449370	12/1994	Vaitekunas	N/A	N/A
5452836	12/1994	Huitema et al.	N/A	N/A
5452837	12/1994	Williamson, IV et al.	N/A	N/A
5454378	12/1994	Palmer et al.	N/A	N/A
5454822	12/1994	Schob et al.	N/A	N/A
5454824	12/1994	Fontayne et al.	N/A	N/A
5454827	12/1994	Aust et al.	N/A	N/A
5456401	12/1994	Green et al.	N/A	N/A
5456917	12/1994	Wise et al.	N/A	N/A
5458279	12/1994	Plyley	N/A	N/A
5458579	12/1994	Chodorow et al.	N/A	N/A
5462215	12/1994	Viola et al.	N/A	N/A
5464013	12/1994	Lemelson	N/A	N/A
5464144	12/1994	Guy et al.	N/A	N/A
5464300	12/1994	Crainich	N/A	N/A
5465819	12/1994	Weilant et al.	N/A	N/A
5465894	12/1994	Clark et al.	N/A	N/A
5465895	12/1994	Knodel et al.	N/A	N/A
5465896	12/1994	Allen et al.	N/A	N/A
5466020	12/1994	Page et al.	N/A	N/A
5467911	12/1994	Tsuruta et al.	N/A	N/A
5468253	12/1994	Bezwada et al.	N/A	N/A
5470006	12/1994	Rodak	N/A	N/A
5470007	12/1994	Plyley et al.	N/A	N/A
5470008	12/1994	Rodak	N/A	N/A
5470009	12/1994	Rodak	N/A	N/A
5470010	12/1994	Rothfuss et al.	N/A	N/A
5471129	12/1994	Mann	N/A	N/A
5472132	12/1994	Savage et al.	N/A	N/A
5472442	12/1994	Klicek	N/A	N/A
5473204	12/1994	Temple	N/A	N/A
5474057	12/1994	Makower et al.	N/A	N/A
5474223	12/1994	Viola et al.	N/A	N/A
5474566	12/1994	Alesi et al.	N/A	N/A
5474570	12/1994	Kockerling et al.	N/A	N/A
5474738	12/1994	Nichols et al.	N/A	N/A
5476206	12/1994	Green et al.	N/A	N/A
5476479	12/1994	Green et al.	N/A	N/A
5476481	12/1994	Schondorf	N/A	N/A
5478003	12/1994	Green et al.	N/A	N/A
5478308	12/1994	Cartmell et al.	N/A	N/A
5478354	12/1994	Tovey et al.	N/A	N/A
5480089	12/1995	Blewett	N/A	N/A
5480409	12/1995	Riza	N/A	N/A
5482197	12/1995	Green et al.	N/A	N/A
5483952	12/1995	Aranyi	N/A	N/A
5484095	12/1995	Green et al.	N/A	N/A
5484398	12/1995	Stoddard	N/A	N/A
5484451	12/1995	Akopov et al.	N/A	N/A
5485947	12/1995	Olson et al.	N/A	N/A

5485952	12/1995	Fontayne	N/A	N/A
5487377	12/1995	Smith et al.	N/A	N/A
5487499	12/1995	Sorrentino et al.	N/A	N/A
5487500	12/1995	Knodel et al.	N/A	N/A
5489058	12/1995	Plyley et al.	N/A	N/A
5489256	12/1995	Adair	N/A	N/A
5489290	12/1995	Furnish	N/A	N/A
5490819	12/1995	Nicholas et al.	N/A	N/A
5492671	12/1995	Krafft	N/A	N/A
5496312	12/1995	Klicek	N/A	N/A
5496317	12/1995	Goble et al.	N/A	N/A
5497933	12/1995	DeFonzo et al.	N/A	N/A
5498164	12/1995	Ward et al.	N/A	N/A
5498838	12/1995	Furman	N/A	N/A
5501654	12/1995	Failla et al.	N/A	N/A
5503320	12/1995	Webster et al.	N/A	N/A
5503635	12/1995	Sauer et al.	N/A	N/A
5503638	12/1995	Cooper et al.	N/A	N/A
5505363	12/1995	Green et al.	N/A	N/A
5507425	12/1995	Ziglioli	N/A	N/A
5507426	12/1995	Young et al.	N/A	N/A
5507773	12/1995	Huitema et al.	N/A	N/A
5509596	12/1995	Green et al.	N/A	N/A
5509916	12/1995	Taylor	N/A	N/A
5509918	12/1995	Romano	N/A	N/A
5511564	12/1995	Wilk	N/A	N/A
5514129	12/1995	Smith	N/A	N/A
5514149	12/1995	Green et al.	N/A	N/A
5514157	12/1995	Nicholas et al.	N/A	N/A
5518163	12/1995	Hooven	N/A	N/A
5518164	12/1995	Hooven	N/A	N/A
5520609	12/1995	Moll et al.	N/A	N/A
5520634	12/1995	Fox et al.	N/A	N/A
5520678	12/1995	Heckele et al.	N/A	N/A
5520700	12/1995	Beyar et al.	N/A	N/A
5522817	12/1995	Sander et al.	N/A	N/A
5522831	12/1995	Sleister et al.	N/A	N/A
5527264	12/1995	Moll et al.	N/A	N/A
5527320	12/1995	Carruthers et al.	N/A	N/A
5529235	12/1995	Boiarski et al.	N/A	N/A
D372086	12/1995	Grasso et al.	N/A	N/A
5531305	12/1995	Roberts et al.	N/A	N/A
5531744	12/1995	Nardella et al.	N/A	N/A
5531856	12/1995	Moll et al.	N/A	N/A
5533521	12/1995	Granger	N/A	N/A
5533581	12/1995	Barth et al.	N/A	N/A
5533661	12/1995	Main et al.	N/A	N/A
5535934	12/1995	Boiarski et al.	N/A	N/A
5535935	12/1995	Vidal et al.	N/A	N/A
5535937	12/1995	Boiarski et al.	N/A	N/A

5540375	12/1995	Bolanos et al.	N/A	N/A
5540705	12/1995	Meade et al.	N/A	N/A
5541376	12/1995	Ladtkow et al.	N/A	N/A
5541489	12/1995	Dunstan	N/A	N/A
5542594	12/1995	Mckean et al.	N/A	N/A
5542945	12/1995	Fritzsch	N/A	N/A
5542949	12/1995	Yoon	N/A	N/A
5543119	12/1995	Sutter et al.	N/A	N/A
5543695	12/1995	Culp et al.	N/A	N/A
5544802	12/1995	Crainich	N/A	N/A
5547117	12/1995	Hamblin et al.	N/A	N/A
5549583	12/1995	Sanford et al.	N/A	N/A
5549621	12/1995	Bessler et al.	N/A	N/A
5549627	12/1995	Kieturakis	N/A	N/A
5549628	12/1995	Cooper et al.	N/A	N/A
5549637	12/1995	Crainich	N/A	N/A
5551622	12/1995	Yoon	N/A	N/A
5553624	12/1995	Francese et al.	N/A	N/A
5553675	12/1995	Pitzen et al.	N/A	N/A
5553765	12/1995	Knodel et al.	N/A	N/A
5554148	12/1995	Aebischer et al.	N/A	N/A
5554169	12/1995	Green et al.	N/A	N/A
5556020	12/1995	Hou	N/A	N/A
5556416	12/1995	Clark et al.	N/A	N/A
5558533	12/1995	Hashizawa et al.	N/A	N/A
5558665	12/1995	Kieturakis	N/A	N/A
5558671	12/1995	Yates	N/A	N/A
5560530	12/1995	Bolanos et al.	N/A	N/A
5560532	12/1995	DeFonzo et al.	N/A	N/A
5561881	12/1995	Klinger et al.	N/A	N/A
5562239	12/1995	Boiarski et al.	N/A	N/A
5562241	12/1995	Knodel et al.	N/A	N/A
5562682	12/1995	Oberlin et al.	N/A	N/A
5562690	12/1995	Green et al.	N/A	N/A
5562694	12/1995	Sauer et al.	N/A	N/A
5562701	12/1995	Huitema et al.	N/A	N/A
5562702	12/1995	Huitema et al.	N/A	N/A
5563481	12/1995	Krause	N/A	N/A
5564615	12/1995	Bishop et al.	N/A	N/A
5569161	12/1995	Ebling et al.	N/A	N/A
5569270	12/1995	Weng	N/A	N/A
5569284	12/1995	Young et al.	N/A	N/A
5571090	12/1995	Sherts	N/A	N/A
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5571116	12/1995	Bolanos et al.	N/A	N/A
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5571488	12/1995	Beerstecher et al.	N/A	N/A
5573169	12/1995	Green et al.	N/A	N/A
5573543	12/1995	Akopov et al.	N/A	N/A
5574431	12/1995	Mckeown et al.	N/A	N/A

5575054	12/1995	Klinzing et al.	N/A	N/A
5575789	12/1995	Bell et al.	N/A	N/A
5575799	12/1995	Bolanos et al.	N/A	N/A
5575803	12/1995	Cooper et al.	N/A	N/A
5575805	12/1995	Li	N/A	N/A
5577654	12/1995	Bishop	N/A	N/A
5578052	12/1995	Koros et al.	N/A	N/A
5579978	12/1995	Green et al.	N/A	N/A
5580067	12/1995	Hamblin et al.	N/A	N/A
5582611	12/1995	Tsuruta et al.	N/A	N/A
5582617	12/1995	Klieman et al.	N/A	N/A
5582907	12/1995	Pall	N/A	N/A
5583114	12/1995	Barrows et al.	N/A	N/A
5584425	12/1995	Savage et al.	N/A	N/A
5586711	12/1995	Plyley et al.	N/A	N/A
5588579	12/1995	Schnut et al.	N/A	N/A
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5588581	12/1995	Conlon et al.	N/A	N/A
5591170	12/1996	Spievack et al.	N/A	N/A
5591187	12/1996	Dekel	N/A	N/A
5597107	12/1996	Knodel et al.	N/A	N/A
5599151	12/1996	Daum et al.	N/A	N/A
5599279	12/1996	Slotman et al.	N/A	N/A
5599344	12/1996	Paterson	N/A	N/A
5599350	12/1996	Schulze et al.	N/A	N/A
5599852	12/1996	Scopelianos et al.	N/A	N/A
5601224	12/1996	Bishop et al.	N/A	N/A
5601573	12/1996	Fogelberg et al.	N/A	N/A
5601604	12/1996	Vincent	N/A	N/A
5602449	12/1996	Krause et al.	N/A	N/A
5603443	12/1996	Clark et al.	N/A	N/A
5605272	12/1996	Witt et al.	N/A	N/A
5605273	12/1996	Hamblin et al.	N/A	N/A
5607094	12/1996	Clark et al.	N/A	N/A
5607095	12/1996	Smith et al.	N/A	N/A
5607303	12/1996	Nakamura	N/A	N/A
5607433	12/1996	Polla et al.	N/A	N/A
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5607450	12/1996	Zvenyatsky et al.	N/A	N/A
5607474	12/1996	Athanasiou et al.	N/A	N/A
5609285	12/1996	Grant et al.	N/A	N/A
5609601	12/1996	Kolesa et al.	N/A	N/A
5611709	12/1996	McAnulty	N/A	N/A
5611813	12/1996	Lichtman	N/A	N/A
5613499	12/1996	Palmer et al.	N/A	N/A
5613937	12/1996	Garrison et al.	N/A	N/A
5613966	12/1996	Makower et al.	N/A	N/A
5614887	12/1996	Buchbinder	N/A	N/A
5615820	12/1996	Viola	N/A	N/A
5618294	12/1996	Aust et al.	N/A	N/A

5618303	12/1996	Marlow et al.	N/A	N/A
5618307	12/1996	Donlon et al.	N/A	N/A
5619992	12/1996	Guthrie et al.	N/A	N/A
5620289	12/1996	Curry	N/A	N/A
5620326	12/1996	Younker	N/A	N/A
5620452	12/1996	Yoon	N/A	N/A
5624398	12/1996	Smith et al.	N/A	N/A
5624452	12/1996	Yates	N/A	N/A
5626587	12/1996	Bishop et al.	N/A	N/A
5626595	12/1996	Sklar et al.	N/A	N/A
5626979	12/1996	Mitsui et al.	N/A	N/A
5628446	12/1996	Geiste et al.	N/A	N/A
5628743	12/1996	Cimino	N/A	N/A
5628745	12/1996	Bek	N/A	N/A
5630539	12/1996	Plyley et al.	N/A	N/A
5630540	12/1996	Blewett	N/A	N/A
5630541	12/1996	Williamson, IV et al.	N/A	N/A
5630782	12/1996	Adair	N/A	N/A
5631973	12/1996	Green	N/A	N/A
5632432	12/1996	Schulze et al.	N/A	N/A
5632433	12/1996	Grant et al.	N/A	N/A
5633374	12/1996	Humphrey et al.	N/A	N/A
5634584	12/1996	Okorocha et al.	N/A	N/A
5636779	12/1996	Palmer	N/A	N/A
5636780	12/1996	Green et al.	N/A	N/A
5637110	12/1996	Pennybacker et al.	N/A	N/A
5638582	12/1996	Klatt et al.	N/A	N/A
5639008	12/1996	Gallagher et al.	N/A	N/A
D381077	12/1996	Hunt	N/A	N/A
5643291	12/1996	Pier et al.	N/A	N/A
5643293	12/1996	Kogasaka et al.	N/A	N/A
5643294	12/1996	Tovey et al.	N/A	N/A
5643319	12/1996	Green et al.	N/A	N/A
5645209	12/1996	Green et al.	N/A	N/A
5647526	12/1996	Green et al.	N/A	N/A
5647869	12/1996	Goble et al.	N/A	N/A
5649937	12/1996	Bito et al.	N/A	N/A
5649956	12/1996	Jensen et al.	N/A	N/A
5651491	12/1996	Heaton et al.	N/A	N/A
5651762	12/1996	Bridges	N/A	N/A
5651821	12/1996	Uchida	N/A	N/A
5653373	12/1996	Green et al.	N/A	N/A
5653374	12/1996	Young et al.	N/A	N/A
5653677	12/1996	Okada et al.	N/A	N/A
5653721	12/1996	Knodel et al.	N/A	N/A
5653748	12/1996	Strecker	N/A	N/A
5655698	12/1996	Yoon	N/A	N/A
5656917	12/1996	Theobald	N/A	N/A
5657417	12/1996	Di Troia	N/A	N/A
5657429	12/1996	Wang et al.	N/A	N/A

5657921	12/1996	Young et al.	N/A	N/A
5658238	12/1996	Suzuki et al.	N/A	N/A
5658281	12/1996	Heard	N/A	N/A
5658298	12/1996	Vincent et al.	N/A	N/A
5658300	12/1996	Bito et al.	N/A	N/A
5658307	12/1996	Exconde	N/A	N/A
5662258	12/1996	Knodel et al.	N/A	N/A
5662260	12/1996	Yoon	N/A	N/A
5662662	12/1996	Bishop et al.	N/A	N/A
5662667	12/1996	Knodel	N/A	N/A
5664404	12/1996	Ivanov et al.	N/A	N/A
5665085	12/1996	Nardella	N/A	N/A
5667517	12/1996	Hooven	N/A	N/A
5667526	12/1996	Levin	N/A	N/A
5667527	12/1996	Cook	N/A	N/A
5667864	12/1996	Landoll	N/A	N/A
5669544	12/1996	Schulze et al.	N/A	N/A
5669904	12/1996	Platt, Jr. et al.	N/A	N/A
5669907	12/1996	Platt, Jr. et al.	N/A	N/A
5669918	12/1996	Balazs et al.	N/A	N/A
5672945	12/1996	Krause	N/A	N/A
5673840	12/1996	Schulze et al.	N/A	N/A
5673841	12/1996	Schulze et al.	N/A	N/A
5673842	12/1996	Bittner et al.	N/A	N/A
5674184	12/1996	Hassler, Jr.	N/A	N/A
5674286	12/1996	D'Alessio et al.	N/A	N/A
5678748	12/1996	Plyley et al.	N/A	N/A
5680981	12/1996	Mililli et al.	N/A	N/A
5680982	12/1996	Schulze et al.	N/A	N/A
5680983	12/1996	Plyley et al.	N/A	N/A
5681341	12/1996	Lunsford et al.	N/A	N/A
5683349	12/1996	Makower et al.	N/A	N/A
5685474	12/1996	Seeber	N/A	N/A
5686090	12/1996	Schilder et al.	N/A	N/A
5688270	12/1996	Yates et al.	N/A	N/A
5690269	12/1996	Bolanos et al.	N/A	N/A
5690675	12/1996	Sawyer et al.	N/A	N/A
5692668	12/1996	Schulze et al.	N/A	N/A
5693020	12/1996	Rauh	N/A	N/A
5693042	12/1996	Boiarski et al.	N/A	N/A
5693051	12/1996	Schulze et al.	N/A	N/A
5695494	12/1996	Becker	N/A	N/A
5695502	12/1996	Pier et al.	N/A	N/A
5695504	12/1996	Gifford, III et al.	N/A	N/A
5695524	12/1996	Kelley et al.	N/A	N/A
5697542	12/1996	Knodel et al.	N/A	N/A
5697543	12/1996	Burdorff	N/A	N/A
5697909	12/1996	Eggers et al.	N/A	N/A
5697943	12/1996	Sauer et al.	N/A	N/A
5700265	12/1996	Romano	N/A	N/A

5700270	12/1996	Peyser et al.	N/A	N/A
5700276	12/1996	Benecke	N/A	N/A
5702387	12/1996	Arts et al.	N/A	N/A
5702408	12/1996	Wales et al.	N/A	N/A
5702409	12/1996	Rayburn et al.	N/A	N/A
5704087	12/1997	Strub	N/A	N/A
5704534	12/1997	Huitema et al.	N/A	N/A
5704792	12/1997	Sobhani	N/A	N/A
5706997	12/1997	Green et al.	N/A	N/A
5706998	12/1997	Plyley et al.	N/A	N/A
5707392	12/1997	Kortenbach	N/A	N/A
5709334	12/1997	Sorrentino et al.	N/A	N/A
5709335	12/1997	Heck	N/A	N/A
5709680	12/1997	Yates et al.	N/A	N/A
5709706	12/1997	Kienzle et al.	N/A	N/A
5711472	12/1997	Bryan	N/A	N/A
5711960	12/1997	Shikinami	N/A	N/A
5712460	12/1997	Carr et al.	N/A	N/A
5713128	12/1997	Schrenk et al.	N/A	N/A
5713505	12/1997	Huitema	N/A	N/A
5713895	12/1997	Lontine et al.	N/A	N/A
5713896	12/1997	Nardella	N/A	N/A
5713920	12/1997	Bezwada et al.	N/A	N/A
5715604	12/1997	Lanzoni	N/A	N/A
5715836	12/1997	Kliegis et al.	N/A	N/A
5715987	12/1997	Kelley et al.	N/A	N/A
5715988	12/1997	Palmer	N/A	N/A
5716352	12/1997	Viola et al.	N/A	N/A
5716366	12/1997	Yates	N/A	N/A
5718359	12/1997	Palmer et al.	N/A	N/A
5718360	12/1997	Green et al.	N/A	N/A
5718548	12/1997	Cotellessa	N/A	N/A
5718714	12/1997	Livneh	N/A	N/A
5720744	12/1997	Eggleston et al.	N/A	N/A
D393067	12/1997	Geary et al.	N/A	N/A
5724025	12/1997	Tavori	N/A	N/A
5725536	12/1997	Oberlin et al.	N/A	N/A
5725554	12/1997	Simon et al.	N/A	N/A
5728110	12/1997	Vidal et al.	N/A	N/A
5728113	12/1997	Sherts	N/A	N/A
5728121	12/1997	Bimbo et al.	N/A	N/A
5730758	12/1997	Allgeyer	N/A	N/A
5732712	12/1997	Adair	N/A	N/A
5732821	12/1997	Stone et al.	N/A	N/A
5732871	12/1997	Clark et al.	N/A	N/A
5732872	12/1997	Bolduc et al.	N/A	N/A
5733308	12/1997	Daugherty et al.	N/A	N/A
5735445	12/1997	Vidal et al.	N/A	N/A
5735848	12/1997	Yates et al.	N/A	N/A
5735874	12/1997	Measamer et al.	N/A	N/A

5736271	12/1997	Cisar et al.	N/A	N/A
5738474	12/1997	Blewett	N/A	N/A
5738629	12/1997	Moll et al.	N/A	N/A
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5741271	12/1997	Nakao et al.	N/A	N/A
5743456	12/1997	Jones et al.	N/A	N/A
5746770	12/1997	Zeitels et al.	N/A	N/A
5747953	12/1997	Philipp	N/A	N/A
5749889	12/1997	Bacich et al.	N/A	N/A
5749893	12/1997	Vidal et al.	N/A	N/A
5749896	12/1997	Cook	N/A	N/A
5749968	12/1997	Melanson et al.	N/A	N/A
5752644	12/1997	Bolanos et al.	N/A	N/A
5752965	12/1997	Francis et al.	N/A	N/A
5752970	12/1997	Yoon	N/A	N/A
5752973	12/1997	Kieturakis	N/A	N/A
5755717	12/1997	Yates et al.	N/A	N/A
5755726	12/1997	Pratt et al.	N/A	N/A
5758814	12/1997	Gallagher et al.	N/A	N/A
5762255	12/1997	Chrisman et al.	N/A	N/A
5762256	12/1997	Mastri et al.	N/A	N/A
5762458	12/1997	Wang et al.	N/A	N/A
5765565	12/1997	Adair	N/A	N/A
5766186	12/1997	Faraz et al.	N/A	N/A
5766188	12/1997	Igaki	N/A	N/A
5766205	12/1997	Zvenyatsky et al.	N/A	N/A
5769303	12/1997	Knodel et al.	N/A	N/A
5769640	12/1997	Jacobus et al.	N/A	N/A
5769748	12/1997	Eyerly et al.	N/A	N/A
5769791	12/1997	Benaron et al.	N/A	N/A
5769892	12/1997	Kingwell	N/A	N/A
5772099	12/1997	Gravener	N/A	N/A
5772379	12/1997	Evensen	N/A	N/A
5772578	12/1997	Heimberger et al.	N/A	N/A
5772659	12/1997	Becker et al.	N/A	N/A
5773991	12/1997	Chen	N/A	N/A
5776130	12/1997	Buysse et al.	N/A	N/A
5778939	12/1997	Hok-Yin	N/A	N/A
5779130	12/1997	Alesi et al.	N/A	N/A
5779131	12/1997	Knodel et al.	N/A	N/A
5779132	12/1997	Knodel et al.	N/A	N/A
5782396	12/1997	Mastri et al.	N/A	N/A
5782397	12/1997	Koukline	N/A	N/A
5782748	12/1997	Palmer et al.	N/A	N/A
5782749	12/1997	Riza	N/A	N/A
5782859	12/1997	Nicholas et al.	N/A	N/A
5784934	12/1997	Izumisawa	N/A	N/A
5785232	12/1997	Vidal et al.	N/A	N/A
5785647	12/1997	Tompkins et al.	N/A	N/A
5787897	12/1997	Kieturakis	N/A	N/A

5791231	12/1997	Cohn et al.	N/A	N/A
5792135	12/1997	Madhani et al.	N/A	N/A
5792162	12/1997	Jolly et al.	N/A	N/A
5792165	12/1997	Klieman et al.	N/A	N/A
5792573	12/1997	Pitzen et al.	N/A	N/A
5794834	12/1997	Hamblin et al.	N/A	N/A
5796188	12/1997	Bays	N/A	N/A
5797536	12/1997	Smith et al.	N/A	N/A
5797537	12/1997	Oberlin et al.	N/A	N/A
5797538	12/1997	Heaton et al.	N/A	N/A
5797637	12/1997	Ervin	N/A	N/A
5797900	12/1997	Madhani et al.	N/A	N/A
5797906	12/1997	Rhum et al.	N/A	N/A
5797927	12/1997	Yoon	N/A	N/A
5797941	12/1997	Schulze et al.	N/A	N/A
5797959	12/1997	Castro et al.	N/A	N/A
5798752	12/1997	Buxton et al.	N/A	N/A
5799857	12/1997	Robertson et al.	N/A	N/A
5800379	12/1997	Edwards	N/A	N/A
5800423	12/1997	Jensen	N/A	N/A
5804726	12/1997	Geib et al.	N/A	N/A
5804936	12/1997	Brodsky et al.	N/A	N/A
5806676	12/1997	Wasgien	N/A	N/A
5807241	12/1997	Heimberger	N/A	N/A
5807376	12/1997	Viola et al.	N/A	N/A
5807378	12/1997	Jensen et al.	N/A	N/A
5807393	12/1997	Williamson, IV et al.	N/A	N/A
5809441	12/1997	McKee	N/A	N/A
5810240	12/1997	Robertson	N/A	N/A
5810721	12/1997	Mueller et al.	N/A	N/A
5810811	12/1997	Yates et al.	N/A	N/A
5810846	12/1997	Virnich et al.	N/A	N/A
5810855	12/1997	Rayburn et al.	N/A	N/A
5812188	12/1997	Adair	N/A	N/A
5813813	12/1997	Daum et al.	N/A	N/A
5814055	12/1997	Knodel et al.	N/A	N/A
5814057	12/1997	Oi et al.	N/A	N/A
5816471	12/1997	Plyley et al.	N/A	N/A
5817084	12/1997	Jensen	N/A	N/A
5817091	12/1997	Nardella et al.	N/A	N/A
5817093	12/1997	Williamson, IV et al.	N/A	N/A
5817109	12/1997	McGarry et al.	N/A	N/A
5817119	12/1997	Klieman et al.	N/A	N/A
5820009	12/1997	Melling et al.	N/A	N/A
5823066	12/1997	Huitema et al.	N/A	N/A
5824333	12/1997	Scopelianos et al.	N/A	N/A
5826776	12/1997	Schulze et al.	N/A	N/A
5827271	12/1997	Buysse et al.	N/A	N/A
5827298	12/1997	Hart et al.	N/A	N/A
5827323	12/1997	Klieman et al.	N/A	N/A

5829662	12/1997	Allen et al.	N/A	N/A
5830598	12/1997	Patterson	N/A	N/A
5833690	12/1997	Yates et al.	N/A	N/A
5833695	12/1997	Yoon	N/A	N/A
5833696	12/1997	Whitfield et al.	N/A	N/A
5836503	12/1997	Ehrenfels et al.	N/A	N/A
5836960	12/1997	Kolesa et al.	N/A	N/A
5839369	12/1997	Chatterjee et al.	N/A	N/A
5839639	12/1997	Sauer et al.	N/A	N/A
5841284	12/1997	Takahashi	N/A	N/A
5843021	12/1997	Edwards et al.	N/A	N/A
5843096	12/1997	Igaki et al.	N/A	N/A
5843097	12/1997	Mayenberger et al.	N/A	N/A
5843122	12/1997	Riza	N/A	N/A
5843132	12/1997	Ilvento	N/A	N/A
5843169	12/1997	Taheri	N/A	N/A
5846254	12/1997	Schulze et al.	N/A	N/A
5847566	12/1997	Marritt et al.	N/A	N/A
5849011	12/1997	Jones et al.	N/A	N/A
5849020	12/1997	Long et al.	N/A	N/A
5849023	12/1997	Mericle	N/A	N/A
5851179	12/1997	Ritson et al.	N/A	N/A
5851212	12/1997	Zirps et al.	N/A	N/A
5853366	12/1997	Dowlatshahi	N/A	N/A
5855311	12/1998	Hamblin et al.	N/A	N/A
5855583	12/1998	Wang et al.	N/A	N/A
5860581	12/1998	Robertson et al.	N/A	N/A
5860975	12/1998	Goble et al.	N/A	N/A
5865361	12/1998	Milliman et al.	N/A	N/A
5865638	12/1998	Trafton	N/A	N/A
5868361	12/1998	Rinderer	N/A	N/A
5868664	12/1998	Speier et al.	N/A	N/A
5868760	12/1998	McGuckin, Jr.	N/A	N/A
5868790	12/1998	Vincent et al.	N/A	N/A
5871135	12/1998	Williamson IV et al.	N/A	N/A
5873885	12/1998	Weidenbenner	N/A	N/A
5876401	12/1998	Schulze et al.	N/A	N/A
5878193	12/1998	Wang et al.	N/A	N/A
5878607	12/1998	Nunes et al.	N/A	N/A
5878937	12/1998	Green et al.	N/A	N/A
5878938	12/1998	Bittner et al.	N/A	N/A
5881777	12/1998	Bassi et al.	N/A	N/A
5881943	12/1998	Heck et al.	N/A	N/A
5891094	12/1998	Masterson et al.	N/A	N/A
5891160	12/1998	Williamson, IV et al.	N/A	N/A
5891558	12/1998	Bell et al.	N/A	N/A
5893506	12/1998	Powell	N/A	N/A
5893835	12/1998	Witt et al.	N/A	N/A
5893855	12/1998	Jacobs	N/A	N/A
5893863	12/1998	Yoon	N/A	N/A

5893878	12/1998	Pierce	N/A	N/A
5894979	12/1998	Powell	N/A	N/A
5897552	12/1998	Edwards et al.	N/A	N/A
5897562	12/1998	Bolanos et al.	N/A	N/A
5899824	12/1998	Kurtz et al.	N/A	N/A
5899914	12/1998	Zirps et al.	N/A	N/A
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5902312	12/1998	Frater et al.	N/A	N/A
5903117	12/1998	Gregory	N/A	N/A
5904647	12/1998	Ouchi	N/A	N/A
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5908427	12/1998	McKean et al.	N/A	N/A
5909062	12/1998	Krietzman	N/A	N/A
5911353	12/1998	Bolanos et al.	N/A	N/A
5915616	12/1998	Viola et al.	N/A	N/A
5916225	12/1998	Kugel	N/A	N/A
5918791	12/1998	Sorrentino et al.	N/A	N/A
5919198	12/1998	Graves, Jr. et al.	N/A	N/A
5921956	12/1998	Grinberg et al.	N/A	N/A
5922001	12/1998	Yoon	N/A	N/A
5922003	12/1998	Anctil et al.	N/A	N/A
5924864	12/1998	Loge et al.	N/A	N/A
5928137	12/1998	Green	N/A	N/A
5928256	12/1998	Riza	N/A	N/A
5931847	12/1998	Bittner et al.	N/A	N/A
5931853	12/1998	McEwen et al.	N/A	N/A
5937951	12/1998	Izuchukwu et al.	N/A	N/A
5938667	12/1998	Peyser et al.	N/A	N/A
5941442	12/1998	Geiste et al.	N/A	N/A
5941890	12/1998	Voegele et al.	N/A	N/A
5944172	12/1998	Hannula	N/A	N/A
5944715	12/1998	Goble et al.	N/A	N/A
5946978	12/1998	Yamashita	N/A	N/A
5947984	12/1998	Whipple	N/A	N/A
5947996	12/1998	Logeman	N/A	N/A
5948030	12/1998	Miller et al.	N/A	N/A
5948429	12/1998	Bell et al.	N/A	N/A
5951301	12/1998	Younker	N/A	N/A
5951516	12/1998	Bunyan	N/A	N/A
5951552	12/1998	Long et al.	N/A	N/A
5951574	12/1998	Stefanchik et al.	N/A	N/A
5951575	12/1998	Bolduc et al.	N/A	N/A
5951581	12/1998	Saadat et al.	N/A	N/A

5954259	12/1998	Viola et al.	N/A	N/A
5957831	12/1998	Adair	N/A	N/A
5964394	12/1998	Robertson	N/A	N/A
5964774	12/1998	McKean et al.	N/A	N/A
5966126	12/1998	Szabo	N/A	N/A
5971916	12/1998	Koren	N/A	N/A
5973221	12/1998	Collyer et al.	N/A	N/A
D416089	12/1998	Barton et al.	N/A	N/A
5976122	12/1998	Madhani et al.	N/A	N/A
5977746	12/1998	Hershberger et al.	N/A	N/A
5980248	12/1998	Kusakabe et al.	N/A	N/A
5980569	12/1998	Scirica	N/A	N/A
5984949	12/1998	Levin	N/A	N/A
5988479	12/1998	Palmer	N/A	N/A
5990379	12/1998	Gregory	N/A	N/A
5993466	12/1998	Yoon	N/A	N/A
5997528	12/1998	Bisch et al.	N/A	N/A
5997552	12/1998	Person et al.	N/A	N/A
6001108	12/1998	Wang et al.	N/A	N/A
6003517	12/1998	Sheffield et al.	N/A	N/A
6004319	12/1998	Goble et al.	N/A	N/A
6004335	12/1998	Vaitekunas et al.	N/A	N/A
6007521	12/1998	Bidwell et al.	N/A	N/A
6010054	12/1999	Johnson et al.	N/A	N/A
6010513	12/1999	Tormala et al.	N/A	N/A
6010520	12/1999	Pattison	N/A	N/A
6012494	12/1999	Balazs	N/A	N/A
6013076	12/1999	Goble et al.	N/A	N/A
6013991	12/1999	Philipp	N/A	N/A
6015406	12/1999	Goble et al.	N/A	N/A
6015417	12/1999	Reynolds, Jr.	N/A	N/A
6017322	12/1999	Snoke et al.	N/A	N/A
6017354	12/1999	Culp et al.	N/A	N/A
6017356	12/1999	Frederick et al.	N/A	N/A
6018227	12/1999	Kumar et al.	N/A	N/A
6019745	12/1999	Gray	N/A	N/A
6019780	12/1999	Lombardo et al.	N/A	N/A
6022352	12/1999	Vandewalle	N/A	N/A
6023275	12/1999	Horvitz et al.	N/A	N/A
6023641	12/1999	Thompson	N/A	N/A
6024708	12/1999	Bales et al.	N/A	N/A
6024741	12/1999	Williamson, IV et al.	N/A	N/A
6024748	12/1999	Manzo et al.	N/A	N/A
6024750	12/1999	Mastri et al.	N/A	N/A
6024764	12/1999	Schroeppel	N/A	N/A
6027501	12/1999	Goble et al.	N/A	N/A
6030384	12/1999	Nezhat	N/A	N/A
6032849	12/1999	Mastri et al.	N/A	N/A
6033105	12/1999	Barker et al.	N/A	N/A
6033378	12/1999	Lundquist et al.	N/A	N/A

6033399	12/1999	Gines	N/A	N/A
6033427	12/1999	Lee	N/A	N/A
6036641	12/1999	Taylor et al.	N/A	N/A
6036667	12/1999	Manna et al.	N/A	N/A
6037724	12/1999	Buss et al.	N/A	N/A
6037927	12/1999	Rosenberg	N/A	N/A
6039126	12/1999	Hsieh	N/A	N/A
6039733	12/1999	Buysse et al.	N/A	N/A
6039734	12/1999	Goble	N/A	N/A
6042601	12/1999	Smith	N/A	N/A
6042607	12/1999	Williamson, IV et al.	N/A	N/A
6043626	12/1999	Snyder et al.	N/A	N/A
6045560	12/1999	McKean et al.	N/A	N/A
6047861	12/1999	Vidal et al.	N/A	N/A
6049145	12/1999	Austin et al.	N/A	N/A
6050172	12/1999	Corves et al.	N/A	N/A
6050472	12/1999	Shibata	N/A	N/A
6050989	12/1999	Fox et al.	N/A	N/A
6050990	12/1999	Tankovich et al.	N/A	N/A
6050996	12/1999	Schmaltz et al.	N/A	N/A
6053390	12/1999	Green et al.	N/A	N/A
6053899	12/1999	Slanda et al.	N/A	N/A
6053922	12/1999	Krause et al.	N/A	N/A
6054142	12/1999	Li et al.	N/A	N/A
6055062	12/1999	Dina et al.	N/A	N/A
RE36720	12/1999	Green et al.	N/A	N/A
6056735	12/1999	Okada et al.	N/A	N/A
6056746	12/1999	Goble et al.	N/A	N/A
6059806	12/1999	Hoegerle	N/A	N/A
6062360	12/1999	Shields	N/A	N/A
6063020	12/1999	Jones et al.	N/A	N/A
6063025	12/1999	Bridges et al.	N/A	N/A
6063050	12/1999	Manna et al.	N/A	N/A
6063095	12/1999	Wang et al.	N/A	N/A
6063097	12/1999	Oi et al.	N/A	N/A
6063098	12/1999	Houser et al.	N/A	N/A
6065679	12/1999	Levie et al.	N/A	N/A
6065919	12/1999	Peck	N/A	N/A
6066132	12/1999	Chen et al.	N/A	N/A
6066151	12/1999	Miyawaki et al.	N/A	N/A
6068627	12/1999	Orszulak et al.	N/A	N/A
6071233	12/1999	Ishikawa et al.	N/A	N/A
6072299	12/1999	Kurle et al.	N/A	N/A
6074386	12/1999	Goble et al.	N/A	N/A
6074401	12/1999	Gardiner et al.	N/A	N/A
6075441	12/1999	Maloney	N/A	N/A
6077280	12/1999	Fossum	N/A	N/A
6077286	12/1999	Cuschieri et al.	N/A	N/A
6077290	12/1999	Marini	N/A	N/A
6079606	12/1999	Milliman et al.	N/A	N/A

6080181	12/1999	Jensen et al.	N/A	N/A
6082577	12/1999	Coates et al.	N/A	N/A
6083191	12/1999	Rose	N/A	N/A
6083223	12/1999	Baker	N/A	N/A
6083234	12/1999	Nicholas et al.	N/A	N/A
6083242	12/1999	Cook	N/A	N/A
6086544	12/1999	Hibner et al.	N/A	N/A
6086600	12/1999	Kortenbach	N/A	N/A
6090106	12/1999	Goble et al.	N/A	N/A
6090123	12/1999	Culp et al.	N/A	N/A
6093186	12/1999	Goble	N/A	N/A
6094021	12/1999	Noro et al.	N/A	N/A
D429252	12/1999	Haitani et al.	N/A	N/A
6099537	12/1999	Sugai et al.	N/A	N/A
6099551	12/1999	Gabbay	N/A	N/A
6102271	12/1999	Longo et al.	N/A	N/A
6102926	12/1999	Tartaglia et al.	N/A	N/A
6104162	12/1999	Sainsbury et al.	N/A	N/A
6104304	12/1999	Clark et al.	N/A	N/A
6106511	12/1999	Jensen	N/A	N/A
6109500	12/1999	Alli et al.	N/A	N/A
6110187	12/1999	Donlon	N/A	N/A
6113618	12/1999	Nic	N/A	N/A
6117148	12/1999	Ravo et al.	N/A	N/A
6117158	12/1999	Measamer et al.	N/A	N/A
6119913	12/1999	Adams et al.	N/A	N/A
6120433	12/1999	Mizuno et al.	N/A	N/A
6120462	12/1999	Hibner et al.	N/A	N/A
6123241	12/1999	Walter et al.	N/A	N/A
6123701	12/1999	Nezhat	N/A	N/A
H1904	12/1999	Yates et al.	N/A	N/A
RE36923	12/1999	Hiroi et al.	N/A	N/A
6126058	12/1999	Adams et al.	N/A	N/A
6126359	12/1999	Dittrich et al.	N/A	N/A
6126670	12/1999	Walker et al.	N/A	N/A
6131789	12/1999	Schulze et al.	N/A	N/A
6131790	12/1999	Piraka	N/A	N/A
6132368	12/1999	Cooper	N/A	N/A
6134962	12/1999	Sugitani	N/A	N/A
6139546	12/1999	Koenig et al.	N/A	N/A
6142149	12/1999	Steen	N/A	N/A
6142933	12/1999	Longo et al.	N/A	N/A
6147135	12/1999	Yuan et al.	N/A	N/A
6149660	12/1999	Laufer et al.	N/A	N/A
6151323	12/1999	O'Connell et al.	N/A	N/A
6152935	12/1999	Kammerer et al.	N/A	N/A
6155473	12/1999	Tompkins et al.	N/A	N/A
6156056	12/1999	Kearns et al.	N/A	N/A
6157169	12/1999	Lee	N/A	N/A
6159146	12/1999	El Gazayerli	N/A	N/A

6159200	12/1999	Verdura et al.	N/A	N/A
6159224	12/1999	Yoon	N/A	N/A
6162208	12/1999	Hipps	N/A	N/A
6162220	12/1999	Nezhat	N/A	N/A
6162537	12/1999	Martin et al.	N/A	N/A
6165175	12/1999	Wampler et al.	N/A	N/A
6165184	12/1999	Verdura et al.	N/A	N/A
6165188	12/1999	Saadat et al.	N/A	N/A
6167185	12/1999	Smiley et al.	N/A	N/A
6168605	12/2000	Measamer et al.	N/A	N/A
6171305	12/2000	Sherman	N/A	N/A
6171316	12/2000	Kovac et al.	N/A	N/A
6171330	12/2000	Benchetrit	N/A	N/A
6173074	12/2000	Russo	N/A	N/A
6174308	12/2000	Goble et al.	N/A	N/A
6174309	12/2000	Wrublewski et al.	N/A	N/A
6174318	12/2000	Bates et al.	N/A	N/A
6175290	12/2000	Forsythe et al.	N/A	N/A
6179195	12/2000	Adams et al.	N/A	N/A
6179776	12/2000	Adams et al.	N/A	N/A
6181105	12/2000	Cutolo et al.	N/A	N/A
6182673	12/2000	Kindermann et al.	N/A	N/A
6185356	12/2000	Parker et al.	N/A	N/A
6186142	12/2000	Schmidt et al.	N/A	N/A
6186957	12/2000	Milam	N/A	N/A
6187003	12/2000	Buysse et al.	N/A	N/A
6190386	12/2000	Rydell	N/A	N/A
6193129	12/2000	Bittner et al.	N/A	N/A
6197042	12/2000	Ginn et al.	N/A	N/A
6200311	12/2000	Danek et al.	N/A	N/A
6200330	12/2000	Benderev et al.	N/A	N/A
6202914	12/2000	Geiste et al.	N/A	N/A
6206894	12/2000	Thompson et al.	N/A	N/A
6206897	12/2000	Jamiolkowski et al.	N/A	N/A
6206903	12/2000	Ramans	N/A	N/A
6206904	12/2000	Ouchi	N/A	N/A
6209414	12/2000	Uneme	N/A	N/A
6210403	12/2000	Klicek	N/A	N/A
6211626	12/2000	Lys et al.	N/A	N/A
6213999	12/2000	Platt, Jr. et al.	N/A	N/A
6214028	12/2000	Yoon et al.	N/A	N/A
6220368	12/2000	Ark et al.	N/A	N/A
6221007	12/2000	Green	N/A	N/A
6221023	12/2000	Matsuba et al.	N/A	N/A
6223100	12/2000	Green	N/A	N/A
6223835	12/2000	Habedank et al.	N/A	N/A
6224617	12/2000	Saadat et al.	N/A	N/A
6228080	12/2000	Gines	N/A	N/A
6228081	12/2000	Goble	N/A	N/A
6228083	12/2000	Lands et al.	N/A	N/A

6228084	12/2000	Kirwan, Jr.	N/A	N/A
6228089	12/2000	Wahrburg	N/A	N/A
6228098	12/2000	Kayan et al.	N/A	N/A
6231565	12/2000	Tovey et al.	N/A	N/A
6234178	12/2000	Goble et al.	N/A	N/A
6235036	12/2000	Gardner et al.	N/A	N/A
6237604	12/2000	Burnside et al.	N/A	N/A
6238384	12/2000	Peer	N/A	N/A
6241139	12/2000	Milliman et al.	N/A	N/A
6241140	12/2000	Adams et al.	N/A	N/A
6241723	12/2000	Heim et al.	N/A	N/A
6245084	12/2000	Mark et al.	N/A	N/A
6248116	12/2000	Chevillon et al.	N/A	N/A
6248117	12/2000	Blatter	N/A	N/A
6249076	12/2000	Madden et al.	N/A	N/A
6249105	12/2000	Andrews et al.	N/A	N/A
6250532	12/2000	Green et al.	N/A	N/A
6251485	12/2000	Harris et al.	N/A	N/A
D445745	12/2000	Norman	N/A	N/A
6254534	12/2000	Butler et al.	N/A	N/A
6254619	12/2000	Garabet et al.	N/A	N/A
6254642	12/2000	Taylor	N/A	N/A
6258107	12/2000	Balazs et al.	N/A	N/A
6261246	12/2000	Pantages et al.	N/A	N/A
6261286	12/2000	Goble et al.	N/A	N/A
6261679	12/2000	Chen et al.	N/A	N/A
6264086	12/2000	McGuckin, Jr.	N/A	N/A
6264087	12/2000	Whitman	N/A	N/A
6264617	12/2000	Bales et al.	N/A	N/A
6269997	12/2000	Balazs et al.	N/A	N/A
6270508	12/2000	Klieman et al.	N/A	N/A
6270916	12/2000	Sink et al.	N/A	N/A
6273252	12/2000	Mitchell	N/A	N/A
6273876	12/2000	Klima et al.	N/A	N/A
6273897	12/2000	Dalessandro et al.	N/A	N/A
6277114	12/2000	Bullivant et al.	N/A	N/A
6280407	12/2000	Manna et al.	N/A	N/A
6283981	12/2000	Beaupre	N/A	N/A
6293927	12/2000	McGuckin, Jr.	N/A	N/A
6293942	12/2000	Goble et al.	N/A	N/A
6296640	12/2000	Wampler et al.	N/A	N/A
6302311	12/2000	Adams et al.	N/A	N/A
6302743	12/2000	Chiu et al.	N/A	N/A
6305891	12/2000	Burlingame	N/A	N/A
6306134	12/2000	Goble et al.	N/A	N/A
6306149	12/2000	Meade	N/A	N/A
6306424	12/2000	Vyakarnam et al.	N/A	N/A
6309397	12/2000	Julian et al.	N/A	N/A
6309400	12/2000	Beaupre	N/A	N/A
6309403	12/2000	Minor et al.	N/A	N/A

6312435	12/2000	Wallace et al.	N/A	N/A
6315184	12/2000	Whitman	N/A	N/A
6317616	12/2000	Glossop	N/A	N/A
6319510	12/2000	Yates	N/A	N/A
6320123	12/2000	Reimers	N/A	N/A
6322494	12/2000	Bullivant et al.	N/A	N/A
6324339	12/2000	Hudson et al.	N/A	N/A
6325799	12/2000	Goble	N/A	N/A
6325805	12/2000	Ogilvie et al.	N/A	N/A
6325810	12/2000	Hamilton et al.	N/A	N/A
6328498	12/2000	Mersch	N/A	N/A
6330965	12/2000	Milliman et al.	N/A	N/A
6331181	12/2000	Tierney et al.	N/A	N/A
6331761	12/2000	Kumar et al.	N/A	N/A
6333029	12/2000	Vyakarnam et al.	N/A	N/A
6334860	12/2001	Dorn	N/A	N/A
6334861	12/2001	Chandler et al.	N/A	N/A
6336926	12/2001	Goble	N/A	N/A
6338737	12/2001	Toledano	N/A	N/A
6338738	12/2001	Bellotti et al.	N/A	N/A
6343731	12/2001	Adams et al.	N/A	N/A
6346077	12/2001	Taylor et al.	N/A	N/A
6348061	12/2001	Whitman	N/A	N/A
6349868	12/2001	Mattingly et al.	N/A	N/A
D454951	12/2001	Bon	N/A	N/A
6352503	12/2001	Matsui et al.	N/A	N/A
6352532	12/2001	Kramer et al.	N/A	N/A
6355699	12/2001	Vyakarnam et al.	N/A	N/A
6356072	12/2001	Chass	N/A	N/A
6358224	12/2001	Tims et al.	N/A	N/A
6358263	12/2001	Mark et al.	N/A	N/A
6358459	12/2001	Ziegler et al.	N/A	N/A
6361542	12/2001	Dimitriu et al.	N/A	N/A
6364828	12/2001	Yeung et al.	N/A	N/A
6364877	12/2001	Goble et al.	N/A	N/A
6364888	12/2001	Niemeyer et al.	N/A	N/A
6366441	12/2001	Ozawa et al.	N/A	N/A
6370981	12/2001	Watarai	N/A	N/A
6371114	12/2001	Schmidt et al.	N/A	N/A
6373152	12/2001	Wang et al.	N/A	N/A
6377011	12/2001	Ben-Ur	N/A	N/A
6383201	12/2001	Dong	N/A	N/A
6387092	12/2001	Burnside et al.	N/A	N/A
6387113	12/2001	Hawkins et al.	N/A	N/A
6387114	12/2001	Adams	N/A	N/A
6391038	12/2001	Vargas et al.	N/A	N/A
6392854	12/2001	O'Gorman	N/A	N/A
6394998	12/2001	Wallace et al.	N/A	N/A
6398779	12/2001	Buysse et al.	N/A	N/A
6398781	12/2001	Goble et al.	N/A	N/A

6398797	12/2001	Bombard et al.	N/A	N/A
6402766	12/2001	Bowman et al.	N/A	N/A
6402780	12/2001	Williamson, IV et al.	N/A	N/A
6406440	12/2001	Stefanchik	N/A	N/A
6406472	12/2001	Jensen	N/A	N/A
6409724	12/2001	Penny et al.	N/A	N/A
H2037	12/2001	Yates et al.	N/A	N/A
6412639	12/2001	Hickey	N/A	N/A
6413274	12/2001	Pedros	N/A	N/A
6415542	12/2001	Bates et al.	N/A	N/A
6416486	12/2001	Wampler	N/A	N/A
6416509	12/2001	Goble et al.	N/A	N/A
6419695	12/2001	Gabbay	N/A	N/A
6423079	12/2001	Blake, III	N/A	N/A
6424885	12/2001	Niemeyer et al.	N/A	N/A
RE37814	12/2001	Allgeyer	N/A	N/A
6428070	12/2001	Takanashi et al.	N/A	N/A
6428487	12/2001	Burdorff et al.	N/A	N/A
6429611	12/2001	Li	N/A	N/A
6430298	12/2001	Kettl et al.	N/A	N/A
6432065	12/2001	Burdorff et al.	N/A	N/A
6436097	12/2001	Nardella	N/A	N/A
6436107	12/2001	Wang et al.	N/A	N/A
6436110	12/2001	Bowman et al.	N/A	N/A
6436115	12/2001	Beaupre	N/A	N/A
6436122	12/2001	Frank et al.	N/A	N/A
6439439	12/2001	Rickard et al.	N/A	N/A
6439446	12/2001	Perry et al.	N/A	N/A
6440146	12/2001	Nicholas et al.	N/A	N/A
6441577	12/2001	Blumenkranz et al.	N/A	N/A
D462758	12/2001	Epstein et al.	N/A	N/A
6443973	12/2001	Whitman	N/A	N/A
6445530	12/2001	Baker	N/A	N/A
6447518	12/2001	Krause et al.	N/A	N/A
6447523	12/2001	Middleman et al.	N/A	N/A
6447799	12/2001	Ullman	N/A	N/A
6447864	12/2001	Johnson et al.	N/A	N/A
6450391	12/2001	Kayan et al.	N/A	N/A
6450989	12/2001	Dubrul et al.	N/A	N/A
6454656	12/2001	Brissette et al.	N/A	N/A
6454781	12/2001	Witt et al.	N/A	N/A
6457338	12/2001	Frenken	N/A	N/A
6457625	12/2001	Tormala et al.	N/A	N/A
6458077	12/2001	Boebel et al.	N/A	N/A
6458142	12/2001	Faller et al.	N/A	N/A
6458147	12/2001	Cruise et al.	N/A	N/A
6460627	12/2001	Below et al.	N/A	N/A
6463824	12/2001	Prell et al.	N/A	N/A
6468275	12/2001	Wampler et al.	N/A	N/A
6468286	12/2001	Mastri et al.	N/A	N/A

6471106	12/2001	Reining	N/A	N/A
6471659	12/2001	Eggers et al.	N/A	N/A
6478210	12/2001	Adams et al.	N/A	N/A
6482063	12/2001	Frigard	N/A	N/A
6482200	12/2001	Shippert	N/A	N/A
6482217	12/2001	Pintor et al.	N/A	N/A
6485490	12/2001	Wampler et al.	N/A	N/A
6485503	12/2001	Jacobs et al.	N/A	N/A
6485667	12/2001	Tan	N/A	N/A
6486286	12/2001	McGall et al.	N/A	N/A
6488196	12/2001	Fenton, Jr.	N/A	N/A
6488197	12/2001	Whitman	N/A	N/A
6488659	12/2001	Rosenman	N/A	N/A
6491201	12/2001	Whitman	N/A	N/A
6491690	12/2001	Goble et al.	N/A	N/A
6491701	12/2001	Tierney et al.	N/A	N/A
6491702	12/2001	Heilbrun et al.	N/A	N/A
6492785	12/2001	Kasten et al.	N/A	N/A
6494882	12/2001	Lebouitz et al.	N/A	N/A
6494885	12/2001	Dhindsa	N/A	N/A
6494888	12/2001	Laufer et al.	N/A	N/A
6494896	12/2001	D'Alessio et al.	N/A	N/A
6498480	12/2001	Manara	N/A	N/A
6500176	12/2001	Truckai et al.	N/A	N/A
6500189	12/2001	Lang et al.	N/A	N/A
6500194	12/2001	Benderev et al.	N/A	N/A
D468749	12/2002	Friedman	N/A	N/A
6503139	12/2002	Coral	N/A	N/A
6503257	12/2002	Grant et al.	N/A	N/A
6503259	12/2002	Huxel et al.	N/A	N/A
6505768	12/2002	Whitman	N/A	N/A
6506197	12/2002	Rollero et al.	N/A	N/A
6506399	12/2002	Donovan	N/A	N/A
6510854	12/2002	Goble	N/A	N/A
6511468	12/2002	Cragg et al.	N/A	N/A
6512360	12/2002	Goto et al.	N/A	N/A
6514252	12/2002	Nezhat et al.	N/A	N/A
6516073	12/2002	Schulz et al.	N/A	N/A
6517528	12/2002	Pantages et al.	N/A	N/A
6517535	12/2002	Edwards	N/A	N/A
6517565	12/2002	Whitman et al.	N/A	N/A
6517566	12/2002	Hovland et al.	N/A	N/A
6520971	12/2002	Perry et al.	N/A	N/A
6520972	12/2002	Peters	N/A	N/A
6522101	12/2002	Malackowski	N/A	N/A
6524180	12/2002	Simms et al.	N/A	N/A
6525499	12/2002	Naganuma	N/A	N/A
D471206	12/2002	Buzzard et al.	N/A	N/A
6527782	12/2002	Hogg et al.	N/A	N/A
6527785	12/2002	Sancoff et al.	N/A	N/A

6530942	12/2002	Fogarty et al.	N/A	N/A
6532958	12/2002	Buan et al.	N/A	N/A
6533157	12/2002	Whitman	N/A	N/A
6533723	12/2002	Lockery et al.	N/A	N/A
6533784	12/2002	Truckai et al.	N/A	N/A
6535764	12/2002	Imran et al.	N/A	N/A
6539297	12/2002	Weiberle et al.	N/A	N/A
D473239	12/2002	Cockerill	N/A	N/A
6539816	12/2002	Kogiso et al.	N/A	N/A
6540737	12/2002	Bacher et al.	N/A	N/A
6543456	12/2002	Freeman	N/A	N/A
6545384	12/2002	Pelrine et al.	N/A	N/A
6547786	12/2002	Goble	N/A	N/A
6550546	12/2002	Thurler et al.	N/A	N/A
6551333	12/2002	Kuhns et al.	N/A	N/A
6554844	12/2002	Lee et al.	N/A	N/A
6554861	12/2002	Knox et al.	N/A	N/A
6555770	12/2002	Kawase	N/A	N/A
6558378	12/2002	Sherman et al.	N/A	N/A
6558379	12/2002	Batchelor et al.	N/A	N/A
6558429	12/2002	Taylor	N/A	N/A
6561187	12/2002	Schmidt et al.	N/A	N/A
6565560	12/2002	Goble et al.	N/A	N/A
6566619	12/2002	Gillman et al.	N/A	N/A
6569085	12/2002	Kortenbach et al.	N/A	N/A
6569171	12/2002	DeGuillebon et al.	N/A	N/A
6569173	12/2002	Blatter et al.	N/A	N/A
6572629	12/2002	Kalloo et al.	N/A	N/A
6575969	12/2002	Rittman, III et al.	N/A	N/A
6578751	12/2002	Hartwick	N/A	N/A
6582364	12/2002	Butler et al.	N/A	N/A
6582427	12/2002	Goble et al.	N/A	N/A
6582441	12/2002	He et al.	N/A	N/A
6583533	12/2002	Pelrine et al.	N/A	N/A
6585144	12/2002	Adams et al.	N/A	N/A
6585664	12/2002	Burdorff et al.	N/A	N/A
6586898	12/2002	King et al.	N/A	N/A
6587750	12/2002	Gerbi et al.	N/A	N/A
6588277	12/2002	Giordano et al.	N/A	N/A
6588643	12/2002	Bolduc et al.	N/A	N/A
6588931	12/2002	Betzner et al.	N/A	N/A
6589118	12/2002	Soma et al.	N/A	N/A
6589164	12/2002	Flaherty	N/A	N/A
6592538	12/2002	Hotchkiss et al.	N/A	N/A
6592572	12/2002	Suzuta	N/A	N/A
6592597	12/2002	Grant et al.	N/A	N/A
6594552	12/2002	Nowlin et al.	N/A	N/A
6595914	12/2002	Kato	N/A	N/A
6596296	12/2002	Nelson et al.	N/A	N/A
6596304	12/2002	Bayon et al.	N/A	N/A

6596432	12/2002	Kawakami et al.	N/A	N/A
6599295	12/2002	Tornier et al.	N/A	N/A
6599323	12/2002	Melican et al.	N/A	N/A
D478665	12/2002	Isaacs et al.	N/A	N/A
D478986	12/2002	Johnston et al.	N/A	N/A
6601749	12/2002	Sullivan et al.	N/A	N/A
6602252	12/2002	Mollenauer	N/A	N/A
6602262	12/2002	Griego et al.	N/A	N/A
6603050	12/2002	Heaton	N/A	N/A
6605078	12/2002	Adams	N/A	N/A
6605669	12/2002	Awokola et al.	N/A	N/A
6605911	12/2002	Klesing	N/A	N/A
6607475	12/2002	Doyle et al.	N/A	N/A
6611793	12/2002	Burnside et al.	N/A	N/A
6613069	12/2002	Boyd et al.	N/A	N/A
6616686	12/2002	Coleman et al.	N/A	N/A
6619529	12/2002	Green et al.	N/A	N/A
6620111	12/2002	Stephens et al.	N/A	N/A
6620161	12/2002	Schulze et al.	N/A	N/A
6620166	12/2002	Wenstrom, Jr. et al.	N/A	N/A
6625517	12/2002	Bogdanov et al.	N/A	N/A
6626834	12/2002	Dunne et al.	N/A	N/A
6626901	12/2002	Treat et al.	N/A	N/A
6626938	12/2002	Butaric et al.	N/A	N/A
H2086	12/2002	Amsler	N/A	N/A
6629630	12/2002	Adams	N/A	N/A
6629974	12/2002	Penny et al.	N/A	N/A
6629988	12/2002	Weadock	N/A	N/A
6635838	12/2002	Kornelson	N/A	N/A
6636412	12/2002	Smith	N/A	N/A
6638108	12/2002	Tachi	N/A	N/A
6638285	12/2002	Gabbay	N/A	N/A
6638297	12/2002	Huitema	N/A	N/A
RE38335	12/2002	Aust et al.	N/A	N/A
6641528	12/2002	Torii	N/A	N/A
6644532	12/2002	Green et al.	N/A	N/A
6645201	12/2002	Utley et al.	N/A	N/A
6646307	12/2002	Yu et al.	N/A	N/A
6648816	12/2002	Irion et al.	N/A	N/A
6648901	12/2002	Fleischman et al.	N/A	N/A
6652595	12/2002	Nicolo	N/A	N/A
D484243	12/2002	Ryan et al.	N/A	N/A
D484595	12/2002	Ryan et al.	N/A	N/A
D484596	12/2002	Ryan et al.	N/A	N/A
6656177	12/2002	Truckai et al.	N/A	N/A
6656193	12/2002	Grant et al.	N/A	N/A
6659940	12/2002	Adler	N/A	N/A
6660008	12/2002	Foerster et al.	N/A	N/A
6663623	12/2002	Oyama et al.	N/A	N/A
6663641	12/2002	Kovac et al.	N/A	N/A

6666854	12/2002	Lange	N/A	N/A
6666860	12/2002	Takahashi	N/A	N/A
6666875	12/2002	Sakurai et al.	N/A	N/A
6667825	12/2002	Lu et al.	N/A	N/A
6669073	12/2002	Milliman et al.	N/A	N/A
6670806	12/2002	Wendt et al.	N/A	N/A
6671185	12/2002	Duval	N/A	N/A
D484977	12/2003	Ryan et al.	N/A	N/A
6676660	12/2003	Wampler et al.	N/A	N/A
6677687	12/2003	Ho et al.	N/A	N/A
6679269	12/2003	Swanson	N/A	N/A
6679410	12/2003	Wursch et al.	N/A	N/A
6681978	12/2003	Geiste et al.	N/A	N/A
6681979	12/2003	Whitman	N/A	N/A
6682527	12/2003	Strul	N/A	N/A
6682528	12/2003	Frazier et al.	N/A	N/A
6682544	12/2003	Mastri et al.	N/A	N/A
6685698	12/2003	Morley et al.	N/A	N/A
6685727	12/2003	Fisher et al.	N/A	N/A
6689153	12/2003	Skiba	N/A	N/A
6692507	12/2003	Pugsley et al.	N/A	N/A
6692692	12/2003	Stetzel	N/A	N/A
6695198	12/2003	Adams et al.	N/A	N/A
6695199	12/2003	Whitman	N/A	N/A
6695774	12/2003	Hale et al.	N/A	N/A
6695849	12/2003	Michelson	N/A	N/A
6696814	12/2003	Henderson et al.	N/A	N/A
6697048	12/2003	Rosenberg et al.	N/A	N/A
6698643	12/2003	Whitman	N/A	N/A
6699177	12/2003	Wang et al.	N/A	N/A
6699214	12/2003	Gellman	N/A	N/A
6699235	12/2003	Wallace et al.	N/A	N/A
6704210	12/2003	Myers	N/A	N/A
6705503	12/2003	Pedicini et al.	N/A	N/A
6709445	12/2003	Boebel et al.	N/A	N/A
6712773	12/2003	Viola	N/A	N/A
6716215	12/2003	David et al.	N/A	N/A
6716223	12/2003	Leopold et al.	N/A	N/A
6716232	12/2003	Vidal et al.	N/A	N/A
6716233	12/2003	Whitman	N/A	N/A
6720734	12/2003	Norris	N/A	N/A
6722550	12/2003	Ricordi et al.	N/A	N/A
6722552	12/2003	Fenton, Jr.	N/A	N/A
6723087	12/2003	O'Neill et al.	N/A	N/A
6723091	12/2003	Goble et al.	N/A	N/A
6723106	12/2003	Charles et al.	N/A	N/A
6723109	12/2003	Solingen	N/A	N/A
6726651	12/2003	Robinson et al.	N/A	N/A
6726697	12/2003	Nicholas et al.	N/A	N/A
6726705	12/2003	Peterson et al.	N/A	N/A

6726706	12/2003	Dominguez	N/A	N/A
6729119	12/2003	Schnipke et al.	N/A	N/A
6731976	12/2003	Penn et al.	N/A	N/A
6736810	12/2003	Hoey et al.	N/A	N/A
6736825	12/2003	Blatter et al.	N/A	N/A
6736854	12/2003	Vadurro et al.	N/A	N/A
6740030	12/2003	Martone et al.	N/A	N/A
6743230	12/2003	Lutze et al.	N/A	N/A
6744385	12/2003	Kazuya et al.	N/A	N/A
6747121	12/2003	Gogolewski	N/A	N/A
6747300	12/2003	Nadd et al.	N/A	N/A
6749560	12/2003	Konstorum et al.	N/A	N/A
6749600	12/2003	Levy	N/A	N/A
6752768	12/2003	Burdorff et al.	N/A	N/A
6752816	12/2003	Culp et al.	N/A	N/A
6754959	12/2003	Guiette, III et al.	N/A	N/A
6755195	12/2003	Lemke et al.	N/A	N/A
6755338	12/2003	Hahnen et al.	N/A	N/A
6755825	12/2003	Shoenman et al.	N/A	N/A
6755843	12/2003	Chung et al.	N/A	N/A
6756705	12/2003	Pulford, Jr.	N/A	N/A
6758846	12/2003	Goble et al.	N/A	N/A
6761685	12/2003	Adams et al.	N/A	N/A
6762339	12/2003	Klun et al.	N/A	N/A
6763307	12/2003	Berg et al.	N/A	N/A
6764445	12/2003	Ramans et al.	N/A	N/A
6766957	12/2003	Matsuura et al.	N/A	N/A
6767352	12/2003	Field et al.	N/A	N/A
6767356	12/2003	Kanner et al.	N/A	N/A
6769590	12/2003	Vresh et al.	N/A	N/A
6769594	12/2003	Orban, III	N/A	N/A
6770027	12/2003	Banik et al.	N/A	N/A
6770070	12/2003	Balbierz	N/A	N/A
6770072	12/2003	Truckai et al.	N/A	N/A
6770078	12/2003	Bonutti	N/A	N/A
6773409	12/2003	Truckai et al.	N/A	N/A
6773437	12/2003	Ogilvie et al.	N/A	N/A
6773438	12/2003	Knodel et al.	N/A	N/A
6773458	12/2003	Brauker et al.	N/A	N/A
6775575	12/2003	Bommannan et al.	N/A	N/A
6777838	12/2003	Miekka et al.	N/A	N/A
6778846	12/2003	Martinez et al.	N/A	N/A
6780151	12/2003	Grabover et al.	N/A	N/A
6780180	12/2003	Goble et al.	N/A	N/A
6783524	12/2003	Anderson et al.	N/A	N/A
6784775	12/2003	Mandell et al.	N/A	N/A
6786382	12/2003	Hoffman	N/A	N/A
6786864	12/2003	Matsuura et al.	N/A	N/A
6786896	12/2003	Madhani et al.	N/A	N/A
6788018	12/2003	Blumenkranz	N/A	N/A

6790173	12/2003	Saadat et al.	N/A	N/A
6793652	12/2003	Whitman et al.	N/A	N/A
6793661	12/2003	Hamilton et al.	N/A	N/A
6793663	12/2003	Kneifel et al.	N/A	N/A
6793669	12/2003	Nakamura et al.	N/A	N/A
6796921	12/2003	Buck et al.	N/A	N/A
6799669	12/2003	Fukumura et al.	N/A	N/A
6801009	12/2003	Makaran et al.	N/A	N/A
6802822	12/2003	Dodge	N/A	N/A
6802843	12/2003	Truckai et al.	N/A	N/A
6802844	12/2003	Ferree	N/A	N/A
6805273	12/2003	Bilotti et al.	N/A	N/A
6806808	12/2003	Watters et al.	N/A	N/A
6806867	12/2003	Arruda et al.	N/A	N/A
6808525	12/2003	Latterell et al.	N/A	N/A
6810359	12/2003	Sakaguchi	N/A	N/A
6814154	12/2003	Chou	N/A	N/A
6814741	12/2003	Bowman et al.	N/A	N/A
6817508	12/2003	Racenet et al.	N/A	N/A
6817509	12/2003	Geiste et al.	N/A	N/A
6817974	12/2003	Cooper et al.	N/A	N/A
6818018	12/2003	Sawhney	N/A	N/A
6820791	12/2003	Adams	N/A	N/A
6821273	12/2003	Mollenauer	N/A	N/A
6821282	12/2003	Perry et al.	N/A	N/A
6821284	12/2003	Sturtz et al.	N/A	N/A
6827246	12/2003	Sullivan et al.	N/A	N/A
6827712	12/2003	Tovey et al.	N/A	N/A
6827725	12/2003	Batchelor et al.	N/A	N/A
6828902	12/2003	Casden	N/A	N/A
6830174	12/2003	Hillstead et al.	N/A	N/A
6831629	12/2003	Nishino et al.	N/A	N/A
6832998	12/2003	Goble	N/A	N/A
6834001	12/2003	Myono	N/A	N/A
6835173	12/2003	Couvillon, Jr.	N/A	N/A
6835199	12/2003	McGuckin, Jr. et al.	N/A	N/A
6835336	12/2003	Watt	N/A	N/A
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6840938	12/2004	Morley et al.	N/A	N/A
6841967	12/2004	Kim et al.	N/A	N/A
6843403	12/2004	Whitman	N/A	N/A
6843789	12/2004	Goble	N/A	N/A
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6846307	12/2004	Whitman et al.	N/A	N/A
6846308	12/2004	Whitman et al.	N/A	N/A
6846309	12/2004	Whitman et al.	N/A	N/A

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6849071	12/2004	Whitman et al.	N/A	N/A
6850817	12/2004	Green	N/A	N/A
6852122	12/2004	Rush	N/A	N/A
6852330	12/2004	Bowman et al.	N/A	N/A
6853879	12/2004	Sunaoshi	N/A	N/A
6858005	12/2004	Ohline et al.	N/A	N/A
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RE38708	12/2004	Bolanos et al.	N/A	N/A
D502994	12/2004	Blake, III	N/A	N/A
6860169	12/2004	Shinozaki	N/A	N/A
6861142	12/2004	Wilkie et al.	N/A	N/A
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6866178	12/2004	Adams et al.	N/A	N/A
6866668	12/2004	Giannetti et al.	N/A	N/A
6866671	12/2004	Tierney et al.	N/A	N/A
6867248	12/2004	Martin et al.	N/A	N/A
6869430	12/2004	Balbierz et al.	N/A	N/A
6869435	12/2004	Blake, III	N/A	N/A
6872214	12/2004	Sonnenschein et al.	N/A	N/A
6874669	12/2004	Adams et al.	N/A	N/A
6876850	12/2004	Maeshima et al.	N/A	N/A
6877647	12/2004	Green et al.	N/A	N/A
6878106	12/2004	Herrmann	N/A	N/A
6882127	12/2004	Konigbauer	N/A	N/A
6883199	12/2004	Lundell et al.	N/A	N/A
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6884428	12/2004	Binette et al.	N/A	N/A
6886730	12/2004	Fujisawa et al.	N/A	N/A
6887244	12/2004	Walker et al.	N/A	N/A
6887710	12/2004	Call et al.	N/A	N/A
6889116	12/2004	Jinno	N/A	N/A
6893435	12/2004	Goble	N/A	N/A
6894140	12/2004	Roby	N/A	N/A
6895176	12/2004	Archer et al.	N/A	N/A
6899538	12/2004	Matoba	N/A	N/A
6899593	12/2004	Moeller et al.	N/A	N/A
6899705	12/2004	Niemeyer	N/A	N/A
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6905057	12/2004	Swayze et al.	N/A	N/A
6905497	12/2004	Truckai et al.	N/A	N/A
6905498	12/2004	Hooven	N/A	N/A
6908472	12/2004	Wiener et al.	N/A	N/A
6911033	12/2004	de Guillebon et al.	N/A	N/A
6911916	12/2004	Wang et al.	N/A	N/A
6913579	12/2004	Truckai et al.	N/A	N/A
6913608	12/2004	Liddicoat et al.	N/A	N/A

6913613	12/2004	Schwarz et al.	N/A	N/A
6921397	12/2004	Corcoran et al.	N/A	N/A
6921412	12/2004	Black et al.	N/A	N/A
6923093	12/2004	Ullah	N/A	N/A
6923803	12/2004	Goble	N/A	N/A
6923819	12/2004	Meade et al.	N/A	N/A
6925849	12/2004	Jairam	N/A	N/A
6926716	12/2004	Baker et al.	N/A	N/A
6927315	12/2004	Heinecke et al.	N/A	N/A
6928902	12/2004	Eyssallenne	N/A	N/A
6929641	12/2004	Goble et al.	N/A	N/A
6929644	12/2004	Truckai et al.	N/A	N/A
6931830	12/2004	Liao	N/A	N/A
6932218	12/2004	Kosann et al.	N/A	N/A
6932810	12/2004	Ryan	N/A	N/A
6936042	12/2004	Wallace et al.	N/A	N/A
6936948	12/2004	Bell et al.	N/A	N/A
D509297	12/2004	Wells	N/A	N/A
D509589	12/2004	Wells	N/A	N/A
6938706	12/2004	Ng	N/A	N/A
6939358	12/2004	Palacios et al.	N/A	N/A
6942662	12/2004	Goble et al.	N/A	N/A
6942674	12/2004	Belef et al.	N/A	N/A
6945444	12/2004	Gresham et al.	N/A	N/A
6945981	12/2004	Donofrio et al.	N/A	N/A
6949196	12/2004	Schmitz et al.	N/A	N/A
6951562	12/2004	Zwirnmann	N/A	N/A
6953138	12/2004	Dworak et al.	N/A	N/A
6953139	12/2004	Milliman et al.	N/A	N/A
6953461	12/2004	McClurken et al.	N/A	N/A
6957758	12/2004	Aranyi	N/A	N/A
6958035	12/2004	Friedman et al.	N/A	N/A
D511525	12/2004	Hernandez et al.	N/A	N/A
6959851	12/2004	Heinrich	N/A	N/A
6959852	12/2004	Shelton, IV et al.	N/A	N/A
6960107	12/2004	Schaub et al.	N/A	N/A
6960163	12/2004	Ewers et al.	N/A	N/A
6960220	12/2004	Marino et al.	N/A	N/A
6962587	12/2004	Johnson et al.	N/A	N/A
6963792	12/2004	Green	N/A	N/A
6964363	12/2004	Wales et al.	N/A	N/A
6966907	12/2004	Goble	N/A	N/A
6966909	12/2004	Marshall et al.	N/A	N/A
6968908	12/2004	Tokunaga et al.	N/A	N/A
6969385	12/2004	Moreyra	N/A	N/A
6969395	12/2004	Eskuri	N/A	N/A
6971988	12/2004	Orban, III	N/A	N/A
6972199	12/2004	Lebouitz et al.	N/A	N/A
6974435	12/2004	Daw et al.	N/A	N/A
6974462	12/2004	Sater	N/A	N/A

6978921	12/2004	Shelton, IV et al.	N/A	N/A
6978922	12/2004	Bilotti et al.	N/A	N/A
6981628	12/2005	Wales	N/A	N/A
6981941	12/2005	Whitman et al.	N/A	N/A
6981978	12/2005	Gannoe	N/A	N/A
6984203	12/2005	Tartaglia et al.	N/A	N/A
6984231	12/2005	Goble et al.	N/A	N/A
6986451	12/2005	Mastri et al.	N/A	N/A
6988649	12/2005	Shelton, IV et al.	N/A	N/A
6988650	12/2005	Schwemberger et al.	N/A	N/A
6989034	12/2005	Hammer et al.	N/A	N/A
6990731	12/2005	Haytayan	N/A	N/A
6990796	12/2005	Schnipke et al.	N/A	N/A
6991146	12/2005	Sinisi et al.	N/A	N/A
6993200	12/2005	Tastl et al.	N/A	N/A
6993413	12/2005	Sunaoshi	N/A	N/A
6994708	12/2005	Manzo	N/A	N/A
6995729	12/2005	Govari et al.	N/A	N/A
6996433	12/2005	Burbank et al.	N/A	N/A
6997931	12/2005	Sauer et al.	N/A	N/A
6997935	12/2005	Anderson et al.	N/A	N/A
6998736	12/2005	Lee et al.	N/A	N/A
6998816	12/2005	Wieck et al.	N/A	N/A
6999821	12/2005	Jenney et al.	N/A	N/A
7000818	12/2005	Shelton, IV et al.	N/A	N/A
7000819	12/2005	Swayze et al.	N/A	N/A
7000911	12/2005	McCormick et al.	N/A	N/A
7001380	12/2005	Goble	N/A	N/A
7001408	12/2005	Knodel et al.	N/A	N/A
7004174	12/2005	Eggers et al.	N/A	N/A
7005828	12/2005	Karikomi	N/A	N/A
7007176	12/2005	Goodfellow et al.	N/A	N/A
7008433	12/2005	Voellmicke et al.	N/A	N/A
7008435	12/2005	Cummins	N/A	N/A
7009039	12/2005	Yayon et al.	N/A	N/A
7011213	12/2005	Clark et al.	N/A	N/A
7011657	12/2005	Truckai et al.	N/A	N/A
7014640	12/2005	Kemppainen et al.	N/A	N/A
7018357	12/2005	Emmons	N/A	N/A
7018390	12/2005	Turovskiy et al.	N/A	N/A
7021399	12/2005	Driessen	N/A	N/A
7021669	12/2005	Lindermeir et al.	N/A	N/A
7022131	12/2005	Derowe et al.	N/A	N/A
7023159	12/2005	Gorti et al.	N/A	N/A
7025064	12/2005	Wang et al.	N/A	N/A
7025732	12/2005	Thompson et al.	N/A	N/A
7025743	12/2005	Mann et al.	N/A	N/A
7025774	12/2005	Freeman et al.	N/A	N/A
7025775	12/2005	Gadberry et al.	N/A	N/A
7028570	12/2005	Ohta et al.	N/A	N/A

7029435	12/2005	Nakao	N/A	N/A
7029439	12/2005	Roberts et al.	N/A	N/A
7030904	12/2005	Adair et al.	N/A	N/A
7032798	12/2005	Whitman et al.	N/A	N/A
7032799	12/2005	Viola et al.	N/A	N/A
7033356	12/2005	Latterell et al.	N/A	N/A
7033378	12/2005	Smith et al.	N/A	N/A
7035716	12/2005	Harris et al.	N/A	N/A
7035762	12/2005	Menard et al.	N/A	N/A
7036680	12/2005	Flannery	N/A	N/A
7037314	12/2005	Armstrong	N/A	N/A
7037344	12/2005	Kagan et al.	N/A	N/A
7038421	12/2005	Trifilo	N/A	N/A
7041088	12/2005	Nawrocki et al.	N/A	N/A
7041102	12/2005	Truckai et al.	N/A	N/A
7041868	12/2005	Greene et al.	N/A	N/A
7043852	12/2005	Hayashida et al.	N/A	N/A
7044350	12/2005	Kameyama et al.	N/A	N/A
7044352	12/2005	Shelton, IV et al.	N/A	N/A
7044353	12/2005	Mastri et al.	N/A	N/A
7046082	12/2005	Komiya et al.	N/A	N/A
7048165	12/2005	Haramiishi	N/A	N/A
7048687	12/2005	Reuss et al.	N/A	N/A
7048716	12/2005	Kucharczyk et al.	N/A	N/A
7048745	12/2005	Tierney et al.	N/A	N/A
7052454	12/2005	Taylor	N/A	N/A
7052494	12/2005	Goble et al.	N/A	N/A
7052499	12/2005	Steger et al.	N/A	N/A
7055730	12/2005	Ehrenfels et al.	N/A	N/A
7055731	12/2005	Shelton, IV et al.	N/A	N/A
7056123	12/2005	Gregorio et al.	N/A	N/A
7056284	12/2005	Martone et al.	N/A	N/A
7056330	12/2005	Gayton	N/A	N/A
7059331	12/2005	Adams et al.	N/A	N/A
7059508	12/2005	Shelton, IV et al.	N/A	N/A
7063671	12/2005	Couvillon, Jr.	N/A	N/A
7063712	12/2005	Vargas et al.	N/A	N/A
7064509	12/2005	Fu et al.	N/A	N/A
7066879	12/2005	Fowler et al.	N/A	N/A
7066944	12/2005	Laufer et al.	N/A	N/A
7067038	12/2005	Trokhan et al.	N/A	N/A
7070083	12/2005	Jankowski	N/A	N/A
7070559	12/2005	Adams et al.	N/A	N/A
7070597	12/2005	Truckai et al.	N/A	N/A
7071287	12/2005	Rhine et al.	N/A	N/A
7075412	12/2005	Reynolds et al.	N/A	N/A
7075770	12/2005	Smith	N/A	N/A
7077856	12/2005	Whitman	N/A	N/A
7080769	12/2005	Vresh et al.	N/A	N/A
7081114	12/2005	Rashidi	N/A	N/A

7081318	12/2005	Lee et al.	N/A	N/A
7083073	12/2005	Yoshie et al.	N/A	N/A
7083075	12/2005	Swayze et al.	N/A	N/A
7083571	12/2005	Wang et al.	N/A	N/A
7083615	12/2005	Peterson et al.	N/A	N/A
7083619	12/2005	Truckai et al.	N/A	N/A
7083620	12/2005	Jahns et al.	N/A	N/A
7083626	12/2005	Hart et al.	N/A	N/A
7086267	12/2005	Dworak et al.	N/A	N/A
7087049	12/2005	Nowlin et al.	N/A	N/A
7087054	12/2005	Truckai et al.	N/A	N/A
7087071	12/2005	Nicholas et al.	N/A	N/A
7090637	12/2005	Danitz et al.	N/A	N/A
7090673	12/2005	Dycus et al.	N/A	N/A
7090683	12/2005	Brock et al.	N/A	N/A
7090684	12/2005	McGuckin, Jr. et al.	N/A	N/A
7091191	12/2005	Laredo et al.	N/A	N/A
7091412	12/2005	Wang et al.	N/A	N/A
7093492	12/2005	Treiber et al.	N/A	N/A
7094202	12/2005	Nobis et al.	N/A	N/A
7094247	12/2005	Monassevitch et al.	N/A	N/A
7094916	12/2005	DeLuca et al.	N/A	N/A
7096972	12/2005	Orozco, Jr.	N/A	N/A
7097089	12/2005	Marczyk	N/A	N/A
7097644	12/2005	Long	N/A	N/A
7097650	12/2005	Weller et al.	N/A	N/A
7098794	12/2005	Lindsay et al.	N/A	N/A
7100949	12/2005	Williams et al.	N/A	N/A
7101187	12/2005	Deconinck et al.	N/A	N/A
7101363	12/2005	Nishizawa et al.	N/A	N/A
7101371	12/2005	Dycus et al.	N/A	N/A
7101394	12/2005	Hamm et al.	N/A	N/A
7104741	12/2005	Krohn	N/A	N/A
7108695	12/2005	Witt et al.	N/A	N/A
7108701	12/2005	Evens et al.	N/A	N/A
7108709	12/2005	Cummins	N/A	N/A
7111768	12/2005	Cummins et al.	N/A	N/A
7111769	12/2005	Wales et al.	N/A	N/A
7112201	12/2005	Truckai et al.	N/A	N/A
7112214	12/2005	Peterson et al.	N/A	N/A
RE39358	12/2005	Goble	N/A	N/A
D530339	12/2005	Hernandez et al.	N/A	N/A
7114642	12/2005	Whitman	N/A	N/A
7116100	12/2005	Mock et al.	N/A	N/A
7118020	12/2005	Lee et al.	N/A	N/A
7118528	12/2005	Piskun	N/A	N/A
7118563	12/2005	Weckwerth et al.	N/A	N/A
7118582	12/2005	Wang et al.	N/A	N/A
7119534	12/2005	Butzmann	N/A	N/A
7121446	12/2005	Arad et al.	N/A	N/A

7121773	12/2005	Mikiya et al.	N/A	N/A
7122028	12/2005	Looper et al.	N/A	N/A
7125403	12/2005	Julian et al.	N/A	N/A
7125409	12/2005	Truckai et al.	N/A	N/A
7126303	12/2005	Farritor et al.	N/A	N/A
7126879	12/2005	Snyder	N/A	N/A
7128253	12/2005	Mastri et al.	N/A	N/A
7128254	12/2005	Shelton, IV et al.	N/A	N/A
7128748	12/2005	Mooradian et al.	N/A	N/A
7131445	12/2005	Amoah	N/A	N/A
7133601	12/2005	Phillips et al.	N/A	N/A
7134364	12/2005	Kageler et al.	N/A	N/A
7134587	12/2005	Schwemberger et al.	N/A	N/A
7135027	12/2005	Delmotte	N/A	N/A
7137980	12/2005	Buysse et al.	N/A	N/A
7137981	12/2005	Long	N/A	N/A
7139016	12/2005	Squilla et al.	N/A	N/A
7140527	12/2005	Ehrenfels et al.	N/A	N/A
7140528	12/2005	Shelton, IV	N/A	N/A
7141055	12/2005	Abrams et al.	N/A	N/A
7143923	12/2005	Shelton, IV et al.	N/A	N/A
7143924	12/2005	Scirica et al.	N/A	N/A
7143925	12/2005	Shelton, IV et al.	N/A	N/A
7143926	12/2005	Shelton, IV et al.	N/A	N/A
7146191	12/2005	Kerner et al.	N/A	N/A
7147138	12/2005	Shelton, IV	N/A	N/A
7147139	12/2005	Schwemberger et al.	N/A	N/A
7147140	12/2005	Wukusick et al.	N/A	N/A
7147637	12/2005	Goble	N/A	N/A
7147648	12/2005	Lin	N/A	N/A
7147650	12/2005	Lee	N/A	N/A
7150748	12/2005	Ebbutt et al.	N/A	N/A
7153300	12/2005	Goble	N/A	N/A
7153314	12/2005	Laufer et al.	N/A	N/A
7155316	12/2005	Sutherland et al.	N/A	N/A
7156846	12/2006	Dycus et al.	N/A	N/A
7156863	12/2006	Sonnenschein et al.	N/A	N/A
7159750	12/2006	Racenet et al.	N/A	N/A
7160296	12/2006	Pearson et al.	N/A	N/A
7160299	12/2006	Baily	N/A	N/A
7160311	12/2006	Blatter et al.	N/A	N/A
7161036	12/2006	Oikawa et al.	N/A	N/A
7161580	12/2006	Bailey et al.	N/A	N/A
7162758	12/2006	Skinner	N/A	N/A
7163563	12/2006	Schwartz et al.	N/A	N/A
7166117	12/2006	Hellenkamp	N/A	N/A
7166133	12/2006	Evans et al.	N/A	N/A
7168604	12/2006	Milliman et al.	N/A	N/A
7169146	12/2006	Truckai et al.	N/A	N/A
7170910	12/2006	Chen et al.	N/A	N/A

7171279	12/2006	Buckingham et al.	N/A	N/A
7172104	12/2006	Scirica et al.	N/A	N/A
7172593	12/2006	Trieu et al.	N/A	N/A
7172615	12/2006	Morriss et al.	N/A	N/A
7174202	12/2006	Bladen et al.	N/A	N/A
7174636	12/2006	Lowe	N/A	N/A
7177533	12/2006	McFarlin et al.	N/A	N/A
7179223	12/2006	Motoki et al.	N/A	N/A
7179267	12/2006	Nolan et al.	N/A	N/A
7182239	12/2006	Myers	N/A	N/A
7182763	12/2006	Nardella	N/A	N/A
7183737	12/2006	Kitagawa	N/A	N/A
7187960	12/2006	Abreu	N/A	N/A
7188758	12/2006	Viola et al.	N/A	N/A
7189207	12/2006	Viola	N/A	N/A
7190147	12/2006	Gileff et al.	N/A	N/A
7193199	12/2006	Jang	N/A	N/A
7195627	12/2006	Amoah et al.	N/A	N/A
7196911	12/2006	Takano et al.	N/A	N/A
D541418	12/2006	Schechter et al.	N/A	N/A
7197965	12/2006	Anderson	N/A	N/A
7199537	12/2006	Okamura et al.	N/A	N/A
7199545	12/2006	Oleynikov et al.	N/A	N/A
7202576	12/2006	Dechene et al.	N/A	N/A
7202653	12/2006	Pai	N/A	N/A
7204404	12/2006	Nguyen et al.	N/A	N/A
7204835	12/2006	Latterell et al.	N/A	N/A
7205959	12/2006	Henriksson	N/A	N/A
7206626	12/2006	Quaid, III	N/A	N/A
7207233	12/2006	Wadge	N/A	N/A
7207471	12/2006	Heinrich et al.	N/A	N/A
7207472	12/2006	Wukusick et al.	N/A	N/A
7207556	12/2006	Saitoh et al.	N/A	N/A
7208005	12/2006	Frecker et al.	N/A	N/A
7210609	12/2006	Leiboff et al.	N/A	N/A
7211081	12/2006	Goble	N/A	N/A
7211084	12/2006	Goble et al.	N/A	N/A
7211092	12/2006	Hughett	N/A	N/A
7211979	12/2006	Khatib et al.	N/A	N/A
7213736	12/2006	Wales et al.	N/A	N/A
7214224	12/2006	Goble	N/A	N/A
7215517	12/2006	Takamatsu	N/A	N/A
7217285	12/2006	Vargas et al.	N/A	N/A
7220260	12/2006	Fleming et al.	N/A	N/A
7220272	12/2006	Weadock	N/A	N/A
7225959	12/2006	Patton et al.	N/A	N/A
7225963	12/2006	Scirica	N/A	N/A
7225964	12/2006	Mastri et al.	N/A	N/A
7226450	12/2006	Athanasiou et al.	N/A	N/A
7226467	12/2006	Lucatero et al.	N/A	N/A

7228505	12/2006	Shimazu et al.	N/A	N/A
7229408	12/2006	Douglas et al.	N/A	N/A
7234624	12/2006	Gresham et al.	N/A	N/A
7235072	12/2006	Sartor et al.	N/A	N/A
7235089	12/2006	McGuckin, Jr.	N/A	N/A
7235302	12/2006	Jing et al.	N/A	N/A
7237708	12/2006	Guy et al.	N/A	N/A
7238195	12/2006	Viola	N/A	N/A
7238901	12/2006	Kim et al.	N/A	N/A
7239657	12/2006	Gunnarsson	N/A	N/A
7241288	12/2006	Braun	N/A	N/A
7241289	12/2006	Braun	N/A	N/A
7246734	12/2006	Shelton, IV	N/A	N/A
7247161	12/2006	Johnston et al.	N/A	N/A
7249267	12/2006	Chapuis	N/A	N/A
7252641	12/2006	Thompson et al.	N/A	N/A
7252660	12/2006	Kunz	N/A	N/A
7255012	12/2006	Hedtke	N/A	N/A
7255696	12/2006	Goble et al.	N/A	N/A
7256695	12/2006	Hamel et al.	N/A	N/A
7258262	12/2006	Mastri et al.	N/A	N/A
7258546	12/2006	Beier et al.	N/A	N/A
7260431	12/2006	Libbus et al.	N/A	N/A
7265374	12/2006	Lee et al.	N/A	N/A
7267677	12/2006	Johnson et al.	N/A	N/A
7267679	12/2006	McGuckin, Jr. et al.	N/A	N/A
7272002	12/2006	Drapeau	N/A	N/A
7273483	12/2006	Wiener et al.	N/A	N/A
7273488	12/2006	Nakamura et al.	N/A	N/A
D552623	12/2006	Vong et al.	N/A	N/A
7275674	12/2006	Racenet et al.	N/A	N/A
7276044	12/2006	Ferry et al.	N/A	N/A
7276068	12/2006	Johnson et al.	N/A	N/A
7278562	12/2006	Mastri et al.	N/A	N/A
7278563	12/2006	Green	N/A	N/A
7278949	12/2006	Bader	N/A	N/A
7278994	12/2006	Goble	N/A	N/A
7282048	12/2006	Goble et al.	N/A	N/A
7283096	12/2006	Geisheimer et al.	N/A	N/A
7286850	12/2006	Frielink et al.	N/A	N/A
7287682	12/2006	Ezzat et al.	N/A	N/A
7289139	12/2006	Amling et al.	N/A	N/A
7293685	12/2006	Ehrenfels et al.	N/A	N/A
7295893	12/2006	Sunaoshi	N/A	N/A
7295907	12/2006	Lu et al.	N/A	N/A
7296722	12/2006	Ivanko	N/A	N/A
7296724	12/2006	Green et al.	N/A	N/A
7297149	12/2006	Vitali et al.	N/A	N/A
7300373	12/2006	Jinno et al.	N/A	N/A
7300431	12/2006	Dubrovsky	N/A	N/A

7300450	12/2006	Vleugels et al.	N/A	N/A
7303106	12/2006	Milliman et al.	N/A	N/A
7303107	12/2006	Milliman et al.	N/A	N/A
7303108	12/2006	Shelton, IV	N/A	N/A
7303502	12/2006	Thompson	N/A	N/A
7303556	12/2006	Metzger	N/A	N/A
7306597	12/2006	Manzo	N/A	N/A
7308998	12/2006	Mastri et al.	N/A	N/A
7311238	12/2006	Liu	N/A	N/A
7311709	12/2006	Truckai et al.	N/A	N/A
7313430	12/2006	Urquhart et al.	N/A	N/A
7314473	12/2007	Jinno et al.	N/A	N/A
7317955	12/2007	McGreevy	N/A	N/A
7320704	12/2007	Lashinski et al.	N/A	N/A
7322859	12/2007	Evans	N/A	N/A
7322975	12/2007	Goble et al.	N/A	N/A
7322994	12/2007	Nicholas et al.	N/A	N/A
7324572	12/2007	Chang	N/A	N/A
7326203	12/2007	Papineau et al.	N/A	N/A
7326213	12/2007	Benderev et al.	N/A	N/A
7328828	12/2007	Ortiz et al.	N/A	N/A
7328829	12/2007	Arad et al.	N/A	N/A
7330004	12/2007	DeJonge et al.	N/A	N/A
7331340	12/2007	Barney	N/A	N/A
7331343	12/2007	Schmidt et al.	N/A	N/A
7331403	12/2007	Berry et al.	N/A	N/A
7331406	12/2007	Wottreng, Jr. et al.	N/A	N/A
7331969	12/2007	Inganas et al.	N/A	N/A
7334717	12/2007	Rethy et al.	N/A	N/A
7334718	12/2007	McAlister et al.	N/A	N/A
7335199	12/2007	Goble et al.	N/A	N/A
7335401	12/2007	Finke et al.	N/A	N/A
7336045	12/2007	Clermonts	N/A	N/A
7336048	12/2007	Lohr	N/A	N/A
7336183	12/2007	Reddy et al.	N/A	N/A
7336184	12/2007	Smith et al.	N/A	N/A
7337774	12/2007	Webb	N/A	N/A
7338505	12/2007	Belson	N/A	N/A
7338513	12/2007	Lee et al.	N/A	N/A
7341554	12/2007	Sekine et al.	N/A	N/A
7341555	12/2007	Ootawara et al.	N/A	N/A
7341591	12/2007	Grinberg	N/A	N/A
7343920	12/2007	Toby et al.	N/A	N/A
7344532	12/2007	Goble et al.	N/A	N/A
7344533	12/2007	Pearson et al.	N/A	N/A
7346344	12/2007	Fontaine	N/A	N/A
7346406	12/2007	Brotto et al.	N/A	N/A
7348763	12/2007	Reinhart et al.	N/A	N/A
7348875	12/2007	Hughes et al.	N/A	N/A
RE40237	12/2007	Bilotti et al.	N/A	N/A

7351258	12/2007	Ricotta et al.	N/A	N/A
7354398	12/2007	Kanazawa	N/A	N/A
7354440	12/2007	Truckal et al.	N/A	N/A
7354447	12/2007	Shelton, IV et al.	N/A	N/A
7354502	12/2007	Polat et al.	N/A	N/A
7357287	12/2007	Shelton, IV et al.	N/A	N/A
7357806	12/2007	Rivera et al.	N/A	N/A
7361168	12/2007	Makower et al.	N/A	N/A
7361195	12/2007	Schwartz et al.	N/A	N/A
7362062	12/2007	Schneider et al.	N/A	N/A
7364060	12/2007	Milliman	N/A	N/A
7364061	12/2007	Swayze et al.	N/A	N/A
7367485	12/2007	Shelton, IV et al.	N/A	N/A
7367973	12/2007	Manzo et al.	N/A	N/A
7368124	12/2007	Chun et al.	N/A	N/A
7371210	12/2007	Brock et al.	N/A	N/A
7371403	12/2007	McCarthy et al.	N/A	N/A
7375493	12/2007	Calhoon et al.	N/A	N/A
7377918	12/2007	Amoah	N/A	N/A
7377928	12/2007	Zubik et al.	N/A	N/A
7378817	12/2007	Calhoon et al.	N/A	N/A
RE40388	12/2007	Gines	N/A	N/A
D570868	12/2007	Hosokawa et al.	N/A	N/A
7380695	12/2007	Doll et al.	N/A	N/A
7380696	12/2007	Shelton, IV et al.	N/A	N/A
7384403	12/2007	Sherman	N/A	N/A
7384417	12/2007	Cucin	N/A	N/A
7386365	12/2007	Nixon	N/A	N/A
7386730	12/2007	Uchikubo	N/A	N/A
7388217	12/2007	Buschbeck et al.	N/A	N/A
7388484	12/2007	Hsu	N/A	N/A
7391173	12/2007	Schena	N/A	N/A
7394190	12/2007	Huang	N/A	N/A
7396356	12/2007	Mollenauer	N/A	N/A
7397364	12/2007	Govari	N/A	N/A
7398707	12/2007	Morley et al.	N/A	N/A
7398907	12/2007	Racenet et al.	N/A	N/A
7398908	12/2007	Holsten et al.	N/A	N/A
7400107	12/2007	Schneider et al.	N/A	N/A
7400752	12/2007	Zacharias	N/A	N/A
7401000	12/2007	Nakamura	N/A	N/A
7401721	12/2007	Holsten et al.	N/A	N/A
7404449	12/2007	Bermingham et al.	N/A	N/A
7404508	12/2007	Smith et al.	N/A	N/A
7404509	12/2007	Ortiz et al.	N/A	N/A
7404822	12/2007	Viart et al.	N/A	N/A
D575793	12/2007	Ording	N/A	N/A
7407074	12/2007	Ortiz et al.	N/A	N/A
7407075	12/2007	Holsten et al.	N/A	N/A
7407076	12/2007	Racenet et al.	N/A	N/A

7407077	12/2007	Ortiz et al.	N/A	N/A
7407078	12/2007	Shelton, IV et al.	N/A	N/A
7408310	12/2007	Hong et al.	N/A	N/A
7410085	12/2007	Wolf et al.	N/A	N/A
7410086	12/2007	Ortiz et al.	N/A	N/A
7410483	12/2007	Danitz et al.	N/A	N/A
7413563	12/2007	Corcoran et al.	N/A	N/A
7416101	12/2007	Shelton, IV et al.	N/A	N/A
7418078	12/2007	Blanz et al.	N/A	N/A
RE40514	12/2007	Mastri et al.	N/A	N/A
7419080	12/2007	Smith et al.	N/A	N/A
7419081	12/2007	Ehrenfels et al.	N/A	N/A
7419321	12/2007	Tereschouk	N/A	N/A
7419495	12/2007	Menn et al.	N/A	N/A
7422136	12/2007	Marczyk	N/A	N/A
7422138	12/2007	Bilotti et al.	N/A	N/A
7422139	12/2007	Shelton, IV et al.	N/A	N/A
7424965	12/2007	Racenet et al.	N/A	N/A
7427607	12/2007	Suzuki	N/A	N/A
D578644	12/2007	Shumer et al.	N/A	N/A
7430772	12/2007	Van Es	N/A	N/A
7430849	12/2007	Coutts et al.	N/A	N/A
7431188	12/2007	Marczyk	N/A	N/A
7431189	12/2007	Shelton, IV et al.	N/A	N/A
7431230	12/2007	McPherson et al.	N/A	N/A
7431694	12/2007	Stefanchik et al.	N/A	N/A
7431730	12/2007	Viola	N/A	N/A
7434715	12/2007	Shelton, IV et al.	N/A	N/A
7434717	12/2007	Shelton, IV et al.	N/A	N/A
7435249	12/2007	Buysse et al.	N/A	N/A
7438209	12/2007	Hess et al.	N/A	N/A
7438718	12/2007	Milliman et al.	N/A	N/A
7439354	12/2007	Lenges et al.	N/A	N/A
7441684	12/2007	Shelton, IV et al.	N/A	N/A
7441685	12/2007	Boudreaux	N/A	N/A
7442201	12/2007	Pugsley et al.	N/A	N/A
7443547	12/2007	Moreno et al.	N/A	N/A
D580942	12/2007	Oshiro et al.	N/A	N/A
7446131	12/2007	Liu et al.	N/A	N/A
7448525	12/2007	Shelton, IV et al.	N/A	N/A
7450010	12/2007	Gravelle et al.	N/A	N/A
7450991	12/2007	Smith et al.	N/A	N/A
7451904	12/2007	Shelton, IV	N/A	N/A
7455208	12/2007	Wales et al.	N/A	N/A
7455676	12/2007	Holsten et al.	N/A	N/A
7455682	12/2007	Viola	N/A	N/A
7455687	12/2007	Saunders et al.	N/A	N/A
D582934	12/2007	Byeon	N/A	N/A
7461767	12/2007	Viola et al.	N/A	N/A
7462187	12/2007	Johnston et al.	N/A	N/A

7464845	12/2007	Chou	N/A	N/A
7464846	12/2007	Shelton, IV et al.	N/A	N/A
7464847	12/2007	Viola et al.	N/A	N/A
7464848	12/2007	Green et al.	N/A	N/A
7464849	12/2007	Shelton, IV et al.	N/A	N/A
7467740	12/2007	Shelton, IV et al.	N/A	N/A
7467849	12/2007	Silverbrook et al.	N/A	N/A
7472814	12/2008	Mastri et al.	N/A	N/A
7472815	12/2008	Shelton, IV et al.	N/A	N/A
7472816	12/2008	Holsten et al.	N/A	N/A
7473221	12/2008	Ewers et al.	N/A	N/A
7473253	12/2008	Dycus et al.	N/A	N/A
7473263	12/2008	Johnston et al.	N/A	N/A
7476237	12/2008	Taniguchi et al.	N/A	N/A
7479147	12/2008	Honeycutt et al.	N/A	N/A
7479608	12/2008	Smith	N/A	N/A
7481347	12/2008	Roy	N/A	N/A
7481348	12/2008	Marczyk	N/A	N/A
7481349	12/2008	Holsten et al.	N/A	N/A
7481824	12/2008	Boudreaux et al.	N/A	N/A
7485124	12/2008	Kuhns et al.	N/A	N/A
7485133	12/2008	Cannon et al.	N/A	N/A
7485142	12/2008	Milo	N/A	N/A
7487899	12/2008	Shelton, IV et al.	N/A	N/A
7489055	12/2008	Jeong et al.	N/A	N/A
7490749	12/2008	Schall et al.	N/A	N/A
7491232	12/2008	Bolduc et al.	N/A	N/A
7492261	12/2008	Cambre et al.	N/A	N/A
7494039	12/2008	Racenet et al.	N/A	N/A
7494460	12/2008	Haarstad et al.	N/A	N/A
7494499	12/2008	Nagase et al.	N/A	N/A
7494501	12/2008	Ahlberg et al.	N/A	N/A
7497137	12/2008	Tellenbach et al.	N/A	N/A
7500979	12/2008	Hueil et al.	N/A	N/A
7501198	12/2008	Barlev et al.	N/A	N/A
7503474	12/2008	Hillstead et al.	N/A	N/A
7506790	12/2008	Shelton, IV	N/A	N/A
7506791	12/2008	Omaits et al.	N/A	N/A
7507202	12/2008	Schoellhorn	N/A	N/A
7510107	12/2008	Timm et al.	N/A	N/A
7510534	12/2008	Burdorff et al.	N/A	N/A
7510566	12/2008	Jacobs et al.	N/A	N/A
7513407	12/2008	Chang	N/A	N/A
7513408	12/2008	Shelton, IV et al.	N/A	N/A
7517356	12/2008	Heinrich	N/A	N/A
7524320	12/2008	Tierney et al.	N/A	N/A
7527632	12/2008	Houghton et al.	N/A	N/A
7530984	12/2008	Sonnenschein et al.	N/A	N/A
7530985	12/2008	Takemoto et al.	N/A	N/A
7533790	12/2008	Knodel et al.	N/A	N/A

7533906	12/2008	Luettgen et al.	N/A	N/A
7534259	12/2008	Lashinski et al.	N/A	N/A
7540867	12/2008	Jinno et al.	N/A	N/A
7540872	12/2008	Schechter et al.	N/A	N/A
7542807	12/2008	Bertolero et al.	N/A	N/A
7543730	12/2008	Marczyk	N/A	N/A
7544197	12/2008	Kelsch et al.	N/A	N/A
7546939	12/2008	Adams et al.	N/A	N/A
7546940	12/2008	Milliman et al.	N/A	N/A
7547287	12/2008	Boecker et al.	N/A	N/A
7547312	12/2008	Bauman et al.	N/A	N/A
7549563	12/2008	Mather et al.	N/A	N/A
7549564	12/2008	Boudreaux	N/A	N/A
7549998	12/2008	Braun	N/A	N/A
7552854	12/2008	Wixey et al.	N/A	N/A
7553173	12/2008	Kowalick	N/A	N/A
7553275	12/2008	Padget et al.	N/A	N/A
7554343	12/2008	Bromfield	N/A	N/A
7556185	12/2008	Viola	N/A	N/A
7556186	12/2008	Milliman	N/A	N/A
7556647	12/2008	Drews et al.	N/A	N/A
7559449	12/2008	Viola	N/A	N/A
7559450	12/2008	Wales et al.	N/A	N/A
7559452	12/2008	Wales et al.	N/A	N/A
7559937	12/2008	de la Torre et al.	N/A	N/A
7561637	12/2008	Jonsson et al.	N/A	N/A
7562910	12/2008	Kertesz et al.	N/A	N/A
7563269	12/2008	Hashiguchi	N/A	N/A
7563862	12/2008	Sieg et al.	N/A	N/A
7565993	12/2008	Milliman et al.	N/A	N/A
7566300	12/2008	Devierre et al.	N/A	N/A
7567045	12/2008	Fristedt	N/A	N/A
7568603	12/2008	Shelton, IV et al.	N/A	N/A
7568604	12/2008	Ehrenfels et al.	N/A	N/A
7568619	12/2008	Todd et al.	N/A	N/A
7572285	12/2008	Frey et al.	N/A	N/A
7572298	12/2008	Roller et al.	N/A	N/A
7575144	12/2008	Ortiz et al.	N/A	N/A
7578825	12/2008	Huebner	N/A	N/A
D600712	12/2008	LaManna et al.	N/A	N/A
7583063	12/2008	Dooley	N/A	N/A
7584880	12/2008	Racenet et al.	N/A	N/A
7586289	12/2008	Andruk et al.	N/A	N/A
7588174	12/2008	Holsten et al.	N/A	N/A
7588175	12/2008	Timm et al.	N/A	N/A
7588176	12/2008	Timm et al.	N/A	N/A
7588177	12/2008	Racenet	N/A	N/A
7591783	12/2008	Boulais et al.	N/A	N/A
7591818	12/2008	Bertolero et al.	N/A	N/A
7593766	12/2008	Faber et al.	N/A	N/A

7595642	12/2008	Doyle	N/A	N/A
7597229	12/2008	Boudreaux et al.	N/A	N/A
7597230	12/2008	Racenet et al.	N/A	N/A
7597693	12/2008	Garrison	N/A	N/A
7597699	12/2008	Rogers	N/A	N/A
7598972	12/2008	Tomita	N/A	N/A
7600663	12/2008	Green	N/A	N/A
7604118	12/2008	Iio et al.	N/A	N/A
7604150	12/2008	Boudreaux	N/A	N/A
7604151	12/2008	Hess et al.	N/A	N/A
7604668	12/2008	Farnsworth et al.	N/A	N/A
7605826	12/2008	Sauer	N/A	N/A
7607557	12/2008	Shelton, IV et al.	N/A	N/A
7608091	12/2008	Goldfarb et al.	N/A	N/A
D604325	12/2008	Ebeling et al.	N/A	N/A
7611038	12/2008	Racenet et al.	N/A	N/A
7611474	12/2008	Hibner et al.	N/A	N/A
7615003	12/2008	Stefanchik et al.	N/A	N/A
7615006	12/2008	Abe	N/A	N/A
7615067	12/2008	Lee et al.	N/A	N/A
7617961	12/2008	Viola	N/A	N/A
7618427	12/2008	Ortiz et al.	N/A	N/A
D605201	12/2008	Lorenz et al.	N/A	N/A
D606992	12/2008	Liu et al.	N/A	N/A
D607010	12/2008	Kocmick	N/A	N/A
7624902	12/2008	Marczyk et al.	N/A	N/A
7624903	12/2008	Green et al.	N/A	N/A
7625370	12/2008	Hart et al.	N/A	N/A
7625388	12/2008	Boukhny et al.	N/A	N/A
7625662	12/2008	Vaisnys et al.	N/A	N/A
7630841	12/2008	Comisky et al.	N/A	N/A
7631793	12/2008	Rethy et al.	N/A	N/A
7631794	12/2008	Rethy et al.	N/A	N/A
7635074	12/2008	Olson et al.	N/A	N/A
7635922	12/2008	Becker	N/A	N/A
7637409	12/2008	Marczyk	N/A	N/A
7637410	12/2008	Marczyk	N/A	N/A
7638958	12/2008	Philipp et al.	N/A	N/A
7641091	12/2009	Olson et al.	N/A	N/A
7641092	12/2009	Kruszynski et al.	N/A	N/A
7641093	12/2009	Doll et al.	N/A	N/A
7641095	12/2009	Viola	N/A	N/A
7641671	12/2009	Crainich	N/A	N/A
7644016	12/2009	Nycz et al.	N/A	N/A
7644484	12/2009	Vereschagin	N/A	N/A
7644783	12/2009	Roberts et al.	N/A	N/A
7644848	12/2009	Swayze et al.	N/A	N/A
7645230	12/2009	Mikkaichi et al.	N/A	N/A
7648055	12/2009	Marczyk	N/A	N/A
7648457	12/2009	Stefanchik et al.	N/A	N/A

7648519	12/2009	Lee et al.	N/A	N/A
7650185	12/2009	Maile et al.	N/A	N/A
7651017	12/2009	Ortiz et al.	N/A	N/A
7651498	12/2009	Shifrin et al.	N/A	N/A
7654431	12/2009	Hueil et al.	N/A	N/A
7655003	12/2009	Lorang et al.	N/A	N/A
7655004	12/2009	Long	N/A	N/A
7655288	12/2009	Bauman et al.	N/A	N/A
7655584	12/2009	Biran et al.	N/A	N/A
7656131	12/2009	Embrey et al.	N/A	N/A
7658311	12/2009	Boudreaux	N/A	N/A
7658312	12/2009	Vidal et al.	N/A	N/A
7658705	12/2009	Melvin et al.	N/A	N/A
7659219	12/2009	Biran et al.	N/A	N/A
7661448	12/2009	Kim et al.	N/A	N/A
7662161	12/2009	Briganti et al.	N/A	N/A
7665646	12/2009	Prommersberger	N/A	N/A
7665647	12/2009	Shelton, IV et al.	N/A	N/A
7666195	12/2009	Kelleher et al.	N/A	N/A
7669746	12/2009	Shelton, IV	N/A	N/A
7669747	12/2009	Weisenburgh, II et al.	N/A	N/A
7670334	12/2009	Hueil et al.	N/A	N/A
7670337	12/2009	Young	N/A	N/A
7673780	12/2009	Shelton, IV et al.	N/A	N/A
7673781	12/2009	Swayze et al.	N/A	N/A
7673782	12/2009	Hess et al.	N/A	N/A
7673783	12/2009	Morgan et al.	N/A	N/A
7674253	12/2009	Fisher et al.	N/A	N/A
7674255	12/2009	Braun	N/A	N/A
7674263	12/2009	Ryan	N/A	N/A
7674270	12/2009	Layer	N/A	N/A
7678121	12/2009	Knodel	N/A	N/A
7682307	12/2009	Danitz et al.	N/A	N/A
7682367	12/2009	Shah et al.	N/A	N/A
7682686	12/2009	Curro et al.	N/A	N/A
7686201	12/2009	Csiky	N/A	N/A
7686804	12/2009	Johnson et al.	N/A	N/A
7686826	12/2009	Lee et al.	N/A	N/A
7688028	12/2009	Phillips et al.	N/A	N/A
7690547	12/2009	Racenet et al.	N/A	N/A
7691098	12/2009	Wallace et al.	N/A	N/A
7691103	12/2009	Fernandez et al.	N/A	N/A
7691106	12/2009	Schenberger et al.	N/A	N/A
7694864	12/2009	Okada et al.	N/A	N/A
7694865	12/2009	Scirica	N/A	N/A
7695485	12/2009	Whitman et al.	N/A	N/A
7695493	12/2009	Saadat et al.	N/A	N/A
7699204	12/2009	Viola	N/A	N/A
7699835	12/2009	Lee et al.	N/A	N/A
7699844	12/2009	Utley et al.	N/A	N/A

7699846	12/2009	Ryan	N/A	N/A
7699856	12/2009	Van Wyk et al.	N/A	N/A
7699859	12/2009	Bombard et al.	N/A	N/A
7699860	12/2009	Huitema et al.	N/A	N/A
7699868	12/2009	Frank et al.	N/A	N/A
7703653	12/2009	Shah et al.	N/A	N/A
7705559	12/2009	Powell et al.	N/A	N/A
7706853	12/2009	Hacker et al.	N/A	N/A
7708180	12/2009	Murray et al.	N/A	N/A
7708181	12/2009	Cole et al.	N/A	N/A
7708182	12/2009	Viola	N/A	N/A
7708758	12/2009	Lee et al.	N/A	N/A
7708768	12/2009	Danek et al.	N/A	N/A
7709136	12/2009	Touchton et al.	N/A	N/A
7712182	12/2009	Zeiler et al.	N/A	N/A
7713190	12/2009	Brock et al.	N/A	N/A
7713542	12/2009	Xu et al.	N/A	N/A
7714239	12/2009	Smith	N/A	N/A
7714334	12/2009	Lin	N/A	N/A
7717312	12/2009	Beetel	N/A	N/A
7717313	12/2009	Criscuolo et al.	N/A	N/A
7717846	12/2009	Zirps et al.	N/A	N/A
7717873	12/2009	Swick	N/A	N/A
7717915	12/2009	Miyazawa	N/A	N/A
7717926	12/2009	Whitfield et al.	N/A	N/A
7718180	12/2009	Karp	N/A	N/A
7718556	12/2009	Matsuda et al.	N/A	N/A
7721930	12/2009	McKenna et al.	N/A	N/A
7721931	12/2009	Shelton, IV et al.	N/A	N/A
7721932	12/2009	Cole et al.	N/A	N/A
7721933	12/2009	Ehrenfels et al.	N/A	N/A
7721934	12/2009	Shelton, IV et al.	N/A	N/A
7721936	12/2009	Shalton, IV et al.	N/A	N/A
7722527	12/2009	Bouchier et al.	N/A	N/A
7722607	12/2009	Dumbauld et al.	N/A	N/A
7722610	12/2009	Viola et al.	N/A	N/A
7725214	12/2009	Diolaiti	N/A	N/A
7726171	12/2009	Langlotz et al.	N/A	N/A
7726537	12/2009	Olson et al.	N/A	N/A
7726538	12/2009	Holsten et al.	N/A	N/A
7726539	12/2009	Holsten et al.	N/A	N/A
7727954	12/2009	McKay	N/A	N/A
7728553	12/2009	Carrier et al.	N/A	N/A
7729742	12/2009	Govari	N/A	N/A
7731072	12/2009	Timm et al.	N/A	N/A
7731073	12/2009	Wixey et al.	N/A	N/A
7731724	12/2009	Huitema et al.	N/A	N/A
7735703	12/2009	Morgan et al.	N/A	N/A
7735704	12/2009	Bilotti	N/A	N/A
7736254	12/2009	Schena	N/A	N/A

7736306	12/2009	Brustad et al.	N/A	N/A
7736356	12/2009	Cooper et al.	N/A	N/A
7736374	12/2009	Vaughan et al.	N/A	N/A
7738971	12/2009	Swayze et al.	N/A	N/A
7740159	12/2009	Shelton, IV et al.	N/A	N/A
7742036	12/2009	Grant et al.	N/A	N/A
7743960	12/2009	Whitman et al.	N/A	N/A
7744624	12/2009	Bettuchi	N/A	N/A
7744627	12/2009	Orban, III et al.	N/A	N/A
7744628	12/2009	Viola	N/A	N/A
7747146	12/2009	Milano et al.	N/A	N/A
7748587	12/2009	Haramiishi et al.	N/A	N/A
7748632	12/2009	Coleman et al.	N/A	N/A
7749204	12/2009	Dhanaraj et al.	N/A	N/A
7749240	12/2009	Takahashi et al.	N/A	N/A
7751870	12/2009	Whitman	N/A	N/A
7753245	12/2009	Boudreaux et al.	N/A	N/A
7753246	12/2009	Scirica	N/A	N/A
7753904	12/2009	Shelton, IV et al.	N/A	N/A
7757924	12/2009	Gerbi et al.	N/A	N/A
7758594	12/2009	Lamson et al.	N/A	N/A
7758612	12/2009	Shipp	N/A	N/A
7758613	12/2009	Whitman	N/A	N/A
7762462	12/2009	Gelbman	N/A	N/A
7762998	12/2009	Birk et al.	N/A	N/A
D622286	12/2009	Umezawa	N/A	N/A
7766207	12/2009	Mather et al.	N/A	N/A
7766209	12/2009	Baxter, III et al.	N/A	N/A
7766210	12/2009	Shelton, IV et al.	N/A	N/A
7766821	12/2009	Brunnen et al.	N/A	N/A
7766894	12/2009	Weitzner et al.	N/A	N/A
7770658	12/2009	Ito et al.	N/A	N/A
7770773	12/2009	Whitman et al.	N/A	N/A
7770774	12/2009	Mastri et al.	N/A	N/A
7770775	12/2009	Shelton, IV et al.	N/A	N/A
7770776	12/2009	Chen et al.	N/A	N/A
7771396	12/2009	Stefanchik et al.	N/A	N/A
7772720	12/2009	McGee et al.	N/A	N/A
7772725	12/2009	Siman-Tov	N/A	N/A
7775972	12/2009	Brock et al.	N/A	N/A
7776037	12/2009	Odom	N/A	N/A
7776060	12/2009	Mooradian et al.	N/A	N/A
7776065	12/2009	Griffiths et al.	N/A	N/A
7778004	12/2009	Nerheim et al.	N/A	N/A
7779614	12/2009	McGonagle et al.	N/A	N/A
7779737	12/2009	Newman, Jr. et al.	N/A	N/A
7780054	12/2009	Wales	N/A	N/A
7780055	12/2009	Scirica et al.	N/A	N/A
7780309	12/2009	McMillan et al.	N/A	N/A
7780651	12/2009	Madhani et al.	N/A	N/A

7780663	12/2009	Yates et al.	N/A	N/A
7780685	12/2009	Hunt et al.	N/A	N/A
7782382	12/2009	Fujimura	N/A	N/A
7784662	12/2009	Wales et al.	N/A	N/A
7784663	12/2009	Shelton, IV	N/A	N/A
7787256	12/2009	Chan et al.	N/A	N/A
7789283	12/2009	Shah	N/A	N/A
7789875	12/2009	Brock et al.	N/A	N/A
7789883	12/2009	Takashino et al.	N/A	N/A
7789889	12/2009	Zubik et al.	N/A	N/A
7793812	12/2009	Moore et al.	N/A	N/A
7794475	12/2009	Hess et al.	N/A	N/A
7798386	12/2009	Schall et al.	N/A	N/A
7799039	12/2009	Shelton, IV et al.	N/A	N/A
7799044	12/2009	Johnston et al.	N/A	N/A
7799965	12/2009	Patel et al.	N/A	N/A
7803151	12/2009	Whitman	N/A	N/A
7806871	12/2009	Li et al.	N/A	N/A
7806891	12/2009	Nowlin et al.	N/A	N/A
7810690	12/2009	Bilotti et al.	N/A	N/A
7810691	12/2009	Boyden et al.	N/A	N/A
7810692	12/2009	Hall et al.	N/A	N/A
7810693	12/2009	Broehl et al.	N/A	N/A
7811275	12/2009	Birk et al.	N/A	N/A
7814816	12/2009	Alberti et al.	N/A	N/A
7815092	12/2009	Whitman et al.	N/A	N/A
7815565	12/2009	Stefanchik et al.	N/A	N/A
7815662	12/2009	Spivey et al.	N/A	N/A
7819296	12/2009	Hueil et al.	N/A	N/A
7819297	12/2009	Doll et al.	N/A	N/A
7819298	12/2009	Hall et al.	N/A	N/A
7819299	12/2009	Shelton, IV et al.	N/A	N/A
7819799	12/2009	Merril et al.	N/A	N/A
7819884	12/2009	Lee et al.	N/A	N/A
7819885	12/2009	Cooper	N/A	N/A
7819886	12/2009	Whitfield et al.	N/A	N/A
7819894	12/2009	Mitsuishi et al.	N/A	N/A
7823076	12/2009	Borovsky et al.	N/A	N/A
7823592	12/2009	Bettuchi et al.	N/A	N/A
7823760	12/2009	Zemlok et al.	N/A	N/A
7824401	12/2009	Manzo et al.	N/A	N/A
7824422	12/2009	Benchetrit	N/A	N/A
7824426	12/2009	Racenet et al.	N/A	N/A
7828189	12/2009	Holsten et al.	N/A	N/A
7828794	12/2009	Sartor	N/A	N/A
7828808	12/2009	Hinman et al.	N/A	N/A
7829416	12/2009	Kudou et al.	N/A	N/A
7831292	12/2009	Quaid et al.	N/A	N/A
7832408	12/2009	Shelton, IV et al.	N/A	N/A
7832611	12/2009	Boyden et al.	N/A	N/A

7832612	12/2009	Baxter, III et al.	N/A	N/A
7833234	12/2009	Bailly et al.	N/A	N/A
7835823	12/2009	Sillman et al.	N/A	N/A
7836400	12/2009	May et al.	N/A	N/A
7837079	12/2009	Holsten et al.	N/A	N/A
7837080	12/2009	Schwemberger	N/A	N/A
7837081	12/2009	Holsten et al.	N/A	N/A
7837425	12/2009	Saeki et al.	N/A	N/A
7837685	12/2009	Weinberg et al.	N/A	N/A
7837687	12/2009	Harp	N/A	N/A
7837694	12/2009	Tethrake et al.	N/A	N/A
7838789	12/2009	Stoffers et al.	N/A	N/A
7839109	12/2009	Carmen, Jr. et al.	N/A	N/A
7840253	12/2009	Tremblay et al.	N/A	N/A
7841503	12/2009	Sonnenschein et al.	N/A	N/A
7842025	12/2009	Coleman et al.	N/A	N/A
7842028	12/2009	Lee	N/A	N/A
7843158	12/2009	Prisco	N/A	N/A
7845533	12/2009	Marczyk et al.	N/A	N/A
7845534	12/2009	Viola et al.	N/A	N/A
7845535	12/2009	Scircia	N/A	N/A
7845536	12/2009	Viola et al.	N/A	N/A
7845537	12/2009	Shelton, IV et al.	N/A	N/A
7845538	12/2009	Whitman	N/A	N/A
7845912	12/2009	Sung et al.	N/A	N/A
7846085	12/2009	Silverman et al.	N/A	N/A
7846149	12/2009	Jankowski	N/A	N/A
7846161	12/2009	Dumbauld et al.	N/A	N/A
7848066	12/2009	Yanagishima	N/A	N/A
7850623	12/2009	Griffin et al.	N/A	N/A
7850642	12/2009	Moll et al.	N/A	N/A
7850982	12/2009	Stopek et al.	N/A	N/A
7853813	12/2009	Lee	N/A	N/A
7854735	12/2009	Houser et al.	N/A	N/A
7854736	12/2009	Ryan	N/A	N/A
7857183	12/2009	Shelton, IV	N/A	N/A
7857184	12/2009	Viola	N/A	N/A
7857185	12/2009	Swayze et al.	N/A	N/A
7857186	12/2009	Baxter, III et al.	N/A	N/A
7857813	12/2009	Schmitz et al.	N/A	N/A
7861906	12/2010	Doll et al.	N/A	N/A
7862502	12/2010	Pool et al.	N/A	N/A
7862546	12/2010	Conlon et al.	N/A	N/A
7862579	12/2010	Ortiz et al.	N/A	N/A
7866525	12/2010	Scirica	N/A	N/A
7866527	12/2010	Hall et al.	N/A	N/A
7866528	12/2010	Olson et al.	N/A	N/A
7870989	12/2010	Viola et al.	N/A	N/A
7871418	12/2010	Thompson et al.	N/A	N/A
7871440	12/2010	Schwartz et al.	N/A	N/A

7875055	12/2010	Cichocki, Jr.	N/A	N/A
7877869	12/2010	Mehdizadeh et al.	N/A	N/A
7879063	12/2010	Khosravi	N/A	N/A
7879070	12/2010	Ortiz et al.	N/A	N/A
7879367	12/2010	Heublein et al.	N/A	N/A
7883461	12/2010	Albrecht et al.	N/A	N/A
7883465	12/2010	Donofrio et al.	N/A	N/A
7883540	12/2010	Niwa et al.	N/A	N/A
7886951	12/2010	Hessler	N/A	N/A
7886952	12/2010	Scirica et al.	N/A	N/A
7887530	12/2010	Zemlok et al.	N/A	N/A
7887535	12/2010	Lands et al.	N/A	N/A
7887536	12/2010	Johnson et al.	N/A	N/A
7887563	12/2010	Cummins	N/A	N/A
7887755	12/2010	Mingerink et al.	N/A	N/A
7891531	12/2010	Ward	N/A	N/A
7891532	12/2010	Mastri et al.	N/A	N/A
7892200	12/2010	Birk et al.	N/A	N/A
7892245	12/2010	Liddicoat et al.	N/A	N/A
7893586	12/2010	West et al.	N/A	N/A
7896214	12/2010	Farascioni	N/A	N/A
7896215	12/2010	Adams et al.	N/A	N/A
7896671	12/2010	Kim et al.	N/A	N/A
7896869	12/2010	DiSilvestro et al.	N/A	N/A
7896877	12/2010	Hall et al.	N/A	N/A
7896895	12/2010	Boudreaux et al.	N/A	N/A
7896897	12/2010	Gresham et al.	N/A	N/A
7896900	12/2010	Frank et al.	N/A	N/A
7898198	12/2010	Murphree	N/A	N/A
7900805	12/2010	Shelton, IV et al.	N/A	N/A
7900806	12/2010	Chen et al.	N/A	N/A
7901381	12/2010	Birk et al.	N/A	N/A
7905380	12/2010	Shelton, IV et al.	N/A	N/A
7905381	12/2010	Baxter, III et al.	N/A	N/A
7905881	12/2010	Masuda et al.	N/A	N/A
7905889	12/2010	Catanese, III et al.	N/A	N/A
7905890	12/2010	Whitfield et al.	N/A	N/A
7905902	12/2010	Huitema et al.	N/A	N/A
7909039	12/2010	Hur	N/A	N/A
7909191	12/2010	Baker et al.	N/A	N/A
7909220	12/2010	Viola	N/A	N/A
7909221	12/2010	Viola et al.	N/A	N/A
7909224	12/2010	Prommersberger	N/A	N/A
7913891	12/2010	Doll et al.	N/A	N/A
7913893	12/2010	Mastri et al.	N/A	N/A
7914521	12/2010	Wang et al.	N/A	N/A
7914543	12/2010	Roth et al.	N/A	N/A
7914551	12/2010	Ortiz et al.	N/A	N/A
7918230	12/2010	Whitman et al.	N/A	N/A
7918376	12/2010	Knodel et al.	N/A	N/A

7918377	12/2010	Measamer et al.	N/A	N/A
7918845	12/2010	Saadat et al.	N/A	N/A
7918848	12/2010	Lau et al.	N/A	N/A
7918861	12/2010	Brock et al.	N/A	N/A
7918867	12/2010	Dana et al.	N/A	N/A
7922061	12/2010	Shelton, IV et al.	N/A	N/A
7922063	12/2010	Zemlok et al.	N/A	N/A
7922743	12/2010	Heinrich et al.	N/A	N/A
7923144	12/2010	Kohn et al.	N/A	N/A
7926691	12/2010	Viola et al.	N/A	N/A
7926692	12/2010	Racenet et al.	N/A	N/A
7927328	12/2010	Orszulak et al.	N/A	N/A
7928281	12/2010	Augustine	N/A	N/A
7930040	12/2010	Kelsch et al.	N/A	N/A
7930065	12/2010	Larkin et al.	N/A	N/A
7931660	12/2010	Aranyi et al.	N/A	N/A
7931695	12/2010	Ringeisen	N/A	N/A
7931877	12/2010	Steffens et al.	N/A	N/A
7934630	12/2010	Shelton, IV et al.	N/A	N/A
7934631	12/2010	Balbierz et al.	N/A	N/A
7934896	12/2010	Schnier	N/A	N/A
7935130	12/2010	Williams	N/A	N/A
7935773	12/2010	Hadba et al.	N/A	N/A
7936142	12/2010	Otsuka et al.	N/A	N/A
7938307	12/2010	Bettuchi	N/A	N/A
7939152	12/2010	Haskin et al.	N/A	N/A
7941865	12/2010	Seman, Jr. et al.	N/A	N/A
7942300	12/2010	Rethy et al.	N/A	N/A
7942303	12/2010	Shah	N/A	N/A
7942890	12/2010	D'Agostino et al.	N/A	N/A
7944175	12/2010	Mori et al.	N/A	N/A
7945792	12/2010	Cherpantier	N/A	N/A
7945798	12/2010	Carlson et al.	N/A	N/A
7946453	12/2010	Voegele et al.	N/A	N/A
7947011	12/2010	Birk et al.	N/A	N/A
7948381	12/2010	Lindsay et al.	N/A	N/A
7950560	12/2010	Zemlok et al.	N/A	N/A
7950561	12/2010	Aranyi	N/A	N/A
7950562	12/2010	Beardsley et al.	N/A	N/A
7951071	12/2010	Whitman et al.	N/A	N/A
7951166	12/2010	Orban, III et al.	N/A	N/A
7952464	12/2010	Nikitin et al.	N/A	N/A
7954682	12/2010	Giordano et al.	N/A	N/A
7954684	12/2010	Boudreaux	N/A	N/A
7954685	12/2010	Viola	N/A	N/A
7954686	12/2010	Baxter, III et al.	N/A	N/A
7954687	12/2010	Zemlok et al.	N/A	N/A
7954688	12/2010	Argentine et al.	N/A	N/A
7955253	12/2010	Ewers et al.	N/A	N/A
7955257	12/2010	Frasier et al.	N/A	N/A

7955322	12/2010	Devengenzo et al.	N/A	N/A
7955327	12/2010	Sartor et al.	N/A	N/A
7955380	12/2010	Chu et al.	N/A	N/A
7959050	12/2010	Smith et al.	N/A	N/A
7959051	12/2010	Smith et al.	N/A	N/A
7959052	12/2010	Sonnenschein et al.	N/A	N/A
7963432	12/2010	Knodel et al.	N/A	N/A
7963433	12/2010	Whitman et al.	N/A	N/A
7963913	12/2010	Devengenzo et al.	N/A	N/A
7963963	12/2010	Francischelli et al.	N/A	N/A
7963964	12/2010	Santilli et al.	N/A	N/A
7964206	12/2010	Suokas et al.	N/A	N/A
7966236	12/2010	Noriega et al.	N/A	N/A
7966269	12/2010	Bauer et al.	N/A	N/A
7966799	12/2010	Morgan et al.	N/A	N/A
7967178	12/2010	Scirica et al.	N/A	N/A
7967179	12/2010	Olson et al.	N/A	N/A
7967180	12/2010	Scirica	N/A	N/A
7967181	12/2010	Viola et al.	N/A	N/A
7967791	12/2010	Franer et al.	N/A	N/A
7967839	12/2010	Flock et al.	N/A	N/A
7972298	12/2010	Wallace et al.	N/A	N/A
7972315	12/2010	Birk et al.	N/A	N/A
7976213	12/2010	Bertolotti et al.	N/A	N/A
7976508	12/2010	Hoag	N/A	N/A
7976563	12/2010	Summerer	N/A	N/A
7979137	12/2010	Tracey et al.	N/A	N/A
7980443	12/2010	Scheib et al.	N/A	N/A
7981025	12/2010	Pool et al.	N/A	N/A
7981102	12/2010	Patel et al.	N/A	N/A
7981132	12/2010	Dubrul et al.	N/A	N/A
7987405	12/2010	Turner et al.	N/A	N/A
7988015	12/2010	Mason, II et al.	N/A	N/A
7988026	12/2010	Knodel et al.	N/A	N/A
7988027	12/2010	Olson et al.	N/A	N/A
7988028	12/2010	Farascioni et al.	N/A	N/A
7988779	12/2010	Disalvo et al.	N/A	N/A
7992757	12/2010	Wheeler et al.	N/A	N/A
7993360	12/2010	Hacker et al.	N/A	N/A
7994670	12/2010	Ji	N/A	N/A
7997054	12/2010	Bertsch et al.	N/A	N/A
7997468	12/2010	Farascioni	N/A	N/A
7997469	12/2010	Olson et al.	N/A	N/A
8002696	12/2010	Suzuki	N/A	N/A
8002784	12/2010	Jinno et al.	N/A	N/A
8002785	12/2010	Weiss et al.	N/A	N/A
8002795	12/2010	Beetel	N/A	N/A
8006365	12/2010	Levin et al.	N/A	N/A
8006885	12/2010	Marczyk	N/A	N/A
8006889	12/2010	Adams et al.	N/A	N/A

8007370	12/2010	Hirsch et al.	N/A	N/A
8007465	12/2010	Birk et al.	N/A	N/A
8007479	12/2010	Birk et al.	N/A	N/A
8007511	12/2010	Brock et al.	N/A	N/A
8007513	12/2010	Nalagatla et al.	N/A	N/A
8008598	12/2010	Whitman et al.	N/A	N/A
8010180	12/2010	Quaid et al.	N/A	N/A
8011550	12/2010	Aranyi et al.	N/A	N/A
8011551	12/2010	Marczyk et al.	N/A	N/A
8011553	12/2010	Mastri et al.	N/A	N/A
8011555	12/2010	Tarinelli et al.	N/A	N/A
8012170	12/2010	Whitman et al.	N/A	N/A
8016176	12/2010	Kasvikis et al.	N/A	N/A
8016177	12/2010	Bettuchi et al.	N/A	N/A
8016178	12/2010	Olson et al.	N/A	N/A
8016849	12/2010	Wenchell	N/A	N/A
8016855	12/2010	Whitman et al.	N/A	N/A
8016858	12/2010	Whitman	N/A	N/A
8016881	12/2010	Furst	N/A	N/A
8020741	12/2010	Cole et al.	N/A	N/A
8020742	12/2010	Marczyk	N/A	N/A
8020743	12/2010	Shelton, IV	N/A	N/A
8021375	12/2010	Aldrich et al.	N/A	N/A
8025199	12/2010	Whitman et al.	N/A	N/A
8025896	12/2010	Malaviya et al.	N/A	N/A
8028835	12/2010	Yasuda et al.	N/A	N/A
8028882	12/2010	Viola	N/A	N/A
8028883	12/2010	Stopek	N/A	N/A
8028884	12/2010	Sniffin et al.	N/A	N/A
8028885	12/2010	Smith et al.	N/A	N/A
8029510	12/2010	Hoegerle	N/A	N/A
8031069	12/2010	Cohn et al.	N/A	N/A
8033438	12/2010	Scirica	N/A	N/A
8033439	12/2010	Racenet et al.	N/A	N/A
8033440	12/2010	Wenchell et al.	N/A	N/A
8033442	12/2010	Racenet et al.	N/A	N/A
8034077	12/2010	Smith et al.	N/A	N/A
8034337	12/2010	Simard	N/A	N/A
8034363	12/2010	Li et al.	N/A	N/A
8035487	12/2010	Malackowski	N/A	N/A
8037591	12/2010	Spivey et al.	N/A	N/A
8038044	12/2010	Viola	N/A	N/A
8038045	12/2010	Bettuchi et al.	N/A	N/A
8038046	12/2010	Smith et al.	N/A	N/A
8038686	12/2010	Huitema et al.	N/A	N/A
8043207	12/2010	Adams	N/A	N/A
8043328	12/2010	Hahnen et al.	N/A	N/A
8044536	12/2010	Nguyen et al.	N/A	N/A
8044604	12/2010	Hagino et al.	N/A	N/A
8047236	12/2010	Perry	N/A	N/A

8048503	12/2010	Farnsworth et al.	N/A	N/A
8052636	12/2010	Moll et al.	N/A	N/A
8052697	12/2010	Phillips	N/A	N/A
8056787	12/2010	Boudreaux et al.	N/A	N/A
8056788	12/2010	Mastri et al.	N/A	N/A
8056789	12/2010	White et al.	N/A	N/A
8057508	12/2010	Shelton, IV	N/A	N/A
8058771	12/2010	Giordano et al.	N/A	N/A
8060250	12/2010	Reiland et al.	N/A	N/A
8061014	12/2010	Smith et al.	N/A	N/A
8061576	12/2010	Cappola	N/A	N/A
8062236	12/2010	Soltz	N/A	N/A
8062306	12/2010	Nobis et al.	N/A	N/A
8062330	12/2010	Prommersberger et al.	N/A	N/A
8063619	12/2010	Zhu et al.	N/A	N/A
8066158	12/2010	Vogel et al.	N/A	N/A
8066166	12/2010	Demmy et al.	N/A	N/A
8066167	12/2010	Measamer et al.	N/A	N/A
8066168	12/2010	Vidal et al.	N/A	N/A
8066720	12/2010	Knodel et al.	N/A	N/A
D650074	12/2010	Hunt et al.	N/A	N/A
D650789	12/2010	Arnold	N/A	N/A
8070033	12/2010	Milliman et al.	N/A	N/A
8070034	12/2010	Knodel	N/A	N/A
8070035	12/2010	Holsten et al.	N/A	N/A
8070743	12/2010	Kagan et al.	N/A	N/A
8074858	12/2010	Marczyk	N/A	N/A
8074859	12/2010	Kostrzewski	N/A	N/A
8074861	12/2010	Ehrenfels et al.	N/A	N/A
8075476	12/2010	Vargas	N/A	N/A
8075571	12/2010	Vitali et al.	N/A	N/A
8079950	12/2010	Stern et al.	N/A	N/A
8079989	12/2010	Birk et al.	N/A	N/A
8080004	12/2010	Downey et al.	N/A	N/A
8083118	12/2010	Milliman et al.	N/A	N/A
8083119	12/2010	Prommersberger	N/A	N/A
8083120	12/2010	Shelton, IV et al.	N/A	N/A
8084001	12/2010	Burns et al.	N/A	N/A
8084969	12/2010	David et al.	N/A	N/A
8085013	12/2010	Wei et al.	N/A	N/A
8087562	12/2011	Manoux et al.	N/A	N/A
8087563	12/2011	Milliman et al.	N/A	N/A
8089509	12/2011	Chatenever et al.	N/A	N/A
8091753	12/2011	Viola	N/A	N/A
8091756	12/2011	Viola	N/A	N/A
8092443	12/2011	Bischoff	N/A	N/A
8092932	12/2011	Phillips et al.	N/A	N/A
8093572	12/2011	Kuduvalli	N/A	N/A
8096458	12/2011	Hessler	N/A	N/A

8096459	12/2011	Ortiz et al.	N/A	N/A
8097017	12/2011	Viola	N/A	N/A
8100310	12/2011	Zemlok	N/A	N/A
8100824	12/2011	Hegeman et al.	N/A	N/A
8100872	12/2011	Patel	N/A	N/A
8102138	12/2011	Sekine et al.	N/A	N/A
8102278	12/2011	Deck et al.	N/A	N/A
8105320	12/2011	Manzo	N/A	N/A
8105350	12/2011	Lee et al.	N/A	N/A
8107925	12/2011	Natsuno et al.	N/A	N/A
8108033	12/2011	Drew et al.	N/A	N/A
8108072	12/2011	Zhao et al.	N/A	N/A
8109426	12/2011	Milliman et al.	N/A	N/A
8110208	12/2011	Hen	N/A	N/A
8113405	12/2011	Milliman	N/A	N/A
8113407	12/2011	Holsten et al.	N/A	N/A
8113408	12/2011	Wenchell et al.	N/A	N/A
8113410	12/2011	Hall et al.	N/A	N/A
8114017	12/2011	Bacher	N/A	N/A
8114100	12/2011	Smith et al.	N/A	N/A
8114345	12/2011	Dlugos, Jr. et al.	N/A	N/A
8118206	12/2011	Zand et al.	N/A	N/A
8118207	12/2011	Racenet et al.	N/A	N/A
8120301	12/2011	Goldberg et al.	N/A	N/A
8122128	12/2011	Burke, II et al.	N/A	N/A
8123103	12/2011	Milliman	N/A	N/A
8123523	12/2011	Carron et al.	N/A	N/A
8123766	12/2011	Bauman et al.	N/A	N/A
8123767	12/2011	Bauman et al.	N/A	N/A
8125168	12/2011	Johnson et al.	N/A	N/A
8127975	12/2011	Olson et al.	N/A	N/A
8127976	12/2011	Scirica et al.	N/A	N/A
8128624	12/2011	Couture et al.	N/A	N/A
8128643	12/2011	Aranyi et al.	N/A	N/A
8128645	12/2011	Sonnenschein et al.	N/A	N/A
8128662	12/2011	Altarac et al.	N/A	N/A
8132703	12/2011	Milliman et al.	N/A	N/A
8132705	12/2011	Viola et al.	N/A	N/A
8132706	12/2011	Marczyk et al.	N/A	N/A
8133500	12/2011	Ringeisen et al.	N/A	N/A
8134306	12/2011	Drader et al.	N/A	N/A
8136711	12/2011	Beardsley et al.	N/A	N/A
8136712	12/2011	Zingman	N/A	N/A
8136713	12/2011	Hathaway et al.	N/A	N/A
8137339	12/2011	Jinno et al.	N/A	N/A
8140417	12/2011	Shibata	N/A	N/A
8141762	12/2011	Bedi et al.	N/A	N/A
8141763	12/2011	Milliman	N/A	N/A
8142200	12/2011	Crunkilton et al.	N/A	N/A
8142425	12/2011	Eggers	N/A	N/A

8142461	12/2011	Houser et al.	N/A	N/A
8142515	12/2011	Therin et al.	N/A	N/A
8143520	12/2011	Cutler	N/A	N/A
8146790	12/2011	Milliman	N/A	N/A
8147421	12/2011	Farquhar et al.	N/A	N/A
8147456	12/2011	Fisher et al.	N/A	N/A
8147485	12/2011	Wham et al.	N/A	N/A
8152041	12/2011	Kostrzewski	N/A	N/A
8152756	12/2011	Webster et al.	N/A	N/A
8154239	12/2011	Katsuki et al.	N/A	N/A
8157145	12/2011	Shelton, IV et al.	N/A	N/A
8157148	12/2011	Scirica	N/A	N/A
8157151	12/2011	Ingmanson et al.	N/A	N/A
8157152	12/2011	Holsten et al.	N/A	N/A
8157153	12/2011	Shelton, IV et al.	N/A	N/A
8157793	12/2011	Omori et al.	N/A	N/A
8157834	12/2011	Conlon	N/A	N/A
8161977	12/2011	Shelton, IV et al.	N/A	N/A
8162138	12/2011	Bettenhausen et al.	N/A	N/A
8162197	12/2011	Mastri et al.	N/A	N/A
8162668	12/2011	Toly	N/A	N/A
8162933	12/2011	Francischelli et al.	N/A	N/A
8162965	12/2011	Reschke et al.	N/A	N/A
8167185	12/2011	Shelton, IV et al.	N/A	N/A
8167622	12/2011	Zhou	N/A	N/A
8167895	12/2011	D'Agostino et al.	N/A	N/A
8167898	12/2011	Schaller et al.	N/A	N/A
8170241	12/2011	Roe et al.	N/A	N/A
8172004	12/2011	Ho	N/A	N/A
8172120	12/2011	Boyden et al.	N/A	N/A
8172122	12/2011	Kasvikis et al.	N/A	N/A
8172124	12/2011	Shelton, IV et al.	N/A	N/A
8177776	12/2011	Humayun et al.	N/A	N/A
8177797	12/2011	Shimoji et al.	N/A	N/A
8179705	12/2011	Chapuis	N/A	N/A
8180458	12/2011	Kane et al.	N/A	N/A
8181839	12/2011	Beetel	N/A	N/A
8181840	12/2011	Milliman	N/A	N/A
8182422	12/2011	Bayer et al.	N/A	N/A
8182444	12/2011	Uber, III et al.	N/A	N/A
8183807	12/2011	Tsai et al.	N/A	N/A
8186555	12/2011	Shelton, IV et al.	N/A	N/A
8186556	12/2011	Viola	N/A	N/A
8186558	12/2011	Sapienza	N/A	N/A
8186560	12/2011	Hess et al.	N/A	N/A
8190238	12/2011	Moll et al.	N/A	N/A
8191752	12/2011	Scirica	N/A	N/A
8192350	12/2011	Ortiz et al.	N/A	N/A
8192460	12/2011	Orban, III et al.	N/A	N/A
8192651	12/2011	Young et al.	N/A	N/A

8193129	12/2011	Tagawa et al.	N/A	N/A
8196795	12/2011	Moore et al.	N/A	N/A
8196796	12/2011	Shelton, IV et al.	N/A	N/A
8197501	12/2011	Shadeck et al.	N/A	N/A
8197502	12/2011	Smith et al.	N/A	N/A
8197837	12/2011	Jamiolkowski et al.	N/A	N/A
8201720	12/2011	Hessler	N/A	N/A
8201721	12/2011	Zemlok et al.	N/A	N/A
8202549	12/2011	Stucky et al.	N/A	N/A
8205779	12/2011	Ma et al.	N/A	N/A
8205780	12/2011	Sorrentino et al.	N/A	N/A
8205781	12/2011	Baxter, III et al.	N/A	N/A
8207863	12/2011	Neubauer et al.	N/A	N/A
8210411	12/2011	Yates et al.	N/A	N/A
8210414	12/2011	Bettuchi et al.	N/A	N/A
8210415	12/2011	Ward	N/A	N/A
8210416	12/2011	Milliman et al.	N/A	N/A
8210721	12/2011	Chen et al.	N/A	N/A
8211125	12/2011	Spivey	N/A	N/A
8214019	12/2011	Govari et al.	N/A	N/A
8215531	12/2011	Shelton, IV et al.	N/A	N/A
8215532	12/2011	Marczyk	N/A	N/A
8215533	12/2011	Viola et al.	N/A	N/A
8220468	12/2011	Cooper et al.	N/A	N/A
8220688	12/2011	Laurent et al.	N/A	N/A
8220690	12/2011	Hess et al.	N/A	N/A
8221402	12/2011	Francischelli et al.	N/A	N/A
8221424	12/2011	Cha	N/A	N/A
8221433	12/2011	Lozier et al.	N/A	N/A
8225799	12/2011	Bettuchi	N/A	N/A
8225979	12/2011	Farascioni et al.	N/A	N/A
8226553	12/2011	Shelton, IV et al.	N/A	N/A
8226635	12/2011	Petrie et al.	N/A	N/A
8226675	12/2011	Houser et al.	N/A	N/A
8226715	12/2011	Hwang et al.	N/A	N/A
8227946	12/2011	Kim	N/A	N/A
8228020	12/2011	Shin et al.	N/A	N/A
8228048	12/2011	Spencer	N/A	N/A
8229549	12/2011	Whitman et al.	N/A	N/A
8230235	12/2011	Goodman et al.	N/A	N/A
8231040	12/2011	Zemlok et al.	N/A	N/A
8231042	12/2011	Hessler et al.	N/A	N/A
8231043	12/2011	Tarinelli et al.	N/A	N/A
8235272	12/2011	Nicholas et al.	N/A	N/A
8235274	12/2011	Cappola	N/A	N/A
8236010	12/2011	Ortiz et al.	N/A	N/A
8236011	12/2011	Harris et al.	N/A	N/A
8236020	12/2011	Smith et al.	N/A	N/A
8237388	12/2011	Jinno et al.	N/A	N/A
8240537	12/2011	Marczyk	N/A	N/A

8241271	12/2011	Millman et al.	N/A	N/A
8241284	12/2011	Dycus et al.	N/A	N/A
8241308	12/2011	Kortenbach et al.	N/A	N/A
8241322	12/2011	Whitman et al.	N/A	N/A
8245594	12/2011	Rogers et al.	N/A	N/A
8245898	12/2011	Smith et al.	N/A	N/A
8245899	12/2011	Swensgard et al.	N/A	N/A
8245900	12/2011	Scirica	N/A	N/A
8245901	12/2011	Stopek	N/A	N/A
8246608	12/2011	Omori et al.	N/A	N/A
8246637	12/2011	Viola et al.	N/A	N/A
8252009	12/2011	Weller et al.	N/A	N/A
8256654	12/2011	Bettuchi et al.	N/A	N/A
8256655	12/2011	Sniffin et al.	N/A	N/A
8256656	12/2011	Milliman et al.	N/A	N/A
8257251	12/2011	Shelton, IV et al.	N/A	N/A
8257356	12/2011	Bleich et al.	N/A	N/A
8257386	12/2011	Lee et al.	N/A	N/A
8257391	12/2011	Orban, III et al.	N/A	N/A
8257634	12/2011	Scirica	N/A	N/A
8258745	12/2011	Smith et al.	N/A	N/A
8261958	12/2011	Knodel	N/A	N/A
8262560	12/2011	Whitman	N/A	N/A
8262655	12/2011	Ghabrial et al.	N/A	N/A
8266232	12/2011	Piper et al.	N/A	N/A
8267300	12/2011	Boudreaux	N/A	N/A
8267849	12/2011	Wazer et al.	N/A	N/A
8267924	12/2011	Zemlok et al.	N/A	N/A
8267946	12/2011	Whitfield et al.	N/A	N/A
8267951	12/2011	Whayne et al.	N/A	N/A
8268344	12/2011	Ma et al.	N/A	N/A
8269121	12/2011	Smith	N/A	N/A
8272553	12/2011	Mastri et al.	N/A	N/A
8272554	12/2011	Whitman et al.	N/A	N/A
8272918	12/2011	Lam	N/A	N/A
8273404	12/2011	Dave et al.	N/A	N/A
8276594	12/2011	Shah	N/A	N/A
8276801	12/2011	Zemlok et al.	N/A	N/A
8276802	12/2011	Kostrzewski	N/A	N/A
8277473	12/2011	Sunaoshi et al.	N/A	N/A
8281446	12/2011	Moskovich	N/A	N/A
8281973	12/2011	Wenchell et al.	N/A	N/A
8281974	12/2011	Hessler et al.	N/A	N/A
8282654	12/2011	Ferrari et al.	N/A	N/A
8285367	12/2011	Hyde et al.	N/A	N/A
8286723	12/2011	Puzio et al.	N/A	N/A
8286845	12/2011	Perry et al.	N/A	N/A
8286846	12/2011	Smith et al.	N/A	N/A
8286847	12/2011	Taylor	N/A	N/A
8287487	12/2011	Estes	N/A	N/A

8287522	12/2011	Moses et al.	N/A	N/A
8287561	12/2011	Nunez et al.	N/A	N/A
8288984	12/2011	Yang	N/A	N/A
8289403	12/2011	Dobashi et al.	N/A	N/A
8290883	12/2011	Takeuchi et al.	N/A	N/A
8292147	12/2011	Viola	N/A	N/A
8292148	12/2011	Viola	N/A	N/A
8292150	12/2011	Bryant	N/A	N/A
8292151	12/2011	Viola	N/A	N/A
8292152	12/2011	Milliman et al.	N/A	N/A
8292155	12/2011	Shelton, IV et al.	N/A	N/A
8292157	12/2011	Smith et al.	N/A	N/A
8292158	12/2011	Sapienza	N/A	N/A
8292801	12/2011	Dejima et al.	N/A	N/A
8292888	12/2011	Whitman	N/A	N/A
8292906	12/2011	Taylor et al.	N/A	N/A
8294399	12/2011	Suzuki et al.	N/A	N/A
8298161	12/2011	Vargas	N/A	N/A
8298189	12/2011	Fisher et al.	N/A	N/A
8298233	12/2011	Mueller	N/A	N/A
8298677	12/2011	Wiesner et al.	N/A	N/A
8302323	12/2011	Fortier et al.	N/A	N/A
8303621	12/2011	Miyamoto et al.	N/A	N/A
8308040	12/2011	Huang et al.	N/A	N/A
8308041	12/2011	Kostrzewski	N/A	N/A
8308042	12/2011	Aranyi	N/A	N/A
8308043	12/2011	Bindra et al.	N/A	N/A
8308046	12/2011	Prommersberger	N/A	N/A
8308659	12/2011	Scheibe et al.	N/A	N/A
8308725	12/2011	Bell et al.	N/A	N/A
8310188	12/2011	Nakai	N/A	N/A
8313496	12/2011	Sauer et al.	N/A	N/A
8313499	12/2011	Magnusson et al.	N/A	N/A
8313509	12/2011	Kostrzewski	N/A	N/A
8317070	12/2011	Hueil et al.	N/A	N/A
8317071	12/2011	Knodel	N/A	N/A
8317074	12/2011	Ortiz et al.	N/A	N/A
8317437	12/2011	Merkley et al.	N/A	N/A
8317744	12/2011	Kirschenman	N/A	N/A
8317790	12/2011	Bell et al.	N/A	N/A
8319002	12/2011	Daniels et al.	N/A	N/A
D672784	12/2011	Clanton et al.	N/A	N/A
8322455	12/2011	Shelton, IV et al.	N/A	N/A
8322589	12/2011	Boudreaux	N/A	N/A
8322590	12/2011	Patel et al.	N/A	N/A
8322901	12/2011	Michelotti	N/A	N/A
8323271	12/2011	Humayun et al.	N/A	N/A
8323789	12/2011	Rozhin et al.	N/A	N/A
8324585	12/2011	McBroom et al.	N/A	N/A
8327514	12/2011	Kim	N/A	N/A

8328061	12/2011	Kasvikis	N/A	N/A
8328062	12/2011	Viola	N/A	N/A
8328063	12/2011	Milliman et al.	N/A	N/A
8328064	12/2011	Racenet et al.	N/A	N/A
8328065	12/2011	Shah	N/A	N/A
8328802	12/2011	Deville et al.	N/A	N/A
8328823	12/2011	Aranyi et al.	N/A	N/A
8333313	12/2011	Boudreaux et al.	N/A	N/A
8333691	12/2011	Schaaf	N/A	N/A
8333764	12/2011	Francischelli et al.	N/A	N/A
8333779	12/2011	Smith et al.	N/A	N/A
8334468	12/2011	Palmer et al.	N/A	N/A
8336753	12/2011	Olson et al.	N/A	N/A
8336754	12/2011	Cappola et al.	N/A	N/A
8342377	12/2012	Milliman et al.	N/A	N/A
8342378	12/2012	Marczyk et al.	N/A	N/A
8342379	12/2012	Whitman et al.	N/A	N/A
8342380	12/2012	Viola	N/A	N/A
8343150	12/2012	Artale	N/A	N/A
8347978	12/2012	Forster et al.	N/A	N/A
8348118	12/2012	Segura	N/A	N/A
8348123	12/2012	Scirica et al.	N/A	N/A
8348124	12/2012	Scirica	N/A	N/A
8348125	12/2012	Viola et al.	N/A	N/A
8348126	12/2012	Olson et al.	N/A	N/A
8348127	12/2012	Marczyk	N/A	N/A
8348129	12/2012	Bedi et al.	N/A	N/A
8348130	12/2012	Shah et al.	N/A	N/A
8348131	12/2012	Omaits et al.	N/A	N/A
8348837	12/2012	Wenchell	N/A	N/A
8348948	12/2012	Bahney	N/A	N/A
8348959	12/2012	Wolford et al.	N/A	N/A
8348972	12/2012	Soltz et al.	N/A	N/A
8349987	12/2012	Kapiamba et al.	N/A	N/A
8352004	12/2012	Mannheimer et al.	N/A	N/A
8353437	12/2012	Boudreaux	N/A	N/A
8353438	12/2012	Baxter, III et al.	N/A	N/A
8353439	12/2012	Baxter, III et al.	N/A	N/A
8356740	12/2012	Knodel	N/A	N/A
8357144	12/2012	Whitman et al.	N/A	N/A
8357158	12/2012	Mckenna et al.	N/A	N/A
8357161	12/2012	Mueller	N/A	N/A
8359174	12/2012	Nakashima et al.	N/A	N/A
8360296	12/2012	Zingman	N/A	N/A
8360297	12/2012	Shelton, IV et al.	N/A	N/A
8360298	12/2012	Farascioni et al.	N/A	N/A
8360299	12/2012	Zemlok et al.	N/A	N/A
8361501	12/2012	DiTizio et al.	N/A	N/A
D676866	12/2012	Chaudhri	N/A	N/A
8365972	12/2012	Aranyi et al.	N/A	N/A

8365973	12/2012	White et al.	N/A	N/A
8365975	12/2012	Manoux et al.	N/A	N/A
8365976	12/2012	Hess et al.	N/A	N/A
8366559	12/2012	Papenfuss et al.	N/A	N/A
8366719	12/2012	Markey et al.	N/A	N/A
8366787	12/2012	Brown et al.	N/A	N/A
8368327	12/2012	Benning et al.	N/A	N/A
8369056	12/2012	Senriuchi et al.	N/A	N/A
8371393	12/2012	Higuchi et al.	N/A	N/A
8371491	12/2012	Huitema et al.	N/A	N/A
8371492	12/2012	Aranyi et al.	N/A	N/A
8371493	12/2012	Aranyi et al.	N/A	N/A
8371494	12/2012	Racenet et al.	N/A	N/A
8372094	12/2012	Bettuchi et al.	N/A	N/A
8374723	12/2012	Zhao et al.	N/A	N/A
8376865	12/2012	Forster et al.	N/A	N/A
8377029	12/2012	Nagao et al.	N/A	N/A
8377044	12/2012	Coe et al.	N/A	N/A
8377059	12/2012	Deville et al.	N/A	N/A
8381828	12/2012	Whitman et al.	N/A	N/A
8381834	12/2012	Barhitte et al.	N/A	N/A
8382773	12/2012	Whitfield et al.	N/A	N/A
8382790	12/2012	Uenohara et al.	N/A	N/A
D677273	12/2012	Randall et al.	N/A	N/A
8387848	12/2012	Johnson et al.	N/A	N/A
8388633	12/2012	Rousseau et al.	N/A	N/A
8389588	12/2012	Ringeisen et al.	N/A	N/A
8393513	12/2012	Jankowski	N/A	N/A
8393514	12/2012	Shelton, IV et al.	N/A	N/A
8393516	12/2012	Kostrzewski	N/A	N/A
8397832	12/2012	Blickle et al.	N/A	N/A
8397971	12/2012	Yates et al.	N/A	N/A
8397972	12/2012	Kostrzewski	N/A	N/A
8397973	12/2012	Hausen	N/A	N/A
8398633	12/2012	Mueller	N/A	N/A
8398669	12/2012	Kim	N/A	N/A
8398673	12/2012	Hinchliffe et al.	N/A	N/A
8398674	12/2012	Prestel	N/A	N/A
8400108	12/2012	Powell et al.	N/A	N/A
8400851	12/2012	Byun	N/A	N/A
8403138	12/2012	Weisshaupt et al.	N/A	N/A
8403195	12/2012	Beardsley et al.	N/A	N/A
8403196	12/2012	Beardsley et al.	N/A	N/A
8403198	12/2012	Sorrentino et al.	N/A	N/A
8403832	12/2012	Cunningham et al.	N/A	N/A
8403926	12/2012	Nobis et al.	N/A	N/A
8403945	12/2012	Whitfield et al.	N/A	N/A
8403946	12/2012	Whitfield et al.	N/A	N/A
8403950	12/2012	Palmer et al.	N/A	N/A
D680646	12/2012	Hunt et al.	N/A	N/A

8408439	12/2012	Huang et al.	N/A	N/A
8408442	12/2012	Racenet et al.	N/A	N/A
8409079	12/2012	Okamoto et al.	N/A	N/A
8409174	12/2012	Omori	N/A	N/A
8409175	12/2012	Lee et al.	N/A	N/A
8409211	12/2012	Baroud	N/A	N/A
8409222	12/2012	Whitfield et al.	N/A	N/A
8409223	12/2012	Sorrentino et al.	N/A	N/A
8409234	12/2012	Stahler et al.	N/A	N/A
8411500	12/2012	Gapihan et al.	N/A	N/A
8413661	12/2012	Rousseau et al.	N/A	N/A
8413870	12/2012	Pastorelli et al.	N/A	N/A
8413871	12/2012	Racenet et al.	N/A	N/A
8413872	12/2012	Patel	N/A	N/A
8414469	12/2012	Diolaiti	N/A	N/A
8414577	12/2012	Boudreaux et al.	N/A	N/A
8414598	12/2012	Brock et al.	N/A	N/A
8418073	12/2012	Mohr et al.	N/A	N/A
8418906	12/2012	Farascioni et al.	N/A	N/A
8418907	12/2012	Johnson et al.	N/A	N/A
8418908	12/2012	Beardsley	N/A	N/A
8418909	12/2012	Kostrzewski	N/A	N/A
8419635	12/2012	Shelton, IV et al.	N/A	N/A
8419717	12/2012	Diolaiti et al.	N/A	N/A
8419747	12/2012	Hinman et al.	N/A	N/A
8419754	12/2012	Laby et al.	N/A	N/A
8419755	12/2012	Deem et al.	N/A	N/A
8423182	12/2012	Robinson et al.	N/A	N/A
8424737	12/2012	Scirica	N/A	N/A
8424739	12/2012	Racenet et al.	N/A	N/A
8424740	12/2012	Shelton, IV et al.	N/A	N/A
8424741	12/2012	McGuckin, Jr. et al.	N/A	N/A
8425600	12/2012	Maxwell	N/A	N/A
8427430	12/2012	Lee et al.	N/A	N/A
8430292	12/2012	Patel et al.	N/A	N/A
8430892	12/2012	Bindra et al.	N/A	N/A
8430898	12/2012	Wiener et al.	N/A	N/A
8435257	12/2012	Smith et al.	N/A	N/A
8439246	12/2012	Knodel	N/A	N/A
8439830	12/2012	McKinley et al.	N/A	N/A
8444036	12/2012	Shelton, IV	N/A	N/A
8444037	12/2012	Nicholas et al.	N/A	N/A
8444549	12/2012	Viola et al.	N/A	N/A
8449536	12/2012	Selig	N/A	N/A
8449560	12/2012	Roth et al.	N/A	N/A
8453904	12/2012	Eskaros et al.	N/A	N/A
8453906	12/2012	Huang et al.	N/A	N/A
8453907	12/2012	Laurent et al.	N/A	N/A
8453908	12/2012	Bedi et al.	N/A	N/A
8453912	12/2012	Mastri et al.	N/A	N/A

8453914	12/2012	Laurent et al.	N/A	N/A
8454495	12/2012	Kawano et al.	N/A	N/A
8454551	12/2012	Allen et al.	N/A	N/A
8454628	12/2012	Smith et al.	N/A	N/A
8454640	12/2012	Johnston et al.	N/A	N/A
8457757	12/2012	Cauller et al.	N/A	N/A
8459520	12/2012	Giordano et al.	N/A	N/A
8459521	12/2012	Zemlok et al.	N/A	N/A
8459524	12/2012	Pribanic et al.	N/A	N/A
8459525	12/2012	Yates et al.	N/A	N/A
8464922	12/2012	Marczyk	N/A	N/A
8464923	12/2012	Shelton, IV	N/A	N/A
8464924	12/2012	Gresham et al.	N/A	N/A
8464925	12/2012	Hull et al.	N/A	N/A
8465475	12/2012	Isbell, Jr.	N/A	N/A
8465502	12/2012	Zergiebel	N/A	N/A
8465515	12/2012	Drew et al.	N/A	N/A
8469254	12/2012	Czernik et al.	N/A	N/A
8469946	12/2012	Sugita	N/A	N/A
8469973	12/2012	Meade et al.	N/A	N/A
8470355	12/2012	Skalla et al.	N/A	N/A
D686240	12/2012	Lin	N/A	N/A
D686244	12/2012	Moriya et al.	N/A	N/A
8474677	12/2012	Woodard, Jr. et al.	N/A	N/A
8475453	12/2012	Marczyk et al.	N/A	N/A
8475454	12/2012	Alshemari	N/A	N/A
8475474	12/2012	Bombard et al.	N/A	N/A
8479968	12/2012	Hodgkinson et al.	N/A	N/A
8479969	12/2012	Shelton, IV	N/A	N/A
8480703	12/2012	Nicholas et al.	N/A	N/A
8483509	12/2012	Matsuzaka	N/A	N/A
8485412	12/2012	Shelton, IV et al.	N/A	N/A
8485413	12/2012	Scheib et al.	N/A	N/A
8485970	12/2012	Widenhouse et al.	N/A	N/A
8486047	12/2012	Stopek	N/A	N/A
8487199	12/2012	Palmer et al.	N/A	N/A
8487487	12/2012	Dietz et al.	N/A	N/A
8490851	12/2012	Blier et al.	N/A	N/A
8490852	12/2012	Viola	N/A	N/A
8490853	12/2012	Criscuolo et al.	N/A	N/A
8491581	12/2012	Deville et al.	N/A	N/A
8491603	12/2012	Yeung et al.	N/A	N/A
8496153	12/2012	Demmy et al.	N/A	N/A
8496154	12/2012	Marczyk et al.	N/A	N/A
8496156	12/2012	Sniffin et al.	N/A	N/A
8496683	12/2012	Prommersberger et al.	N/A	N/A
8498691	12/2012	Moll et al.	N/A	N/A
8499673	12/2012	Keller	N/A	N/A
8499966	12/2012	Palmer et al.	N/A	N/A

8499992	12/2012	Whitman et al.	N/A	N/A
8499993	12/2012	Shelton, IV et al.	N/A	N/A
8499994	12/2012	D'Arcangelo	N/A	N/A
8500721	12/2012	Jinno	N/A	N/A
8500762	12/2012	Sholev et al.	N/A	N/A
8502091	12/2012	Palmer et al.	N/A	N/A
8505799	12/2012	Viola et al.	N/A	N/A
8505801	12/2012	Ehrenfels et al.	N/A	N/A
8506555	12/2012	Ruiz Morales	N/A	N/A
8506557	12/2012	Zemlok et al.	N/A	N/A
8506580	12/2012	Zergiebel et al.	N/A	N/A
8506581	12/2012	Wingardner, III et al.	N/A	N/A
8511308	12/2012	Hecox et al.	N/A	N/A
8512359	12/2012	Whitman et al.	N/A	N/A
8512402	12/2012	Marczyk et al.	N/A	N/A
8517239	12/2012	Scheib et al.	N/A	N/A
8517241	12/2012	Nicholas et al.	N/A	N/A
8517243	12/2012	Giordano et al.	N/A	N/A
8517244	12/2012	Shelton, IV et al.	N/A	N/A
8517938	12/2012	Eisenhardt et al.	N/A	N/A
8518024	12/2012	Williams et al.	N/A	N/A
8521273	12/2012	Kliman	N/A	N/A
8523042	12/2012	Masiakos et al.	N/A	N/A
8523043	12/2012	Ullrich et al.	N/A	N/A
8523787	12/2012	Ludwin et al.	N/A	N/A
8523881	12/2012	Cabiri et al.	N/A	N/A
8523882	12/2012	Huitema et al.	N/A	N/A
8523900	12/2012	Jinno et al.	N/A	N/A
8529588	12/2012	Ahlberg et al.	N/A	N/A
8529599	12/2012	Holsten	N/A	N/A
8529600	12/2012	Woodard, Jr. et al.	N/A	N/A
8529819	12/2012	Ostapoff et al.	N/A	N/A
8531153	12/2012	Baarman et al.	N/A	N/A
8532747	12/2012	Nock et al.	N/A	N/A
8534527	12/2012	Brendel et al.	N/A	N/A
8534528	12/2012	Shelton, IV	N/A	N/A
8535304	12/2012	Sklar et al.	N/A	N/A
8535340	12/2012	Allen	N/A	N/A
8539866	12/2012	Nayak et al.	N/A	N/A
8540128	12/2012	Shelton, IV et al.	N/A	N/A
8540129	12/2012	Baxter, III et al.	N/A	N/A
8540130	12/2012	Moore et al.	N/A	N/A
8540131	12/2012	Swayze	N/A	N/A
8540133	12/2012	Bedi et al.	N/A	N/A
8540646	12/2012	Mendez-Coll	N/A	N/A
8540733	12/2012	Whitman et al.	N/A	N/A
8540735	12/2012	Mitelberg et al.	N/A	N/A
8550984	12/2012	Takemoto	N/A	N/A
8551076	12/2012	Duval et al.	N/A	N/A
8555660	12/2012	Takenaka et al.	N/A	N/A

8556151	12/2012	Viola	N/A	N/A
8556918	12/2012	Bauman et al.	N/A	N/A
8556935	12/2012	Knodel et al.	N/A	N/A
8560147	12/2012	Taylor et al.	N/A	N/A
8561617	12/2012	Lindh et al.	N/A	N/A
8561870	12/2012	Baxter, III et al.	N/A	N/A
8561871	12/2012	Rajappa et al.	N/A	N/A
8561873	12/2012	Ingmanson et al.	N/A	N/A
8562592	12/2012	Conlon et al.	N/A	N/A
8562598	12/2012	Falkenstein et al.	N/A	N/A
8567656	12/2012	Shelton, IV et al.	N/A	N/A
8568416	12/2012	Schmitz et al.	N/A	N/A
8568425	12/2012	Ross et al.	N/A	N/A
D692916	12/2012	Granchi et al.	N/A	N/A
8573459	12/2012	Smith et al.	N/A	N/A
8573461	12/2012	Shelton, IV et al.	N/A	N/A
8573462	12/2012	Smith et al.	N/A	N/A
8573465	12/2012	Shelton, IV	N/A	N/A
8574199	12/2012	von Bulow et al.	N/A	N/A
8574263	12/2012	Mueller	N/A	N/A
8575880	12/2012	Grantz	N/A	N/A
8575895	12/2012	Garrastacho et al.	N/A	N/A
8579176	12/2012	Smith et al.	N/A	N/A
8579178	12/2012	Holsten et al.	N/A	N/A
8579897	12/2012	Vakharia et al.	N/A	N/A
8579937	12/2012	Gresham	N/A	N/A
8584919	12/2012	Hueil et al.	N/A	N/A
8584920	12/2012	Hodgkinson	N/A	N/A
8584921	12/2012	Scirica	N/A	N/A
8585583	12/2012	Sakaguchi et al.	N/A	N/A
8585598	12/2012	Razzaque et al.	N/A	N/A
8585721	12/2012	Kirsch	N/A	N/A
8590760	12/2012	Cummins et al.	N/A	N/A
8590762	12/2012	Hess et al.	N/A	N/A
8590764	12/2012	Hartwick et al.	N/A	N/A
8591400	12/2012	Sugiyama	N/A	N/A
8596515	12/2012	Okoniewski	N/A	N/A
8597745	12/2012	Farnsworth et al.	N/A	N/A
8599450	12/2012	Kubo et al.	N/A	N/A
8602125	12/2012	King	N/A	N/A
8602287	12/2012	Yates et al.	N/A	N/A
8602288	12/2012	Shelton, IV et al.	N/A	N/A
8603077	12/2012	Cooper et al.	N/A	N/A
8603089	12/2012	Viola	N/A	N/A
8603110	12/2012	Maruyama et al.	N/A	N/A
8603135	12/2012	Mueller	N/A	N/A
8608043	12/2012	Scirica	N/A	N/A
8608044	12/2012	Hueil et al.	N/A	N/A
8608045	12/2012	Smith et al.	N/A	N/A
8608046	12/2012	Laurent et al.	N/A	N/A

8608745	12/2012	Guzman et al.	N/A	N/A
8613383	12/2012	Beckman et al.	N/A	N/A
8613384	12/2012	Pastorelli et al.	N/A	N/A
8616427	12/2012	Viola	N/A	N/A
8616431	12/2012	Timm et al.	N/A	N/A
8617155	12/2012	Johnson et al.	N/A	N/A
8620473	12/2012	Diolaiti et al.	N/A	N/A
8622274	12/2013	Yates et al.	N/A	N/A
8622275	12/2013	Baxter, III et al.	N/A	N/A
8627993	12/2013	Smith et al.	N/A	N/A
8627994	12/2013	Zemlok et al.	N/A	N/A
8627995	12/2013	Smith et al.	N/A	N/A
8628467	12/2013	Whitman et al.	N/A	N/A
8628518	12/2013	Blumenkranz et al.	N/A	N/A
8628544	12/2013	Farascioni	N/A	N/A
8628545	12/2013	Cabrera et al.	N/A	N/A
8631987	12/2013	Shelton, IV et al.	N/A	N/A
8631992	12/2013	Hausen et al.	N/A	N/A
8631993	12/2013	Kostrzewski	N/A	N/A
8632462	12/2013	Yoo et al.	N/A	N/A
8632525	12/2013	Kerr et al.	N/A	N/A
8632535	12/2013	Shelton, IV et al.	N/A	N/A
8632539	12/2013	Twomey et al.	N/A	N/A
8632563	12/2013	Nagase et al.	N/A	N/A
8636187	12/2013	Hueil et al.	N/A	N/A
8636190	12/2013	Zemlok et al.	N/A	N/A
8636191	12/2013	Meagher	N/A	N/A
8636193	12/2013	Whitman et al.	N/A	N/A
8636736	12/2013	Yates et al.	N/A	N/A
8636766	12/2013	Milliman et al.	N/A	N/A
8639936	12/2013	Hu et al.	N/A	N/A
8640788	12/2013	Dachs, II et al.	N/A	N/A
8646674	12/2013	Schulte et al.	N/A	N/A
8647258	12/2013	Aranyi et al.	N/A	N/A
8652120	12/2013	Giordano et al.	N/A	N/A
8652151	12/2013	Lehman et al.	N/A	N/A
8652155	12/2013	Houser et al.	N/A	N/A
8656929	12/2013	Miller et al.	N/A	N/A
8657174	12/2013	Yates et al.	N/A	N/A
8657175	12/2013	Sonnenschein et al.	N/A	N/A
8657176	12/2013	Shelton, IV et al.	N/A	N/A
8657177	12/2013	Scirica et al.	N/A	N/A
8657178	12/2013	Hueil et al.	N/A	N/A
8657482	12/2013	Malackowski et al.	N/A	N/A
8657808	12/2013	McPherson et al.	N/A	N/A
8657814	12/2013	Werneth et al.	N/A	N/A
8657821	12/2013	Palermo	N/A	N/A
D701238	12/2013	Lai et al.	N/A	N/A
8662370	12/2013	Takei	N/A	N/A
8663106	12/2013	Stivoric et al.	N/A	N/A

8663192	12/2013	Hester et al.	N/A	N/A
8663245	12/2013	Francischelli et al.	N/A	N/A
8663262	12/2013	Smith et al.	N/A	N/A
8663270	12/2013	Donnigan et al.	N/A	N/A
8664792	12/2013	Rebsdorf	N/A	N/A
8668129	12/2013	Olson	N/A	N/A
8668130	12/2013	Hess et al.	N/A	N/A
8672206	12/2013	Aranyi et al.	N/A	N/A
8672207	12/2013	Shelton, IV et al.	N/A	N/A
8672208	12/2013	Hess et al.	N/A	N/A
8672209	12/2013	Crainich	N/A	N/A
8672922	12/2013	Loh et al.	N/A	N/A
8672935	12/2013	Okada et al.	N/A	N/A
8672951	12/2013	Smith et al.	N/A	N/A
8673210	12/2013	Deshays	N/A	N/A
8675820	12/2013	Baic et al.	N/A	N/A
8678263	12/2013	Viola	N/A	N/A
8678994	12/2013	Sonnenschein et al.	N/A	N/A
8679093	12/2013	Farra	N/A	N/A
8679098	12/2013	Hart	N/A	N/A
8679137	12/2013	Bauman et al.	N/A	N/A
8679154	12/2013	Smith et al.	N/A	N/A
8679156	12/2013	Smith et al.	N/A	N/A
8679454	12/2013	Guire et al.	N/A	N/A
8684248	12/2013	Milliman	N/A	N/A
8684249	12/2013	Racenet et al.	N/A	N/A
8684250	12/2013	Bettuchi et al.	N/A	N/A
8684253	12/2013	Giordano et al.	N/A	N/A
8684962	12/2013	Kirschenman et al.	N/A	N/A
8685004	12/2013	Zemlock et al.	N/A	N/A
8685020	12/2013	Weizman et al.	N/A	N/A
8690893	12/2013	Deitch et al.	N/A	N/A
8695866	12/2013	Leimbach et al.	N/A	N/A
8696665	12/2013	Hunt et al.	N/A	N/A
8701958	12/2013	Shelton, IV et al.	N/A	N/A
8701959	12/2013	Shah	N/A	N/A
8706316	12/2013	Hoevenaar	N/A	N/A
8708210	12/2013	Zemlok et al.	N/A	N/A
8708211	12/2013	Zemlok et al.	N/A	N/A
8708212	12/2013	Williams	N/A	N/A
8708213	12/2013	Shelton, IV et al.	N/A	N/A
8709012	12/2013	Muller	N/A	N/A
8714352	12/2013	Farascioni et al.	N/A	N/A
8714429	12/2013	Demmy	N/A	N/A
8714430	12/2013	Natarajan et al.	N/A	N/A
8715256	12/2013	Greener	N/A	N/A
8715302	12/2013	Ibrahim et al.	N/A	N/A
8720766	12/2013	Hess et al.	N/A	N/A
8721630	12/2013	Ortiz et al.	N/A	N/A
8721666	12/2013	Schroeder et al.	N/A	N/A

8727197	12/2013	Hess et al.	N/A	N/A
8727199	12/2013	Wenchell	N/A	N/A
8727200	12/2013	Roy	N/A	N/A
8727961	12/2013	Ziv	N/A	N/A
8728099	12/2013	Cohn et al.	N/A	N/A
8728119	12/2013	Cummins	N/A	N/A
8733470	12/2013	Matthias et al.	N/A	N/A
8733611	12/2013	Milliman	N/A	N/A
8733612	12/2013	Ma	N/A	N/A
8733613	12/2013	Huitema et al.	N/A	N/A
8733614	12/2013	Ross et al.	N/A	N/A
8734336	12/2013	Bonadio et al.	N/A	N/A
8734359	12/2013	Ibanez et al.	N/A	N/A
8734478	12/2013	Widenhouse et al.	N/A	N/A
8734831	12/2013	Kim et al.	N/A	N/A
8739033	12/2013	Rosenberg	N/A	N/A
8739417	12/2013	Tokunaga et al.	N/A	N/A
8740034	12/2013	Morgan et al.	N/A	N/A
8740037	12/2013	Shelton, IV et al.	N/A	N/A
8740038	12/2013	Shelton, IV et al.	N/A	N/A
8740987	12/2013	Geremakis et al.	N/A	N/A
8746529	12/2013	Shelton, IV et al.	N/A	N/A
8746530	12/2013	Giordano et al.	N/A	N/A
8746533	12/2013	Whitman et al.	N/A	N/A
8746535	12/2013	Shelton, IV et al.	N/A	N/A
8747238	12/2013	Shelton, IV et al.	N/A	N/A
8747441	12/2013	Konieczynski et al.	N/A	N/A
8752264	12/2013	Ackley et al.	N/A	N/A
8752699	12/2013	Morgan et al.	N/A	N/A
8752747	12/2013	Shelton, IV et al.	N/A	N/A
8752748	12/2013	Whitman et al.	N/A	N/A
8752749	12/2013	Moore et al.	N/A	N/A
8753664	12/2013	Dao et al.	N/A	N/A
8757287	12/2013	Mak et al.	N/A	N/A
8757465	12/2013	Woodard, Jr. et al.	N/A	N/A
8758235	12/2013	Jaworek	N/A	N/A
8758366	12/2013	McLean et al.	N/A	N/A
8758391	12/2013	Swayze et al.	N/A	N/A
8758438	12/2013	Boyce et al.	N/A	N/A
8763875	12/2013	Morgan et al.	N/A	N/A
8763876	12/2013	Kostrzewski	N/A	N/A
8763877	12/2013	Schall et al.	N/A	N/A
8763879	12/2013	Shelton, IV et al.	N/A	N/A
8764732	12/2013	Hartwell	N/A	N/A
8765942	12/2013	Feraud et al.	N/A	N/A
8770458	12/2013	Scirica	N/A	N/A
8770459	12/2013	Racenet et al.	N/A	N/A
8770460	12/2013	Belzer	N/A	N/A
8771169	12/2013	Whitman et al.	N/A	N/A
8771260	12/2013	Conlon et al.	N/A	N/A

8777004	12/2013	Shelton, IV et al.	N/A	N/A
8777082	12/2013	Scirica	N/A	N/A
8777083	12/2013	Racenet et al.	N/A	N/A
8777898	12/2013	Suon et al.	N/A	N/A
8783541	12/2013	Shelton, IV et al.	N/A	N/A
8783542	12/2013	Riestenberg et al.	N/A	N/A
8783543	12/2013	Shelton, IV et al.	N/A	N/A
8784304	12/2013	Mikkaichi et al.	N/A	N/A
8784404	12/2013	Doyle et al.	N/A	N/A
8784415	12/2013	Malackowski et al.	N/A	N/A
8789737	12/2013	Hodgkinson et al.	N/A	N/A
8789739	12/2013	Swensgard	N/A	N/A
8789740	12/2013	Baxter, III et al.	N/A	N/A
8789741	12/2013	Baxter, III et al.	N/A	N/A
8790658	12/2013	Cigarini et al.	N/A	N/A
8790684	12/2013	Dave et al.	N/A	N/A
D711905	12/2013	Morrison et al.	N/A	N/A
8794496	12/2013	Scirica	N/A	N/A
8794497	12/2013	Zingman	N/A	N/A
8795159	12/2013	Moriyama	N/A	N/A
8795276	12/2013	Dietz et al.	N/A	N/A
8795308	12/2013	Valin	N/A	N/A
8795324	12/2013	Kawai et al.	N/A	N/A
8796995	12/2013	Cunanan et al.	N/A	N/A
8800681	12/2013	Rousson et al.	N/A	N/A
8800837	12/2013	Zemlok	N/A	N/A
8800838	12/2013	Shelton, IV	N/A	N/A
8800839	12/2013	Beetel	N/A	N/A
8800840	12/2013	Jankowski	N/A	N/A
8800841	12/2013	Ellerhorst et al.	N/A	N/A
8801710	12/2013	Ullrich et al.	N/A	N/A
8801734	12/2013	Shelton, IV et al.	N/A	N/A
8801735	12/2013	Shelton, IV et al.	N/A	N/A
8801752	12/2013	Fortier et al.	N/A	N/A
8801801	12/2013	Datta et al.	N/A	N/A
8806973	12/2013	Ross et al.	N/A	N/A
8807414	12/2013	Ross et al.	N/A	N/A
8808161	12/2013	Gregg et al.	N/A	N/A
8808164	12/2013	Hoffman et al.	N/A	N/A
8808274	12/2013	Hartwell	N/A	N/A
8808294	12/2013	Fox et al.	N/A	N/A
8808308	12/2013	Boukhny et al.	N/A	N/A
8808311	12/2013	Heinrich et al.	N/A	N/A
8808325	12/2013	Hess et al.	N/A	N/A
8810197	12/2013	Juergens	N/A	N/A
8811017	12/2013	Fujii et al.	N/A	N/A
8813866	12/2013	Suzuki	N/A	N/A
8814024	12/2013	Woodard, Jr. et al.	N/A	N/A
8814025	12/2013	Miller et al.	N/A	N/A
8814836	12/2013	Ignon et al.	N/A	N/A

8815594	12/2013	Harris et al.	N/A	N/A
8818523	12/2013	Olson et al.	N/A	N/A
8820603	12/2013	Shelton, IV et al.	N/A	N/A
8820605	12/2013	Shelton, IV	N/A	N/A
8820606	12/2013	Hodgkinson	N/A	N/A
8820607	12/2013	Marczyk	N/A	N/A
8820608	12/2013	Miyamoto	N/A	N/A
8821514	12/2013	Aranyi	N/A	N/A
8822934	12/2013	Sayeh et al.	N/A	N/A
8825164	12/2013	Tweden et al.	N/A	N/A
8827133	12/2013	Shelton, IV et al.	N/A	N/A
8827134	12/2013	Viola et al.	N/A	N/A
8827903	12/2013	Shelton, IV et al.	N/A	N/A
8828046	12/2013	Stefanchik et al.	N/A	N/A
8831779	12/2013	Ortmaier et al.	N/A	N/A
8833219	12/2013	Pierce	N/A	N/A
8833630	12/2013	Milliman	N/A	N/A
8833632	12/2013	Swensgard	N/A	N/A
8834353	12/2013	Dejima et al.	N/A	N/A
8834465	12/2013	Ramstein et al.	N/A	N/A
8834498	12/2013	Byrum et al.	N/A	N/A
8834518	12/2013	Faller et al.	N/A	N/A
8840003	12/2013	Morgan et al.	N/A	N/A
8840004	12/2013	Holsten et al.	N/A	N/A
8840603	12/2013	Shelton, IV et al.	N/A	N/A
8840609	12/2013	Stuebe	N/A	N/A
8840876	12/2013	Eemeta et al.	N/A	N/A
8844789	12/2013	Shelton, IV et al.	N/A	N/A
8844790	12/2013	Demmy et al.	N/A	N/A
8845622	12/2013	Paik et al.	N/A	N/A
8851215	12/2013	Goto	N/A	N/A
8851354	12/2013	Swensgard et al.	N/A	N/A
8851355	12/2013	Aranyi et al.	N/A	N/A
8852174	12/2013	Burbank	N/A	N/A
8852185	12/2013	Twomey	N/A	N/A
8852199	12/2013	Deslauriers et al.	N/A	N/A
8852218	12/2013	Hughett, Sr. et al.	N/A	N/A
8855822	12/2013	Bartol et al.	N/A	N/A
8857693	12/2013	Schuckmann et al.	N/A	N/A
8857694	12/2013	Shelton, IV et al.	N/A	N/A
8858538	12/2013	Belson et al.	N/A	N/A
8858547	12/2013	Brogna	N/A	N/A
8858571	12/2013	Shelton, IV et al.	N/A	N/A
8858590	12/2013	Shelton, IV et al.	N/A	N/A
8864007	12/2013	Widenhouse et al.	N/A	N/A
8864009	12/2013	Shelton, IV et al.	N/A	N/A
8864010	12/2013	Williams	N/A	N/A
8864750	12/2013	Ross et al.	N/A	N/A
8869912	12/2013	Roβkamp et al.	N/A	N/A
8869913	12/2013	Matthias et al.	N/A	N/A

8870049	12/2013	Amid et al.	N/A	N/A
8870050	12/2013	Hodgkinson	N/A	N/A
8870867	12/2013	Walberg et al.	N/A	N/A
8870912	12/2013	Brisson et al.	N/A	N/A
8871829	12/2013	Gerold et al.	N/A	N/A
8875971	12/2013	Hall et al.	N/A	N/A
8875972	12/2013	Weisenburgh, II et al.	N/A	N/A
8876698	12/2013	Sakamoto et al.	N/A	N/A
8876857	12/2013	Burbank	N/A	N/A
8876858	12/2013	Braun	N/A	N/A
8882660	12/2013	Phee et al.	N/A	N/A
8882792	12/2013	Dietz et al.	N/A	N/A
8884560	12/2013	Ito	N/A	N/A
8887979	12/2013	Mastri et al.	N/A	N/A
8888688	12/2013	Julian et al.	N/A	N/A
8888695	12/2013	Piskun et al.	N/A	N/A
8888792	12/2013	Harris et al.	N/A	N/A
8888809	12/2013	Davison et al.	N/A	N/A
8893946	12/2013	Boudreaux et al.	N/A	N/A
8893949	12/2013	Shelton, IV et al.	N/A	N/A
8894647	12/2013	Beardsley et al.	N/A	N/A
8894654	12/2013	Anderson	N/A	N/A
8899460	12/2013	Wojcicki	N/A	N/A
8899461	12/2013	Farascioni	N/A	N/A
8899462	12/2013	Kostrzewski et al.	N/A	N/A
8899463	12/2013	Schall et al.	N/A	N/A
8899464	12/2013	Hueil et al.	N/A	N/A
8899465	12/2013	Shelton, IV et al.	N/A	N/A
8899466	12/2013	Baxter, III et al.	N/A	N/A
8900267	12/2013	Woolfson et al.	N/A	N/A
8905287	12/2013	Racenet et al.	N/A	N/A
8905977	12/2013	Shelton et al.	N/A	N/A
8910846	12/2013	Viola	N/A	N/A
8910847	12/2013	Nalagatla et al.	N/A	N/A
8911426	12/2013	Coppeta et al.	N/A	N/A
8911448	12/2013	Stein	N/A	N/A
8911460	12/2013	Neurohr et al.	N/A	N/A
8911471	12/2013	Spivey et al.	N/A	N/A
8912746	12/2013	Reid et al.	N/A	N/A
8915842	12/2013	Weisenburgh, II et al.	N/A	N/A
8920368	12/2013	Sandhu et al.	N/A	N/A
8920433	12/2013	Barrier et al.	N/A	N/A
8920435	12/2013	Smith et al.	N/A	N/A
8920438	12/2013	Aranyi et al.	N/A	N/A
8920443	12/2013	Hiles et al.	N/A	N/A
8920444	12/2013	Hiles et al.	N/A	N/A
8922163	12/2013	Macdonald	N/A	N/A
8925782	12/2014	Shelton, IV	N/A	N/A
8925783	12/2014	Zemlok et al.	N/A	N/A
8925788	12/2014	Hess et al.	N/A	N/A

8926506	12/2014	Widenhouse et al.	N/A	N/A
8926598	12/2014	Mollere et al.	N/A	N/A
8931576	12/2014	Iwata	N/A	N/A
8931679	12/2014	Kostrzewski	N/A	N/A
8931680	12/2014	Milliman	N/A	N/A
8931682	12/2014	Timm et al.	N/A	N/A
8931692	12/2014	Sancak	N/A	N/A
8936614	12/2014	Allen, IV	N/A	N/A
8937408	12/2014	Ganem et al.	N/A	N/A
8939343	12/2014	Milliman et al.	N/A	N/A
8939344	12/2014	Olson et al.	N/A	N/A
8939898	12/2014	Omoto	N/A	N/A
8944069	12/2014	Miller et al.	N/A	N/A
8945095	12/2014	Blumenkranz et al.	N/A	N/A
8945098	12/2014	Seibold et al.	N/A	N/A
8945163	12/2014	Voegele et al.	N/A	N/A
8955732	12/2014	Zemlok et al.	N/A	N/A
8956342	12/2014	Russo et al.	N/A	N/A
8956390	12/2014	Shah et al.	N/A	N/A
8958860	12/2014	Banerjee et al.	N/A	N/A
8960519	12/2014	Whitman et al.	N/A	N/A
8960520	12/2014	McCuen	N/A	N/A
8960521	12/2014	Kostrzewski	N/A	N/A
8961191	12/2014	Hanshew	N/A	N/A
8961504	12/2014	Hoarau et al.	N/A	N/A
8961542	12/2014	Whitfield et al.	N/A	N/A
8963714	12/2014	Medhal et al.	N/A	N/A
D725674	12/2014	Jung et al.	N/A	N/A
8967443	12/2014	McCuen	N/A	N/A
8967444	12/2014	Beetel	N/A	N/A
8967446	12/2014	Beardsley et al.	N/A	N/A
8967448	12/2014	Carter et al.	N/A	N/A
8968276	12/2014	Zemlok et al.	N/A	N/A
8968308	12/2014	Horner et al.	N/A	N/A
8968312	12/2014	Marczyk et al.	N/A	N/A
8968337	12/2014	Whitfield et al.	N/A	N/A
8968340	12/2014	Chowaniec et al.	N/A	N/A
8968355	12/2014	Malkowski et al.	N/A	N/A
8968358	12/2014	Reschke	N/A	N/A
8970507	12/2014	Holbein et al.	N/A	N/A
8973803	12/2014	Hall et al.	N/A	N/A
8973804	12/2014	Hess et al.	N/A	N/A
8973805	12/2014	Scirica et al.	N/A	N/A
8974440	12/2014	Farritor et al.	N/A	N/A
8974542	12/2014	Fujimoto et al.	N/A	N/A
8974932	12/2014	McGahan et al.	N/A	N/A
8978954	12/2014	Shelton, IV et al.	N/A	N/A
8978955	12/2014	Aronhalt et al.	N/A	N/A
8978956	12/2014	Schall et al.	N/A	N/A
8979843	12/2014	Timm et al.	N/A	N/A

8979890	12/2014	Boudreaux	N/A	N/A
8982195	12/2014	Claus et al.	N/A	N/A
8984711	12/2014	Ota et al.	N/A	N/A
8985240	12/2014	Winnard	N/A	N/A
8985429	12/2014	Balek et al.	N/A	N/A
8986302	12/2014	Aldridge et al.	N/A	N/A
8989903	12/2014	Weir et al.	N/A	N/A
8991676	12/2014	Hess et al.	N/A	N/A
8991677	12/2014	Moore et al.	N/A	N/A
8991678	12/2014	Wellman et al.	N/A	N/A
8992042	12/2014	Eichenholz	N/A	N/A
8992422	12/2014	Spivey et al.	N/A	N/A
8992565	12/2014	Brisson et al.	N/A	N/A
8996165	12/2014	Wang et al.	N/A	N/A
8998058	12/2014	Moore et al.	N/A	N/A
8998059	12/2014	Smith et al.	N/A	N/A
8998060	12/2014	Bruewer et al.	N/A	N/A
8998061	12/2014	Williams et al.	N/A	N/A
8998939	12/2014	Price et al.	N/A	N/A
9000720	12/2014	Stulen et al.	N/A	N/A
9002518	12/2014	Manzo et al.	N/A	N/A
9004339	12/2014	Park	N/A	N/A
9004799	12/2014	Tibbits	N/A	N/A
9005230	12/2014	Yates et al.	N/A	N/A
9005238	12/2014	DeSantis et al.	N/A	N/A
9005243	12/2014	Stopek et al.	N/A	N/A
9010606	12/2014	Aranyi et al.	N/A	N/A
9010608	12/2014	Casasanta, Jr. et al.	N/A	N/A
9010611	12/2014	Ross et al.	N/A	N/A
9011437	12/2014	Woodruff et al.	N/A	N/A
9011439	12/2014	Shalaby et al.	N/A	N/A
9011471	12/2014	Timm et al.	N/A	N/A
9014856	12/2014	Manzo et al.	N/A	N/A
9016539	12/2014	Kostrzewski et al.	N/A	N/A
9016540	12/2014	Whitman et al.	N/A	N/A
9016541	12/2014	Viola et al.	N/A	N/A
9016542	12/2014	Shelton, IV et al.	N/A	N/A
9016545	12/2014	Aranyi et al.	N/A	N/A
9017331	12/2014	Fox	N/A	N/A
9017355	12/2014	Smith et al.	N/A	N/A
9017369	12/2014	Renger et al.	N/A	N/A
9017371	12/2014	Whitman et al.	N/A	N/A
9017849	12/2014	Stulen et al.	N/A	N/A
9017851	12/2014	Felder et al.	N/A	N/A
D729274	12/2014	Clement et al.	N/A	N/A
9021684	12/2014	Lenker et al.	N/A	N/A
9023014	12/2014	Chowaniec et al.	N/A	N/A
9023069	12/2014	Kasvikis et al.	N/A	N/A
9023071	12/2014	Miller et al.	N/A	N/A
9026347	12/2014	Gadh et al.	N/A	N/A

9027817	12/2014	Milliman et al.	N/A	N/A
9028468	12/2014	Scarfogliero et al.	N/A	N/A
9028494	12/2014	Shelton, IV et al.	N/A	N/A
9028495	12/2014	Mueller et al.	N/A	N/A
9028510	12/2014	Miyamoto et al.	N/A	N/A
9028511	12/2014	Weller et al.	N/A	N/A
9028519	12/2014	Yates et al.	N/A	N/A
9028529	12/2014	Fox et al.	N/A	N/A
9030166	12/2014	Kano	N/A	N/A
9030169	12/2014	Christensen et al.	N/A	N/A
9033203	12/2014	Woodard, Jr. et al.	N/A	N/A
9033204	12/2014	Shelton, IV et al.	N/A	N/A
9034505	12/2014	Detry et al.	N/A	N/A
9038881	12/2014	Schaller et al.	N/A	N/A
9039690	12/2014	Kersten et al.	N/A	N/A
9039694	12/2014	Ross et al.	N/A	N/A
9039720	12/2014	Madan	N/A	N/A
9039736	12/2014	Scirica et al.	N/A	N/A
9040062	12/2014	Maeda et al.	N/A	N/A
9043027	12/2014	Durant et al.	N/A	N/A
9044227	12/2014	Shelton, IV et al.	N/A	N/A
9044228	12/2014	Woodard, Jr. et al.	N/A	N/A
9044229	12/2014	Scheib et al.	N/A	N/A
9044230	12/2014	Morgan et al.	N/A	N/A
9044238	12/2014	Orszulak	N/A	N/A
9044241	12/2014	Barner et al.	N/A	N/A
9044261	12/2014	Houser	N/A	N/A
9044281	12/2014	Pool et al.	N/A	N/A
9050083	12/2014	Yates et al.	N/A	N/A
9050084	12/2014	Schmid et al.	N/A	N/A
9050089	12/2014	Orszulak	N/A	N/A
9050100	12/2014	Yates et al.	N/A	N/A
9050120	12/2014	Swarup et al.	N/A	N/A
9050123	12/2014	Krause et al.	N/A	N/A
9050176	12/2014	Datta et al.	N/A	N/A
9050192	12/2014	Mansmann	N/A	N/A
9055941	12/2014	Schmid et al.	N/A	N/A
9055942	12/2014	Balbierz et al.	N/A	N/A
9055943	12/2014	Zemlok et al.	N/A	N/A
9055944	12/2014	Hodgkinson et al.	N/A	N/A
9055961	12/2014	Manzo et al.	N/A	N/A
9060770	12/2014	Shelton, IV et al.	N/A	N/A
9060776	12/2014	Yates et al.	N/A	N/A
9060794	12/2014	Kang et al.	N/A	N/A
9060894	12/2014	Wubbeling	N/A	N/A
9061392	12/2014	Forgues et al.	N/A	N/A
9070068	12/2014	Coveley et al.	N/A	N/A
9072515	12/2014	Hall et al.	N/A	N/A
9072523	12/2014	Houser et al.	N/A	N/A
9072535	12/2014	Shelton, IV et al.	N/A	N/A

9072536	12/2014	Shelton, IV et al.	N/A	N/A
9078653	12/2014	Leimbach et al.	N/A	N/A
9078654	12/2014	Whitman et al.	N/A	N/A
9084586	12/2014	Hafner et al.	N/A	N/A
9084601	12/2014	Moore et al.	N/A	N/A
9084602	12/2014	Gleiman	N/A	N/A
9086875	12/2014	Harrat et al.	N/A	N/A
9089326	12/2014	Krumanaker et al.	N/A	N/A
9089330	12/2014	Widenhouse et al.	N/A	N/A
9089338	12/2014	Smith et al.	N/A	N/A
9089352	12/2014	Jeong	N/A	N/A
9089360	12/2014	Messerly et al.	N/A	N/A
9091588	12/2014	Lefler	N/A	N/A
D736792	12/2014	Brinda et al.	N/A	N/A
9095339	12/2014	Moore et al.	N/A	N/A
9095346	12/2014	Houser et al.	N/A	N/A
9095362	12/2014	Dachs, II et al.	N/A	N/A
9095367	12/2014	Olson et al.	N/A	N/A
9095642	12/2014	Harder et al.	N/A	N/A
9096033	12/2014	Holop et al.	N/A	N/A
9098153	12/2014	Shen et al.	N/A	N/A
9099863	12/2014	Smith et al.	N/A	N/A
9099877	12/2014	Banos et al.	N/A	N/A
9099922	12/2014	Toosky et al.	N/A	N/A
9101358	12/2014	Kerr et al.	N/A	N/A
9101359	12/2014	Smith et al.	N/A	N/A
9101385	12/2014	Shelton, IV et al.	N/A	N/A
9101475	12/2014	Wei et al.	N/A	N/A
9101621	12/2014	Zeldis	N/A	N/A
9107663	12/2014	Swensgard	N/A	N/A
9107667	12/2014	Hodgkinson	N/A	N/A
9107690	12/2014	Bales, Jr. et al.	N/A	N/A
9110587	12/2014	Kim et al.	N/A	N/A
9113862	12/2014	Morgan et al.	N/A	N/A
9113864	12/2014	Morgan et al.	N/A	N/A
9113865	12/2014	Shelton, IV et al.	N/A	N/A
9113868	12/2014	Felder et al.	N/A	N/A
9113873	12/2014	Marczyk et al.	N/A	N/A
9113874	12/2014	Shelton, IV et al.	N/A	N/A
9113875	12/2014	Viola et al.	N/A	N/A
9113876	12/2014	Zemlok et al.	N/A	N/A
9113879	12/2014	Felder et al.	N/A	N/A
9113880	12/2014	Zemlok et al.	N/A	N/A
9113881	12/2014	Scirica	N/A	N/A
9113883	12/2014	Aronhalt et al.	N/A	N/A
9113884	12/2014	Shelton, IV et al.	N/A	N/A
9113887	12/2014	Behnke, II et al.	N/A	N/A
9119615	12/2014	Felder et al.	N/A	N/A
9119657	12/2014	Shelton, IV et al.	N/A	N/A
9119898	12/2014	Bayon et al.	N/A	N/A

9119957	12/2014	Gantz et al.	N/A	N/A
9123286	12/2014	Park	N/A	N/A
9124097	12/2014	Cruz	N/A	N/A
9125651	12/2014	Mandakolathur Vasudevan et al.	N/A	N/A
9125654	12/2014	Aronhalt et al.	N/A	N/A
9125662	12/2014	Shelton, IV	N/A	N/A
9126317	12/2014	Lawton et al.	N/A	N/A
9131835	12/2014	Widenhouse et al.	N/A	N/A
9131940	12/2014	Huitema et al.	N/A	N/A
9131950	12/2014	Matthew	N/A	N/A
9131957	12/2014	Skarbnik et al.	N/A	N/A
9138225	12/2014	Huang et al.	N/A	N/A
9138226	12/2014	Racenet et al.	N/A	N/A
9144455	12/2014	Kennedy et al.	N/A	N/A
D740414	12/2014	Katsura	N/A	N/A
D741882	12/2014	Shmilov et al.	N/A	N/A
9149274	12/2014	Spivey et al.	N/A	N/A
9149324	12/2014	Huang et al.	N/A	N/A
9149325	12/2014	Worrell et al.	N/A	N/A
9153994	12/2014	Wood et al.	N/A	N/A
9154189	12/2014	Von Novak et al.	N/A	N/A
9161753	12/2014	Prior	N/A	N/A
9161769	12/2014	Stoddard et al.	N/A	N/A
9161803	12/2014	Yates et al.	N/A	N/A
9161807	12/2014	Garrison	N/A	N/A
9161855	12/2014	Rousseau et al.	N/A	N/A
9164271	12/2014	Ebata et al.	N/A	N/A
9167960	12/2014	Yamaguchi et al.	N/A	N/A
9168038	12/2014	Shelton, IV et al.	N/A	N/A
9168039	12/2014	Knodel	N/A	N/A
9168042	12/2014	Milliman	N/A	N/A
9168054	12/2014	Turner et al.	N/A	N/A
9168144	12/2014	Rivin et al.	N/A	N/A
9171244	12/2014	Endou et al.	N/A	N/A
9179832	12/2014	Diolaiti	N/A	N/A
9179911	12/2014	Morgan et al.	N/A	N/A
9179912	12/2014	Yates et al.	N/A	N/A
9180223	12/2014	Yu et al.	N/A	N/A
9182244	12/2014	Luke et al.	N/A	N/A
9186046	12/2014	Ramamurthy et al.	N/A	N/A
9186137	12/2014	Farascioni et al.	N/A	N/A
9186140	12/2014	Hiles et al.	N/A	N/A
9186142	12/2014	Fanelli et al.	N/A	N/A
9186143	12/2014	Timm et al.	N/A	N/A
9186148	12/2014	Felder et al.	N/A	N/A
9186221	12/2014	Burbank	N/A	N/A
9192376	12/2014	Almodovar	N/A	N/A
9192380	12/2014	(Tarinelli) Racenet et al.	N/A	N/A

9192384	12/2014	Bettuchi	N/A	N/A
9192430	12/2014	Rachlin et al.	N/A	N/A
9192434	12/2014	Twomey et al.	N/A	N/A
9193045	12/2014	Saur et al.	N/A	N/A
9197079	12/2014	Yip et al.	N/A	N/A
D744528	12/2014	Agrawal	N/A	N/A
D746459	12/2014	Kaercher et al.	N/A	N/A
9198642	12/2014	Storz	N/A	N/A
9198644	12/2014	Balek et al.	N/A	N/A
9198661	12/2014	Swensgard	N/A	N/A
9198662	12/2014	Barton et al.	N/A	N/A
9198683	12/2014	Friedman et al.	N/A	N/A
9204830	12/2014	Zand et al.	N/A	N/A
9204877	12/2014	Whitman et al.	N/A	N/A
9204878	12/2014	Hall et al.	N/A	N/A
9204879	12/2014	Shelton, IV	N/A	N/A
9204880	12/2014	Baxter, III et al.	N/A	N/A
9204881	12/2014	Penna	N/A	N/A
9204923	12/2014	Manzo et al.	N/A	N/A
9204924	12/2014	Marczyk et al.	N/A	N/A
9211120	12/2014	Scheib et al.	N/A	N/A
9211121	12/2014	Hall et al.	N/A	N/A
9211122	12/2014	Hagerty et al.	N/A	N/A
9216013	12/2014	Scirica et al.	N/A	N/A
9216019	12/2014	Schmid et al.	N/A	N/A
9216020	12/2014	Zhang et al.	N/A	N/A
9216030	12/2014	Fan et al.	N/A	N/A
9216062	12/2014	Duque et al.	N/A	N/A
9220500	12/2014	Swayze et al.	N/A	N/A
9220501	12/2014	Baxter, III et al.	N/A	N/A
9220502	12/2014	Zemlok et al.	N/A	N/A
9220504	12/2014	Viola et al.	N/A	N/A
9220508	12/2014	Dannaher	N/A	N/A
9220559	12/2014	Worrell et al.	N/A	N/A
9220570	12/2014	Kim et al.	N/A	N/A
D746854	12/2015	Shardlow et al.	N/A	N/A
9226686	12/2015	Blair	N/A	N/A
9226750	12/2015	Weir et al.	N/A	N/A
9226751	12/2015	Shelton, IV et al.	N/A	N/A
9226754	12/2015	D'Agostino et al.	N/A	N/A
9226760	12/2015	Shelton, IV	N/A	N/A
9226761	12/2015	Burbank	N/A	N/A
9226767	12/2015	Stulen et al.	N/A	N/A
9226799	12/2015	Lightcap et al.	N/A	N/A
9232941	12/2015	Mandakolathur Vasudevan et al.	N/A	N/A
9232945	12/2015	Zingman	N/A	N/A
9232979	12/2015	Parihar et al.	N/A	N/A
9233610	12/2015	Kim et al.	N/A	N/A
9237891	12/2015	Shelton, IV	N/A	N/A

9237892	12/2015	Hodgkinson	N/A	N/A
9237895	12/2015	McCarthy et al.	N/A	N/A
9237900	12/2015	Boudreaux et al.	N/A	N/A
9237921	12/2015	Messerly et al.	N/A	N/A
9239064	12/2015	Helbig et al.	N/A	N/A
9240740	12/2015	Zeng et al.	N/A	N/A
9241711	12/2015	Ivanko	N/A	N/A
9241712	12/2015	Zemlok et al.	N/A	N/A
9241714	12/2015	Timm et al.	N/A	N/A
9241716	12/2015	Whitman	N/A	N/A
9241731	12/2015	Boudreaux et al.	N/A	N/A
9241758	12/2015	Franer et al.	N/A	N/A
9244524	12/2015	Inoue et al.	N/A	N/A
D748668	12/2015	Kim et al.	N/A	N/A
D749128	12/2015	Perez et al.	N/A	N/A
D749623	12/2015	Gray et al.	N/A	N/A
D750122	12/2015	Shardlow et al.	N/A	N/A
D750129	12/2015	Kwon	N/A	N/A
9254131	12/2015	Soltz et al.	N/A	N/A
9254170	12/2015	Parihar et al.	N/A	N/A
9259265	12/2015	Harris et al.	N/A	N/A
9259268	12/2015	Behnke, II et al.	N/A	N/A
9259274	12/2015	Prisco	N/A	N/A
9259275	12/2015	Burbank	N/A	N/A
9261172	12/2015	Solomon et al.	N/A	N/A
9265500	12/2015	Sorrentino et al.	N/A	N/A
9265510	12/2015	Dietzel et al.	N/A	N/A
9265516	12/2015	Casey et al.	N/A	N/A
9265585	12/2015	Wingardner et al.	N/A	N/A
9271718	12/2015	Milad et al.	N/A	N/A
9271727	12/2015	McGuckin, Jr. et al.	N/A	N/A
9271753	12/2015	Butler et al.	N/A	N/A
9271799	12/2015	Shelton, IV et al.	N/A	N/A
9272406	12/2015	Aronhalt et al.	N/A	N/A
9274095	12/2015	Humayun et al.	N/A	N/A
9277919	12/2015	Timmer et al.	N/A	N/A
9277922	12/2015	Carter et al.	N/A	N/A
9277969	12/2015	Brannan et al.	N/A	N/A
9282962	12/2015	Schmid et al.	N/A	N/A
9282963	12/2015	Bryant	N/A	N/A
9282966	12/2015	Shelton, IV et al.	N/A	N/A
9282974	12/2015	Shelton, IV	N/A	N/A
9283028	12/2015	Johnson	N/A	N/A
9283045	12/2015	Rhee et al.	N/A	N/A
9283054	12/2015	Morgan et al.	N/A	N/A
9283334	12/2015	Mantell et al.	N/A	N/A
9289206	12/2015	Hess et al.	N/A	N/A
9289207	12/2015	Shelton, IV	N/A	N/A
9289210	12/2015	Baxter, III et al.	N/A	N/A
9289211	12/2015	Williams et al.	N/A	N/A

9289212	12/2015	Shelton, IV et al.	N/A	N/A
9289225	12/2015	Shelton, IV et al.	N/A	N/A
9289256	12/2015	Shelton, IV et al.	N/A	N/A
9293757	12/2015	Toussaint et al.	N/A	N/A
9295464	12/2015	Shelton, IV et al.	N/A	N/A
9295465	12/2015	Farascioni	N/A	N/A
9295466	12/2015	Hodgkinson et al.	N/A	N/A
9295467	12/2015	Scirica	N/A	N/A
9295468	12/2015	Heinrich et al.	N/A	N/A
9295514	12/2015	Shelton, IV et al.	N/A	N/A
9295522	12/2015	Kostrzewski	N/A	N/A
9295565	12/2015	McLean	N/A	N/A
9295784	12/2015	Eggert et al.	N/A	N/A
D753167	12/2015	Yu et al.	N/A	N/A
9301691	12/2015	Hufnagel et al.	N/A	N/A
9301752	12/2015	Mandakolathur Vasudevan et al.	N/A	N/A
9301753	12/2015	Aldridge et al.	N/A	N/A
9301755	12/2015	Shelton, IV et al.	N/A	N/A
9301759	12/2015	Spivey et al.	N/A	N/A
9301811	12/2015	Goldberg et al.	N/A	N/A
9307965	12/2015	Ming et al.	N/A	N/A
9307986	12/2015	Hall et al.	N/A	N/A
9307987	12/2015	Swensgard et al.	N/A	N/A
9307988	12/2015	Shelton, IV	N/A	N/A
9307989	12/2015	Shelton, IV et al.	N/A	N/A
9307994	12/2015	Gresham et al.	N/A	N/A
9308009	12/2015	Madan et al.	N/A	N/A
9308011	12/2015	Chao et al.	N/A	N/A
9308646	12/2015	Lim et al.	N/A	N/A
9313915	12/2015	Niu et al.	N/A	N/A
9314246	12/2015	Shelton, IV et al.	N/A	N/A
9314247	12/2015	Shelton, IV et al.	N/A	N/A
9314261	12/2015	Bales, Jr. et al.	N/A	N/A
9314291	12/2015	Schall et al.	N/A	N/A
9314339	12/2015	Mansmann	N/A	N/A
9314908	12/2015	Tanimoto et al.	N/A	N/A
9320518	12/2015	Henderson et al.	N/A	N/A
9320520	12/2015	Shelton, IV et al.	N/A	N/A
9320521	12/2015	Shelton, IV et al.	N/A	N/A
9320523	12/2015	Shelton, IV et al.	N/A	N/A
9325516	12/2015	Pera et al.	N/A	N/A
D755196	12/2015	Meyers et al.	N/A	N/A
D756373	12/2015	Raskin et al.	N/A	N/A
D756377	12/2015	Connolly et al.	N/A	N/A
D757028	12/2015	Goldenberg et al.	N/A	N/A
9326767	12/2015	Koch, Jr. et al.	N/A	N/A
9326768	12/2015	Shelton, IV	N/A	N/A
9326769	12/2015	Shelton, IV et al.	N/A	N/A
9326770	12/2015	Shelton, IV et al.	N/A	N/A

9326771	12/2015	Baxter, III et al.	N/A	N/A
9326788	12/2015	Batross et al.	N/A	N/A
9326812	12/2015	Waaler et al.	N/A	N/A
9326824	12/2015	Inoue et al.	N/A	N/A
9327061	12/2015	Govil et al.	N/A	N/A
9331721	12/2015	Martinez Nuevo et al.	N/A	N/A
9332890	12/2015	Ozawa	N/A	N/A
9332974	12/2015	Henderson et al.	N/A	N/A
9332984	12/2015	Weaner et al.	N/A	N/A
9332987	12/2015	Leimbach et al.	N/A	N/A
9333040	12/2015	Shellenberger et al.	N/A	N/A
9333082	12/2015	Wei et al.	N/A	N/A
9337668	12/2015	Yip	N/A	N/A
9339226	12/2015	van der Walt et al.	N/A	N/A
9339342	12/2015	Prisco et al.	N/A	N/A
9345477	12/2015	Anim et al.	N/A	N/A
9345479	12/2015	(Tarinelli) Racenet et al.	N/A	N/A
9345480	12/2015	Hessler et al.	N/A	N/A
9345481	12/2015	Hall et al.	N/A	N/A
9345503	12/2015	Ishida et al.	N/A	N/A
9351726	12/2015	Leimbach et al.	N/A	N/A
9351727	12/2015	Leimbach et al.	N/A	N/A
9351728	12/2015	Sniffin et al.	N/A	N/A
9351730	12/2015	Schmid et al.	N/A	N/A
9351731	12/2015	Carter et al.	N/A	N/A
9351732	12/2015	Hodgkinson	N/A	N/A
9352071	12/2015	Landgrebe et al.	N/A	N/A
D758433	12/2015	Lee et al.	N/A	N/A
D759063	12/2015	Chen	N/A	N/A
9358003	12/2015	Hall et al.	N/A	N/A
9358004	12/2015	Sniffin et al.	N/A	N/A
9358005	12/2015	Shelton, IV et al.	N/A	N/A
9358015	12/2015	Sorrentino et al.	N/A	N/A
9358031	12/2015	Manzo	N/A	N/A
9358065	12/2015	Ladtkow et al.	N/A	N/A
9364217	12/2015	Kostrzewski et al.	N/A	N/A
9364219	12/2015	Olson et al.	N/A	N/A
9364220	12/2015	Williams	N/A	N/A
9364223	12/2015	Scirica	N/A	N/A
9364226	12/2015	Zemlok et al.	N/A	N/A
9364228	12/2015	Straehnz et al.	N/A	N/A
9364229	12/2015	D'Agostino et al.	N/A	N/A
9364230	12/2015	Shelton, IV et al.	N/A	N/A
9364231	12/2015	Wenchell	N/A	N/A
9364233	12/2015	Alexander, III et al.	N/A	N/A
9364279	12/2015	Houser et al.	N/A	N/A
9368991	12/2015	Qahouq	N/A	N/A
9370341	12/2015	Ceniccola et al.	N/A	N/A

9370358	12/2015	Shelton, IV et al.	N/A	N/A
9370361	12/2015	Viola et al.	N/A	N/A
9370362	12/2015	Petty et al.	N/A	N/A
9370364	12/2015	Smith et al.	N/A	N/A
9370400	12/2015	Parihar	N/A	N/A
9375206	12/2015	Vidal et al.	N/A	N/A
9375218	12/2015	Wheeler et al.	N/A	N/A
9375230	12/2015	Ross et al.	N/A	N/A
9375232	12/2015	Hunt et al.	N/A	N/A
9375255	12/2015	Houser et al.	N/A	N/A
D761309	12/2015	Lee et al.	N/A	N/A
9381058	12/2015	Houser et al.	N/A	N/A
9383881	12/2015	Day et al.	N/A	N/A
9385640	12/2015	Sun et al.	N/A	N/A
9386983	12/2015	Swensgard et al.	N/A	N/A
9386984	12/2015	Aronhalt et al.	N/A	N/A
9386985	12/2015	Koch, Jr. et al.	N/A	N/A
9386988	12/2015	Baxter, III et al.	N/A	N/A
9387003	12/2015	Kaercher et al.	N/A	N/A
9392885	12/2015	Vogler et al.	N/A	N/A
9393015	12/2015	Laurent et al.	N/A	N/A
9393017	12/2015	Flanagan et al.	N/A	N/A
9393018	12/2015	Wang et al.	N/A	N/A
9393354	12/2015	Freedman et al.	N/A	N/A
9396369	12/2015	Whitehurst et al.	N/A	N/A
9396669	12/2015	Karkanias et al.	N/A	N/A
9398905	12/2015	Martin	N/A	N/A
9398911	12/2015	Auld	N/A	N/A
D763277	12/2015	Ahmed et al.	N/A	N/A
D764498	12/2015	Capela et al.	N/A	N/A
9402604	12/2015	Williams et al.	N/A	N/A
9402625	12/2015	Coleman et al.	N/A	N/A
9402626	12/2015	Ortiz et al.	N/A	N/A
9402627	12/2015	Stevenson et al.	N/A	N/A
9402629	12/2015	Ehrenfels et al.	N/A	N/A
9402679	12/2015	Ginnebaugh et al.	N/A	N/A
9402682	12/2015	Worrell et al.	N/A	N/A
9402688	12/2015	Min et al.	N/A	N/A
9408604	12/2015	Shelton, IV et al.	N/A	N/A
9408605	12/2015	Knodel et al.	N/A	N/A
9408606	12/2015	Shelton, IV	N/A	N/A
9408622	12/2015	Stulen et al.	N/A	N/A
9411370	12/2015	Benni et al.	N/A	N/A
9413128	12/2015	Tien et al.	N/A	N/A
9414838	12/2015	Shelton, IV et al.	N/A	N/A
9414849	12/2015	Nagashimada	N/A	N/A
9414880	12/2015	Monson et al.	N/A	N/A
9420967	12/2015	Zand et al.	N/A	N/A
9421003	12/2015	Williams et al.	N/A	N/A
9421014	12/2015	Ingmanson et al.	N/A	N/A

9421030	12/2015	Cole et al.	N/A	N/A
9421060	12/2015	Monson et al.	N/A	N/A
9421062	12/2015	Houser et al.	N/A	N/A
9421682	12/2015	McClaskey et al.	N/A	N/A
9427223	12/2015	Park et al.	N/A	N/A
9427231	12/2015	Racenet et al.	N/A	N/A
9429204	12/2015	Stefan et al.	N/A	N/A
D767624	12/2015	Lee et al.	N/A	N/A
9433411	12/2015	Racenet et al.	N/A	N/A
9433414	12/2015	Chen et al.	N/A	N/A
9433419	12/2015	Gonzalez et al.	N/A	N/A
9433420	12/2015	Hodgkinson	N/A	N/A
9439649	12/2015	Shelton, IV et al.	N/A	N/A
9439650	12/2015	McGuckin, Jr. et al.	N/A	N/A
9439651	12/2015	Smith et al.	N/A	N/A
9439668	12/2015	Timm et al.	N/A	N/A
9445808	12/2015	Woodard, Jr. et al.	N/A	N/A
9445813	12/2015	Shelton, IV et al.	N/A	N/A
9445816	12/2015	Swayze et al.	N/A	N/A
9445817	12/2015	Bettuchi	N/A	N/A
9446226	12/2015	Zilberman	N/A	N/A
9451938	12/2015	Overes et al.	N/A	N/A
9451958	12/2015	Shelton, IV et al.	N/A	N/A
9452020	12/2015	Griffiths et al.	N/A	N/A
D768152	12/2015	Gutierrez et al.	N/A	N/A
D768156	12/2015	Frincke	N/A	N/A
D768167	12/2015	Jones et al.	N/A	N/A
D769315	12/2015	Scotti	N/A	N/A
D769930	12/2015	Agrawal	N/A	N/A
9461340	12/2015	Li et al.	N/A	N/A
9463012	12/2015	Bonutti et al.	N/A	N/A
9463040	12/2015	Jeong et al.	N/A	N/A
9463260	12/2015	Stopek	N/A	N/A
9468438	12/2015	Baber et al.	N/A	N/A
9468447	12/2015	Aman et al.	N/A	N/A
9470297	12/2015	Aranyi et al.	N/A	N/A
9471969	12/2015	Zeng et al.	N/A	N/A
9474506	12/2015	Magnin et al.	N/A	N/A
9474513	12/2015	Ishida et al.	N/A	N/A
9474523	12/2015	Meade et al.	N/A	N/A
9474540	12/2015	Stokes et al.	N/A	N/A
9475180	12/2015	Eshleman et al.	N/A	N/A
9477649	12/2015	Davidson et al.	N/A	N/A
D770476	12/2015	Jitkoff et al.	N/A	N/A
D770515	12/2015	Cho et al.	N/A	N/A
D771116	12/2015	Dellinger et al.	N/A	N/A
D772905	12/2015	Ingenlath	N/A	N/A
9480476	12/2015	Aldridge et al.	N/A	N/A
9480492	12/2015	Aranyi et al.	N/A	N/A
9483095	12/2015	Tran et al.	N/A	N/A

9486186	12/2015	Fiebig et al.	N/A	N/A
9486213	12/2015	Altman et al.	N/A	N/A
9486214	12/2015	Shelton, IV	N/A	N/A
9486215	12/2015	Olson et al.	N/A	N/A
9486302	12/2015	Boey et al.	N/A	N/A
9488197	12/2015	Wi	N/A	N/A
9492146	12/2015	Kostrzewski et al.	N/A	N/A
9492167	12/2015	Shelton, IV et al.	N/A	N/A
9492170	12/2015	Bear et al.	N/A	N/A
9492172	12/2015	Weisshaupt et al.	N/A	N/A
9492189	12/2015	Williams et al.	N/A	N/A
9492192	12/2015	To et al.	N/A	N/A
9492237	12/2015	Kang et al.	N/A	N/A
9498213	12/2015	Marczyk et al.	N/A	N/A
9498219	12/2015	Moore et al.	N/A	N/A
9498231	12/2015	Haider et al.	N/A	N/A
9504455	12/2015	Whitman et al.	N/A	N/A
9504483	12/2015	Houser et al.	N/A	N/A
9504520	12/2015	Worrell et al.	N/A	N/A
9504521	12/2015	Deutmeyer et al.	N/A	N/A
9504528	12/2015	Ivinson et al.	N/A	N/A
9507399	12/2015	Chien	N/A	N/A
D774547	12/2015	Capela et al.	N/A	N/A
D775336	12/2015	Shelton, IV et al.	N/A	N/A
9510827	12/2015	Kostrzewski	N/A	N/A
9510828	12/2015	Yates et al.	N/A	N/A
9510830	12/2015	Shelton, IV et al.	N/A	N/A
9510846	12/2015	Sholev et al.	N/A	N/A
9510895	12/2015	Houser et al.	N/A	N/A
9510925	12/2015	Hotter et al.	N/A	N/A
9515366	12/2015	Herbsommer et al.	N/A	N/A
9517063	12/2015	Swayze et al.	N/A	N/A
9517065	12/2015	Simms et al.	N/A	N/A
9517068	12/2015	Shelton, IV et al.	N/A	N/A
9517326	12/2015	Hinman et al.	N/A	N/A
9521996	12/2015	Armstrong	N/A	N/A
9522003	12/2015	Weir et al.	N/A	N/A
9522005	12/2015	Williams et al.	N/A	N/A
9522014	12/2015	Nishizawa et al.	N/A	N/A
9522029	12/2015	Yates et al.	N/A	N/A
9526481	12/2015	Storz et al.	N/A	N/A
9526499	12/2015	Kostrzewski et al.	N/A	N/A
9526563	12/2015	Twomey	N/A	N/A
9526564	12/2015	Rusin	N/A	N/A
9526921	12/2015	Kimball et al.	N/A	N/A
D776683	12/2016	Gobinski et al.	N/A	N/A
D777773	12/2016	Shi	N/A	N/A
9532783	12/2016	Swayze et al.	N/A	N/A
9539060	12/2016	Lightcap et al.	N/A	N/A
9539726	12/2016	Simaan et al.	N/A	N/A

9545253	12/2016	Worrell et al.	N/A	N/A
9545258	12/2016	Smith et al.	N/A	N/A
9549732	12/2016	Yates et al.	N/A	N/A
9549733	12/2016	Knodel	N/A	N/A
9549735	12/2016	Shelton, IV et al.	N/A	N/A
9549750	12/2016	Shelton, IV et al.	N/A	N/A
9554794	12/2016	Baber et al.	N/A	N/A
9554796	12/2016	Kostrzewski	N/A	N/A
9554803	12/2016	Smith et al.	N/A	N/A
9554812	12/2016	Inkpen et al.	N/A	N/A
9554854	12/2016	Yates et al.	N/A	N/A
9559624	12/2016	Philipp	N/A	N/A
9561013	12/2016	Tsuchiya	N/A	N/A
9561029	12/2016	Scheib et al.	N/A	N/A
9561030	12/2016	Zhang et al.	N/A	N/A
9561031	12/2016	Heinrich et al.	N/A	N/A
9561032	12/2016	Shelton, IV et al.	N/A	N/A
9561038	12/2016	Shelton, IV et al.	N/A	N/A
9561045	12/2016	Hinman et al.	N/A	N/A
9561072	12/2016	Ko	N/A	N/A
9561082	12/2016	Yen et al.	N/A	N/A
9566061	12/2016	Aronhalt et al.	N/A	N/A
9566062	12/2016	Boudreaux	N/A	N/A
9566064	12/2016	Williams et al.	N/A	N/A
9566065	12/2016	Knodel	N/A	N/A
9566067	12/2016	Milliman et al.	N/A	N/A
9572552	12/2016	Bodor et al.	N/A	N/A
9572574	12/2016	Shelton, IV et al.	N/A	N/A
9572576	12/2016	Hodgkinson et al.	N/A	N/A
9572577	12/2016	Lloyd et al.	N/A	N/A
9572592	12/2016	Price et al.	N/A	N/A
9574644	12/2016	Parihar	N/A	N/A
9579088	12/2016	Farritor et al.	N/A	N/A
9579143	12/2016	Ullrich et al.	N/A	N/A
9579158	12/2016	Brianza et al.	N/A	N/A
D780803	12/2016	Gill et al.	N/A	N/A
D781879	12/2016	Butcher et al.	N/A	N/A
D782530	12/2016	Paek et al.	N/A	N/A
9585550	12/2016	Abel et al.	N/A	N/A
9585657	12/2016	Shelton, IV et al.	N/A	N/A
9585658	12/2016	Shelton, IV	N/A	N/A
9585659	12/2016	Viola et al.	N/A	N/A
9585660	12/2016	Laurent et al.	N/A	N/A
9585662	12/2016	Shelton, IV et al.	N/A	N/A
9585663	12/2016	Shelton, IV et al.	N/A	N/A
9585672	12/2016	Bastia	N/A	N/A
9590433	12/2016	Li	N/A	N/A
9592050	12/2016	Schmid et al.	N/A	N/A
9592052	12/2016	Shelton, IV	N/A	N/A
9592053	12/2016	Shelton, IV et al.	N/A	N/A

9592054	12/2016	Schmid et al.	N/A	N/A
9597073	12/2016	Sorrentino et al.	N/A	N/A
9597075	12/2016	Shelton, IV et al.	N/A	N/A
9597078	12/2016	Scirica et al.	N/A	N/A
9597080	12/2016	Milliman et al.	N/A	N/A
9597104	12/2016	Nicholas et al.	N/A	N/A
9597143	12/2016	Madan et al.	N/A	N/A
9603595	12/2016	Shelton, IV et al.	N/A	N/A
9603598	12/2016	Shelton, IV et al.	N/A	N/A
9603599	12/2016	Miller et al.	N/A	N/A
9603991	12/2016	Shelton, IV et al.	N/A	N/A
D783658	12/2016	Hurst et al.	N/A	N/A
9610068	12/2016	Kappel et al.	N/A	N/A
9610079	12/2016	Kamei et al.	N/A	N/A
9610080	12/2016	Whitfield et al.	N/A	N/A
9610412	12/2016	Zemlok et al.	N/A	N/A
9614258	12/2016	Takahashi et al.	N/A	N/A
9615826	12/2016	Shelton, IV et al.	N/A	N/A
9622745	12/2016	Ingmanson et al.	N/A	N/A
9622746	12/2016	Simms et al.	N/A	N/A
9629623	12/2016	Lytle, IV et al.	N/A	N/A
9629626	12/2016	Soltz et al.	N/A	N/A
9629627	12/2016	Kostrzewski et al.	N/A	N/A
9629628	12/2016	Aranyi	N/A	N/A
9629629	12/2016	Leimbach et al.	N/A	N/A
9629631	12/2016	Nicholas et al.	N/A	N/A
9629632	12/2016	Linder et al.	N/A	N/A
9629652	12/2016	Mumaw et al.	N/A	N/A
9629814	12/2016	Widenhouse et al.	N/A	N/A
D785794	12/2016	Magno, Jr.	N/A	N/A
D786280	12/2016	Ma	N/A	N/A
D786896	12/2016	Kim et al.	N/A	N/A
D787547	12/2016	Basargin et al.	N/A	N/A
D788123	12/2016	Shan et al.	N/A	N/A
D788140	12/2016	Hemsley et al.	N/A	N/A
9636091	12/2016	Beardsley et al.	N/A	N/A
9636111	12/2016	Wenchell	N/A	N/A
9636112	12/2016	Penna et al.	N/A	N/A
9636113	12/2016	Wenchell	N/A	N/A
9636850	12/2016	Stopek et al.	N/A	N/A
9641122	12/2016	Romanowich et al.	N/A	N/A
9642620	12/2016	Baxter, III et al.	N/A	N/A
9642642	12/2016	Lim	N/A	N/A
9649096	12/2016	Sholev	N/A	N/A
9649110	12/2016	Parihar et al.	N/A	N/A
9649111	12/2016	Shelton, IV et al.	N/A	N/A
9649190	12/2016	Mathies	N/A	N/A
9651032	12/2016	Weaver et al.	N/A	N/A
9655613	12/2016	Schaller	N/A	N/A
9655614	12/2016	Swensgard et al.	N/A	N/A

9655615	12/2016	Knodel et al.	N/A	N/A
9655616	12/2016	Aranyi	N/A	N/A
9655624	12/2016	Shelton, IV et al.	N/A	N/A
9661991	12/2016	Glossop	N/A	N/A
9662108	12/2016	Williams	N/A	N/A
9662110	12/2016	Huang et al.	N/A	N/A
9662111	12/2016	Holsten et al.	N/A	N/A
9662116	12/2016	Smith et al.	N/A	N/A
9662130	12/2016	Bartels et al.	N/A	N/A
9662131	12/2016	Omori et al.	N/A	N/A
D788792	12/2016	Alessandri et al.	N/A	N/A
D789384	12/2016	Lin et al.	N/A	N/A
D790570	12/2016	Butcher et al.	N/A	N/A
9668728	12/2016	Williams et al.	N/A	N/A
9668729	12/2016	Williams et al.	N/A	N/A
9668732	12/2016	Patel et al.	N/A	N/A
9668733	12/2016	Williams	N/A	N/A
9668734	12/2016	Kostrzewski et al.	N/A	N/A
9668735	12/2016	Beetel	N/A	N/A
9675344	12/2016	Combrowski et al.	N/A	N/A
9675348	12/2016	Smith et al.	N/A	N/A
9675351	12/2016	Hodgkinson et al.	N/A	N/A
9675354	12/2016	Weir et al.	N/A	N/A
9675355	12/2016	Shelton, IV et al.	N/A	N/A
9675368	12/2016	Guo et al.	N/A	N/A
9675372	12/2016	Laurent et al.	N/A	N/A
9675375	12/2016	Houser et al.	N/A	N/A
9675405	12/2016	Trees et al.	N/A	N/A
9675819	12/2016	Dunbar et al.	N/A	N/A
9681870	12/2016	Baxter, III et al.	N/A	N/A
9681873	12/2016	Smith et al.	N/A	N/A
9681884	12/2016	Clem et al.	N/A	N/A
9687230	12/2016	Leimbach et al.	N/A	N/A
9687231	12/2016	Baxter, III et al.	N/A	N/A
9687232	12/2016	Shelton, IV et al.	N/A	N/A
9687233	12/2016	Fernandez et al.	N/A	N/A
9687236	12/2016	Leimbach et al.	N/A	N/A
9687237	12/2016	Schmid et al.	N/A	N/A
9687253	12/2016	Detry et al.	N/A	N/A
9689466	12/2016	Kanai et al.	N/A	N/A
9690362	12/2016	Leimbach et al.	N/A	N/A
9693772	12/2016	Ingmanson et al.	N/A	N/A
9693774	12/2016	Gettinger et al.	N/A	N/A
9693775	12/2016	Agarwal et al.	N/A	N/A
9693777	12/2016	Schellin et al.	N/A	N/A
9700309	12/2016	Jaworek et al.	N/A	N/A
9700310	12/2016	Morgan et al.	N/A	N/A
9700312	12/2016	Kostrzewski et al.	N/A	N/A
9700314	12/2016	Marczyk	N/A	N/A
9700315	12/2016	Chen et al.	N/A	N/A

9700317	12/2016	Aronhalt et al.	N/A	N/A
9700318	12/2016	Scirica et al.	N/A	N/A
9700319	12/2016	Motooka et al.	N/A	N/A
9700320	12/2016	Dinardo et al.	N/A	N/A
9700321	12/2016	Shelton, IV et al.	N/A	N/A
9700334	12/2016	Hinman et al.	N/A	N/A
9700381	12/2016	Amat Girbau	N/A	N/A
9702823	12/2016	Maher et al.	N/A	N/A
9706674	12/2016	Collins et al.	N/A	N/A
9706981	12/2016	Nicholas et al.	N/A	N/A
9706991	12/2016	Hess et al.	N/A	N/A
9706993	12/2016	Hessler et al.	N/A	N/A
9707003	12/2016	Hoell, Jr. et al.	N/A	N/A
9707005	12/2016	Strobl et al.	N/A	N/A
9707026	12/2016	Malackowski et al.	N/A	N/A
9707033	12/2016	Parihar et al.	N/A	N/A
9707043	12/2016	Bozung	N/A	N/A
9707684	12/2016	Ruiz Morales et al.	N/A	N/A
9713466	12/2016	Kostrzewski	N/A	N/A
9713468	12/2016	Harris et al.	N/A	N/A
9713470	12/2016	Scirica et al.	N/A	N/A
9713474	12/2016	Lorenz	N/A	N/A
D795919	12/2016	Bischoff et al.	N/A	N/A
9717497	12/2016	Zerkle et al.	N/A	N/A
9717498	12/2016	Aranyi et al.	N/A	N/A
9718190	12/2016	Larkin et al.	N/A	N/A
9722236	12/2016	Sathrum	N/A	N/A
9724091	12/2016	Shelton, IV et al.	N/A	N/A
9724092	12/2016	Baxter, III et al.	N/A	N/A
9724094	12/2016	Baber et al.	N/A	N/A
9724095	12/2016	Gupta et al.	N/A	N/A
9724096	12/2016	Thompson et al.	N/A	N/A
9724098	12/2016	Baxter, III et al.	N/A	N/A
9724118	12/2016	Schulte et al.	N/A	N/A
9724163	12/2016	Orban	N/A	N/A
9730692	12/2016	Shelton, IV et al.	N/A	N/A
9730695	12/2016	Leimbach et al.	N/A	N/A
9730697	12/2016	Morgan et al.	N/A	N/A
9730717	12/2016	Katsuki et al.	N/A	N/A
9730757	12/2016	Brudniok	N/A	N/A
9731410	12/2016	Hirabayashi et al.	N/A	N/A
9733663	12/2016	Leimbach et al.	N/A	N/A
9737297	12/2016	Racenet et al.	N/A	N/A
9737298	12/2016	Isbell, Jr.	N/A	N/A
9737299	12/2016	Yan	N/A	N/A
9737301	12/2016	Baber et al.	N/A	N/A
9737302	12/2016	Shelton, IV et al.	N/A	N/A
9737303	12/2016	Shelton, IV et al.	N/A	N/A
9737323	12/2016	Thapliyal et al.	N/A	N/A
9737365	12/2016	Hegeman et al.	N/A	N/A

9743927	12/2016	Whitman	N/A	N/A
9743928	12/2016	Shelton, IV et al.	N/A	N/A
9743929	12/2016	Leimbach et al.	N/A	N/A
D798319	12/2016	Bergstrand et al.	N/A	N/A
9750498	12/2016	Timm et al.	N/A	N/A
9750499	12/2016	Leimbach et al.	N/A	N/A
9750501	12/2016	Shelton, IV et al.	N/A	N/A
9750502	12/2016	Scirica et al.	N/A	N/A
9750503	12/2016	Milliman	N/A	N/A
9750639	12/2016	Barnes et al.	N/A	N/A
9751176	12/2016	McRoberts et al.	N/A	N/A
9757123	12/2016	Giordano et al.	N/A	N/A
9757124	12/2016	Schellin et al.	N/A	N/A
9757126	12/2016	Cappola	N/A	N/A
9757128	12/2016	Baber et al.	N/A	N/A
9757129	12/2016	Williams	N/A	N/A
9757130	12/2016	Shelton, IV	N/A	N/A
9763662	12/2016	Shelton, IV et al.	N/A	N/A
9763668	12/2016	Whitfield et al.	N/A	N/A
9770245	12/2016	Swayze et al.	N/A	N/A
9770274	12/2016	Pool et al.	N/A	N/A
D798886	12/2016	Prophete et al.	N/A	N/A
D800742	12/2016	Rhodes	N/A	N/A
D800744	12/2016	Jitkoff et al.	N/A	N/A
D800766	12/2016	Park et al.	N/A	N/A
D800904	12/2016	Leimbach et al.	N/A	N/A
9775608	12/2016	Aronhalt et al.	N/A	N/A
9775609	12/2016	Shelton, IV et al.	N/A	N/A
9775610	12/2016	Nicholas et al.	N/A	N/A
9775611	12/2016	Kostrzewski	N/A	N/A
9775613	12/2016	Shelton, IV et al.	N/A	N/A
9775614	12/2016	Shelton, IV et al.	N/A	N/A
9775618	12/2016	Bettuchi et al.	N/A	N/A
9775635	12/2016	Take	N/A	N/A
9775678	12/2016	Lohmeier	N/A	N/A
9782169	12/2016	Kimsey et al.	N/A	N/A
9782170	12/2016	Zemlok et al.	N/A	N/A
9782180	12/2016	Smith et al.	N/A	N/A
9782187	12/2016	Zergiebel et al.	N/A	N/A
9782193	12/2016	Thistle	N/A	N/A
9782214	12/2016	Houser et al.	N/A	N/A
9788834	12/2016	Schmid et al.	N/A	N/A
9788835	12/2016	Morgan et al.	N/A	N/A
9788836	12/2016	Overmyer et al.	N/A	N/A
9788847	12/2016	Jinno	N/A	N/A
9788851	12/2016	Dannaher et al.	N/A	N/A
9788902	12/2016	Inoue et al.	N/A	N/A
9795379	12/2016	Leimbach et al.	N/A	N/A
9795380	12/2016	Shelton, IV et al.	N/A	N/A
9795381	12/2016	Shelton, IV	N/A	N/A

9795382	12/2016	Shelton, IV	N/A	N/A
9795383	12/2016	Aldridge et al.	N/A	N/A
9795384	12/2016	Weaner et al.	N/A	N/A
9797486	12/2016	Zergiebel et al.	N/A	N/A
9801626	12/2016	Parihar et al.	N/A	N/A
9801627	12/2016	Harris et al.	N/A	N/A
9801628	12/2016	Harris et al.	N/A	N/A
9801634	12/2016	Shelton, IV et al.	N/A	N/A
9801679	12/2016	Trees et al.	N/A	N/A
9802033	12/2016	Hibner et al.	N/A	N/A
9804618	12/2016	Leimbach et al.	N/A	N/A
D803234	12/2016	Day et al.	N/A	N/A
D803235	12/2016	Markson et al.	N/A	N/A
D803850	12/2016	Chang et al.	N/A	N/A
9808244	12/2016	Leimbach et al.	N/A	N/A
9808246	12/2016	Shelton, IV et al.	N/A	N/A
9808247	12/2016	Shelton, IV et al.	N/A	N/A
9808248	12/2016	Hoffman	N/A	N/A
9808249	12/2016	Shelton, IV	N/A	N/A
9814460	12/2016	Kimsey et al.	N/A	N/A
9814462	12/2016	Woodard, Jr. et al.	N/A	N/A
9814463	12/2016	Williams et al.	N/A	N/A
9814530	12/2016	Weir et al.	N/A	N/A
9814561	12/2016	Forsell	N/A	N/A
9815118	12/2016	Schmitt et al.	N/A	N/A
9820445	12/2016	Simpson et al.	N/A	N/A
9820737	12/2016	Beardsley et al.	N/A	N/A
9820738	12/2016	Lytle, IV et al.	N/A	N/A
9820741	12/2016	Kostrzewski	N/A	N/A
9820768	12/2016	Gee et al.	N/A	N/A
9825455	12/2016	Sandhu et al.	N/A	N/A
9826976	12/2016	Parihar et al.	N/A	N/A
9826977	12/2016	Leimbach et al.	N/A	N/A
9826978	12/2016	Shelton, IV et al.	N/A	N/A
9829698	12/2016	Haraguchi et al.	N/A	N/A
D806108	12/2016	Day	N/A	N/A
9833235	12/2016	Penna et al.	N/A	N/A
9833236	12/2016	Shelton, IV et al.	N/A	N/A
9833238	12/2016	Baxter, III et al.	N/A	N/A
9833239	12/2016	Yates et al.	N/A	N/A
9833241	12/2016	Huitema et al.	N/A	N/A
9833242	12/2016	Baxter, III et al.	N/A	N/A
9839420	12/2016	Shelton, IV et al.	N/A	N/A
9839421	12/2016	Zerkle et al.	N/A	N/A
9839422	12/2016	Schellin et al.	N/A	N/A
9839423	12/2016	Vendely et al.	N/A	N/A
9839427	12/2016	Swayze et al.	N/A	N/A
9839428	12/2016	Baxter, III et al.	N/A	N/A
9839429	12/2016	Weisenburgh, II et al.	N/A	N/A
9839480	12/2016	Pribanic et al.	N/A	N/A

9839481	12/2016	Blumenkranz et al.	N/A	N/A
9844368	12/2016	Boudreaux et al.	N/A	N/A
9844369	12/2016	Huitema et al.	N/A	N/A
9844372	12/2016	Shelton, IV et al.	N/A	N/A
9844373	12/2016	Swayze et al.	N/A	N/A
9844374	12/2016	Lytle, IV et al.	N/A	N/A
9844375	12/2016	Overmyer et al.	N/A	N/A
9844376	12/2016	Baxter, III et al.	N/A	N/A
9844379	12/2016	Shelton, IV et al.	N/A	N/A
9848871	12/2016	Harris et al.	N/A	N/A
9848873	12/2016	Shelton, IV	N/A	N/A
9848875	12/2016	Aronhalt et al.	N/A	N/A
9848877	12/2016	Shelton, IV et al.	N/A	N/A
9850994	12/2016	Schena	N/A	N/A
D808989	12/2017	Ayvazian et al.	N/A	N/A
9855039	12/2017	Racenet et al.	N/A	N/A
9855040	12/2017	Kostrzewski	N/A	N/A
9855662	12/2017	Ruiz Morales et al.	N/A	N/A
9861261	12/2017	Shahinian	N/A	N/A
9861359	12/2017	Shelton, IV et al.	N/A	N/A
9861361	12/2017	Aronhalt et al.	N/A	N/A
9861362	12/2017	Whitman et al.	N/A	N/A
9861366	12/2017	Aranyi	N/A	N/A
9861382	12/2017	Smith et al.	N/A	N/A
9861446	12/2017	Lang	N/A	N/A
9867612	12/2017	Parihar et al.	N/A	N/A
9867613	12/2017	Marczyk et al.	N/A	N/A
9867615	12/2017	Fanelli et al.	N/A	N/A
9867617	12/2017	Ma	N/A	N/A
9867618	12/2017	Hall et al.	N/A	N/A
9867620	12/2017	Fischvogt et al.	N/A	N/A
9868198	12/2017	Nicholas et al.	N/A	N/A
9872682	12/2017	Hess et al.	N/A	N/A
9872683	12/2017	Hopkins et al.	N/A	N/A
9872684	12/2017	Hall et al.	N/A	N/A
9872722	12/2017	Lech	N/A	N/A
9877721	12/2017	Schellin et al.	N/A	N/A
9877722	12/2017	Schellin et al.	N/A	N/A
9877723	12/2017	Hall et al.	N/A	N/A
9877776	12/2017	Boudreaux	N/A	N/A
D810099	12/2017	Riedel	N/A	N/A
9883843	12/2017	Garlow	N/A	N/A
9883860	12/2017	Leimbach et al.	N/A	N/A
9883861	12/2017	Shelton, IV et al.	N/A	N/A
9884456	12/2017	Schellin et al.	N/A	N/A
9888914	12/2017	Martin et al.	N/A	N/A
9888919	12/2017	Leimbach et al.	N/A	N/A
9888921	12/2017	Williams et al.	N/A	N/A
9888924	12/2017	Ebersole et al.	N/A	N/A
9889230	12/2017	Bennett et al.	N/A	N/A

9895147	12/2017	Shelton, IV	N/A	N/A
9895148	12/2017	Shelton, IV et al.	N/A	N/A
9895813	12/2017	Blumenkranz et al.	N/A	N/A
9901339	12/2017	Farascioni	N/A	N/A
9901341	12/2017	Kostrzewski	N/A	N/A
9901342	12/2017	Shelton, IV et al.	N/A	N/A
9901344	12/2017	Moore et al.	N/A	N/A
9901345	12/2017	Moore et al.	N/A	N/A
9901346	12/2017	Moore et al.	N/A	N/A
9901358	12/2017	Faller et al.	N/A	N/A
9901406	12/2017	State et al.	N/A	N/A
9901412	12/2017	Lathrop et al.	N/A	N/A
D813899	12/2017	Erant et al.	N/A	N/A
9907456	12/2017	Miyoshi	N/A	N/A
9907552	12/2017	Measamer et al.	N/A	N/A
9907553	12/2017	Cole et al.	N/A	N/A
9907600	12/2017	Stulen et al.	N/A	N/A
9907620	12/2017	Shelton, IV et al.	N/A	N/A
9913641	12/2017	Takemoto et al.	N/A	N/A
9913642	12/2017	Leimbach et al.	N/A	N/A
9913644	12/2017	McCuen	N/A	N/A
9913646	12/2017	Shelton, IV	N/A	N/A
9913647	12/2017	Weisenburgh, II et al.	N/A	N/A
9913648	12/2017	Shelton, IV et al.	N/A	N/A
9913694	12/2017	Brisson	N/A	N/A
9913733	12/2017	Piron et al.	N/A	N/A
9918704	12/2017	Shelton, IV et al.	N/A	N/A
9918714	12/2017	Gibbons, Jr.	N/A	N/A
9918715	12/2017	Menn	N/A	N/A
9918716	12/2017	Baxter, III et al.	N/A	N/A
9918717	12/2017	Czernik	N/A	N/A
9918730	12/2017	Trees et al.	N/A	N/A
9924941	12/2017	Burbank	N/A	N/A
9924942	12/2017	Swayze et al.	N/A	N/A
9924943	12/2017	Mohan Pinjala et al.	N/A	N/A
9924944	12/2017	Shelton, IV et al.	N/A	N/A
9924945	12/2017	Zheng et al.	N/A	N/A
9924946	12/2017	Vendely et al.	N/A	N/A
9924947	12/2017	Shelton, IV et al.	N/A	N/A
9924961	12/2017	Shelton, IV et al.	N/A	N/A
9931106	12/2017	Au et al.	N/A	N/A
9931116	12/2017	Racenet et al.	N/A	N/A
9931117	12/2017	Hathaway et al.	N/A	N/A
9931118	12/2017	Shelton, IV et al.	N/A	N/A
9931120	12/2017	Chen et al.	N/A	N/A
9936949	12/2017	Measamer et al.	N/A	N/A
9936950	12/2017	Shelton, IV et al.	N/A	N/A
9936951	12/2017	Hufnagel et al.	N/A	N/A
9936952	12/2017	Demmy	N/A	N/A
9936954	12/2017	Shelton, IV et al.	N/A	N/A

9937626	12/2017	Rockrohr	N/A	N/A
9943309	12/2017	Shelton, IV et al.	N/A	N/A
9943310	12/2017	Harris et al.	N/A	N/A
9943312	12/2017	Posada et al.	N/A	N/A
9949754	12/2017	Newhauser et al.	N/A	N/A
9953193	12/2017	Butler et al.	N/A	N/A
D819072	12/2017	Clediere	N/A	N/A
9955954	12/2017	Destoumieux et al.	N/A	N/A
9955965	12/2017	Chen et al.	N/A	N/A
9955966	12/2017	Zergiebel	N/A	N/A
9956677	12/2017	Baskar et al.	N/A	N/A
9962129	12/2017	Jerebko et al.	N/A	N/A
9962157	12/2017	Sapre	N/A	N/A
9962158	12/2017	Hall et al.	N/A	N/A
9962159	12/2017	Heinrich et al.	N/A	N/A
9962161	12/2017	Scheib et al.	N/A	N/A
9968354	12/2017	Shelton, IV et al.	N/A	N/A
9968355	12/2017	Shelton, IV et al.	N/A	N/A
9968356	12/2017	Shelton, IV et al.	N/A	N/A
9968397	12/2017	Taylor et al.	N/A	N/A
9974529	12/2017	Shelton, IV et al.	N/A	N/A
9974538	12/2017	Baxter, III et al.	N/A	N/A
9974539	12/2017	Yates et al.	N/A	N/A
9974541	12/2017	Calderoni	N/A	N/A
9974542	12/2017	Hodgkinson	N/A	N/A
9980713	12/2017	Aronhalt et al.	N/A	N/A
9980724	12/2017	Farascioni et al.	N/A	N/A
9980729	12/2017	Moore et al.	N/A	N/A
9980740	12/2017	Krause et al.	N/A	N/A
9980769	12/2017	Trees et al.	N/A	N/A
D819680	12/2017	Nguyen	N/A	N/A
D819682	12/2017	Howard et al.	N/A	N/A
D819684	12/2017	Dart	N/A	N/A
D820307	12/2017	Jian et al.	N/A	N/A
D820867	12/2017	Dickens et al.	N/A	N/A
9987000	12/2017	Shelton, IV et al.	N/A	N/A
9987003	12/2017	Timm et al.	N/A	N/A
9987006	12/2017	Morgan et al.	N/A	N/A
9987008	12/2017	Scirica et al.	N/A	N/A
9987095	12/2017	Chowaniec et al.	N/A	N/A
9987097	12/2017	van der Weide et al.	N/A	N/A
9987099	12/2017	Chen et al.	N/A	N/A
9993248	12/2017	Shelton, IV et al.	N/A	N/A
9993258	12/2017	Shelton, IV et al.	N/A	N/A
9993284	12/2017	Boudreaux	N/A	N/A
9999408	12/2017	Boudreaux et al.	N/A	N/A
9999423	12/2017	Schuckmann et al.	N/A	N/A
9999426	12/2017	Moore et al.	N/A	N/A
9999431	12/2017	Shelton, IV et al.	N/A	N/A
9999472	12/2017	Weir et al.	N/A	N/A

10004497	12/2017	Overmyer et al.	N/A	N/A
10004498	12/2017	Morgan et al.	N/A	N/A
10004500	12/2017	Shelton, IV et al.	N/A	N/A
10004501	12/2017	Shelton, IV et al.	N/A	N/A
10004505	12/2017	Moore et al.	N/A	N/A
10004506	12/2017	Shelton, IV et al.	N/A	N/A
10004552	12/2017	Kleyman et al.	N/A	N/A
D822206	12/2017	Shelton, IV et al.	N/A	N/A
10010322	12/2017	Shelton, IV et al.	N/A	N/A
10010324	12/2017	Huitema et al.	N/A	N/A
10010395	12/2017	Puckett et al.	N/A	N/A
10013049	12/2017	Leimbach et al.	N/A	N/A
10016199	12/2017	Baber et al.	N/A	N/A
10016656	12/2017	Devor et al.	N/A	N/A
10022120	12/2017	Martin et al.	N/A	N/A
10022123	12/2017	Williams et al.	N/A	N/A
10022125	12/2017	(Prommersberger) Stopek et al.	N/A	N/A
10024407	12/2017	Aranyi et al.	N/A	N/A
10028742	12/2017	Shelton, IV et al.	N/A	N/A
10028743	12/2017	Shelton, IV et al.	N/A	N/A
10028744	12/2017	Shelton, IV et al.	N/A	N/A
10028761	12/2017	Leimbach et al.	N/A	N/A
10029108	12/2017	Powers et al.	N/A	N/A
10029125	12/2017	Shapiro et al.	N/A	N/A
10034344	12/2017	Yoshida	N/A	N/A
10034668	12/2017	Ebner	N/A	N/A
D826405	12/2017	Shelton, IV et al.	N/A	N/A
10039440	12/2017	Fenech et al.	N/A	N/A
10039529	12/2017	Kerr et al.	N/A	N/A
10039532	12/2017	Srinivas et al.	N/A	N/A
10039545	12/2017	Sadowski et al.	N/A	N/A
10041822	12/2017	Zemlok	N/A	N/A
10045769	12/2017	Aronhalt et al.	N/A	N/A
10045776	12/2017	Shelton, IV et al.	N/A	N/A
10045778	12/2017	Yates et al.	N/A	N/A
10045779	12/2017	Savage et al.	N/A	N/A
10045781	12/2017	Cropper et al.	N/A	N/A
10045782	12/2017	Murthy Aravalli	N/A	N/A
10045869	12/2017	Forsell	N/A	N/A
10046904	12/2017	Evans et al.	N/A	N/A
10052044	12/2017	Shelton, IV et al.	N/A	N/A
10052099	12/2017	Morgan et al.	N/A	N/A
10052100	12/2017	Morgan et al.	N/A	N/A
10052102	12/2017	Baxter, III et al.	N/A	N/A
10052104	12/2017	Shelton, IV et al.	N/A	N/A
10052164	12/2017	Overmyer	N/A	N/A
10058317	12/2017	Fan et al.	N/A	N/A
10058327	12/2017	Weisenburgh, II et al.	N/A	N/A
10058373	12/2017	Takashino et al.	N/A	N/A

10058395	12/2017	Devengenzo et al.	N/A	N/A
10058963	12/2017	Shelton, IV et al.	N/A	N/A
10064620	12/2017	Gettinger et al.	N/A	N/A
10064621	12/2017	Kerr et al.	N/A	N/A
10064622	12/2017	Murthy Aravalli	N/A	N/A
10064624	12/2017	Shelton, IV et al.	N/A	N/A
10064639	12/2017	Ishida et al.	N/A	N/A
10064642	12/2017	Marczyk et al.	N/A	N/A
10064649	12/2017	Golebieski et al.	N/A	N/A
10064688	12/2017	Shelton, IV et al.	N/A	N/A
10070861	12/2017	Spivey et al.	N/A	N/A
10070863	12/2017	Swayze et al.	N/A	N/A
10071452	12/2017	Shelton, IV et al.	N/A	N/A
10076325	12/2017	Huang et al.	N/A	N/A
10076326	12/2017	Yates et al.	N/A	N/A
10076340	12/2017	Belagali et al.	N/A	N/A
10080552	12/2017	Nicholas et al.	N/A	N/A
D830550	12/2017	Miller et al.	N/A	N/A
D831209	12/2017	Huitema et al.	N/A	N/A
D831676	12/2017	Park et al.	N/A	N/A
D832301	12/2017	Smith	N/A	N/A
10085624	12/2017	Isoda et al.	N/A	N/A
10085643	12/2017	Bandic et al.	N/A	N/A
10085728	12/2017	Jogasaki et al.	N/A	N/A
10085746	12/2017	Fischvogt	N/A	N/A
10085748	12/2017	Morgan et al.	N/A	N/A
10085749	12/2017	Cappola et al.	N/A	N/A
10085750	12/2017	Zergiebel et al.	N/A	N/A
10085751	12/2017	Overmyer et al.	N/A	N/A
10085754	12/2017	Sniffin et al.	N/A	N/A
10085806	12/2017	Hagn et al.	N/A	N/A
10092290	12/2017	Yigit et al.	N/A	N/A
10092292	12/2017	Boudreaux et al.	N/A	N/A
10098635	12/2017	Burbank	N/A	N/A
10098636	12/2017	Shelton, IV et al.	N/A	N/A
10098640	12/2017	Bertolero et al.	N/A	N/A
10098642	12/2017	Baxter, III et al.	N/A	N/A
10099303	12/2017	Yoshida et al.	N/A	N/A
10101861	12/2017	Kiyoto	N/A	N/A
10105126	12/2017	Sauer	N/A	N/A
10105128	12/2017	Cooper et al.	N/A	N/A
10105136	12/2017	Yates et al.	N/A	N/A
10105139	12/2017	Yates et al.	N/A	N/A
10105140	12/2017	Malinouskas et al.	N/A	N/A
10105142	12/2017	Baxter, III et al.	N/A	N/A
10105149	12/2017	Haider et al.	N/A	N/A
10106932	12/2017	Anderson et al.	N/A	N/A
10111657	12/2017	McCuen	N/A	N/A
10111658	12/2017	Chowaniec et al.	N/A	N/A
10111660	12/2017	Hemmann	N/A	N/A

10111665	12/2017	Aranyi et al.	N/A	N/A
10111679	12/2017	Baber et al.	N/A	N/A
10111698	12/2017	Scheib et al.	N/A	N/A
10111702	12/2017	Kostrzewski	N/A	N/A
D833608	12/2017	Miller et al.	N/A	N/A
10117649	12/2017	Baxter, III et al.	N/A	N/A
10117650	12/2017	Nicholas et al.	N/A	N/A
10117652	12/2017	Schmid et al.	N/A	N/A
10117653	12/2017	Leimbach et al.	N/A	N/A
10117654	12/2017	Ingmanson et al.	N/A	N/A
10123798	12/2017	Baxter, III et al.	N/A	N/A
10123845	12/2017	Yeung	N/A	N/A
10124493	12/2017	Rothfuss et al.	N/A	N/A
10130352	12/2017	Widenhouse et al.	N/A	N/A
10130359	12/2017	Hess et al.	N/A	N/A
10130360	12/2017	Olson et al.	N/A	N/A
10130361	12/2017	Yates et al.	N/A	N/A
10130363	12/2017	Huitema et al.	N/A	N/A
10130366	12/2017	Shelton, IV et al.	N/A	N/A
10130367	12/2017	Cappola et al.	N/A	N/A
10130382	12/2017	Gladstone	N/A	N/A
10130738	12/2017	Shelton, IV et al.	N/A	N/A
10130830	12/2017	Miret Carceller et al.	N/A	N/A
10133248	12/2017	Fitzsimmons et al.	N/A	N/A
10135242	12/2017	Baber et al.	N/A	N/A
10136879	12/2017	Ross et al.	N/A	N/A
10136887	12/2017	Shelton, IV et al.	N/A	N/A
10136889	12/2017	Shelton, IV et al.	N/A	N/A
10136890	12/2017	Shelton, IV et al.	N/A	N/A
10136891	12/2017	Shelton, IV et al.	N/A	N/A
10136949	12/2017	Felder et al.	N/A	N/A
D835659	12/2017	Anzures et al.	N/A	N/A
D836124	12/2017	Fan	N/A	N/A
10143474	12/2017	Bucciaglia et al.	N/A	N/A
10146423	12/2017	Reed et al.	N/A	N/A
10149679	12/2017	Shelton, IV et al.	N/A	N/A
10149680	12/2017	Parihar et al.	N/A	N/A
10149682	12/2017	Shelton, IV et al.	N/A	N/A
10149683	12/2017	Smith et al.	N/A	N/A
10149712	12/2017	Manwaring et al.	N/A	N/A
10152789	12/2017	Carnes et al.	N/A	N/A
10154841	12/2017	Weaner et al.	N/A	N/A
10159481	12/2017	Whitman et al.	N/A	N/A
10159482	12/2017	Swayze et al.	N/A	N/A
10159483	12/2017	Beckman et al.	N/A	N/A
10159506	12/2017	Boudreaux et al.	N/A	N/A
10161816	12/2017	Jackson et al.	N/A	N/A
10163065	12/2017	Koski et al.	N/A	N/A
10163589	12/2017	Zergiebel et al.	N/A	N/A
10164466	12/2017	Calderoni	N/A	N/A

D837244	12/2018	Kuo et al.	N/A	N/A
D837245	12/2018	Kuo et al.	N/A	N/A
10166023	12/2018	Vendely et al.	N/A	N/A
10166025	12/2018	Leimbach et al.	N/A	N/A
10166026	12/2018	Shelton, IV et al.	N/A	N/A
10172611	12/2018	Shelton, IV et al.	N/A	N/A
10172615	12/2018	Marczyk et al.	N/A	N/A
10172616	12/2018	Murray et al.	N/A	N/A
10172617	12/2018	Shelton, IV et al.	N/A	N/A
10172618	12/2018	Shelton, IV et al.	N/A	N/A
10172619	12/2018	Harris et al.	N/A	N/A
10172620	12/2018	Harris et al.	N/A	N/A
10172636	12/2018	Stulen et al.	N/A	N/A
10172669	12/2018	Felder et al.	N/A	N/A
10175127	12/2018	Collins et al.	N/A	N/A
10178992	12/2018	Wise et al.	N/A	N/A
10180463	12/2018	Beckman et al.	N/A	N/A
10182813	12/2018	Leimbach et al.	N/A	N/A
10182815	12/2018	Williams et al.	N/A	N/A
10182816	12/2018	Shelton, IV et al.	N/A	N/A
10182818	12/2018	Hensel et al.	N/A	N/A
10182819	12/2018	Shelton, IV	N/A	N/A
10182868	12/2018	Meier et al.	N/A	N/A
10188385	12/2018	Kerr et al.	N/A	N/A
10188389	12/2018	Vendely et al.	N/A	N/A
10188393	12/2018	Smith et al.	N/A	N/A
10188394	12/2018	Shelton, IV et al.	N/A	N/A
10190888	12/2018	Hryb et al.	N/A	N/A
D839900	12/2018	Gan	N/A	N/A
D841667	12/2018	Coren	N/A	N/A
10194801	12/2018	Elhawary et al.	N/A	N/A
10194904	12/2018	Viola et al.	N/A	N/A
10194907	12/2018	Marczyk et al.	N/A	N/A
10194908	12/2018	Duque et al.	N/A	N/A
10194910	12/2018	Shelton, IV et al.	N/A	N/A
10194911	12/2018	Miller et al.	N/A	N/A
10194912	12/2018	Scheib et al.	N/A	N/A
10194913	12/2018	Nalagatla et al.	N/A	N/A
10194976	12/2018	Boudreaux	N/A	N/A
10194992	12/2018	Robinson	N/A	N/A
10201348	12/2018	Scheib et al.	N/A	N/A
10201349	12/2018	Leimbach et al.	N/A	N/A
10201363	12/2018	Shelton, IV	N/A	N/A
10201364	12/2018	Leimbach et al.	N/A	N/A
10201365	12/2018	Boudreaux et al.	N/A	N/A
10201381	12/2018	Zergiebel et al.	N/A	N/A
10206605	12/2018	Shelton, IV et al.	N/A	N/A
10206676	12/2018	Shelton, IV	N/A	N/A
10206677	12/2018	Harris et al.	N/A	N/A
10206678	12/2018	Shelton, IV et al.	N/A	N/A

10206748	12/2018	Burbank	N/A	N/A
10210244	12/2018	Branavan et al.	N/A	N/A
10211586	12/2018	Adams et al.	N/A	N/A
10213198	12/2018	Aronhalt et al.	N/A	N/A
10213201	12/2018	Shelton, IV et al.	N/A	N/A
10213202	12/2018	Flanagan et al.	N/A	N/A
10213203	12/2018	Swayze et al.	N/A	N/A
10213204	12/2018	Aranyi et al.	N/A	N/A
10213262	12/2018	Shelton, IV et al.	N/A	N/A
D842328	12/2018	Jian et al.	N/A	N/A
10219811	12/2018	Haider et al.	N/A	N/A
10219832	12/2018	Bagwell et al.	N/A	N/A
10220522	12/2018	Rockrohr	N/A	N/A
10226239	12/2018	Nicholas et al.	N/A	N/A
10226249	12/2018	Jaworek et al.	N/A	N/A
10226250	12/2018	Beckman et al.	N/A	N/A
10226251	12/2018	Scheib et al.	N/A	N/A
10226274	12/2018	Worrell et al.	N/A	N/A
10231634	12/2018	Zand et al.	N/A	N/A
10231653	12/2018	Bohm et al.	N/A	N/A
10231734	12/2018	Thompson et al.	N/A	N/A
10231794	12/2018	Shelton, IV et al.	N/A	N/A
10238385	12/2018	Yates et al.	N/A	N/A
10238386	12/2018	Overmyer et al.	N/A	N/A
10238387	12/2018	Yates et al.	N/A	N/A
10238389	12/2018	Yates et al.	N/A	N/A
10238390	12/2018	Harris et al.	N/A	N/A
10238391	12/2018	Leimbach et al.	N/A	N/A
D844666	12/2018	Espeleta et al.	N/A	N/A
D844667	12/2018	Espeleta et al.	N/A	N/A
D845342	12/2018	Espeleta et al.	N/A	N/A
D847199	12/2018	Whitmore	N/A	N/A
10244991	12/2018	Shademan et al.	N/A	N/A
10245027	12/2018	Shelton, IV et al.	N/A	N/A
10245028	12/2018	Shelton, IV et al.	N/A	N/A
10245029	12/2018	Hunter et al.	N/A	N/A
10245030	12/2018	Hunter et al.	N/A	N/A
10245032	12/2018	Shelton, IV	N/A	N/A
10245033	12/2018	Overmyer et al.	N/A	N/A
10245034	12/2018	Shelton, IV et al.	N/A	N/A
10245035	12/2018	Swayze et al.	N/A	N/A
10245038	12/2018	Hopkins et al.	N/A	N/A
10245058	12/2018	Omori et al.	N/A	N/A
10251645	12/2018	Kostrzewski	N/A	N/A
10251648	12/2018	Harris et al.	N/A	N/A
10251649	12/2018	Schellin et al.	N/A	N/A
10251725	12/2018	Valentine et al.	N/A	N/A
10258322	12/2018	Fanton et al.	N/A	N/A
10258330	12/2018	Shelton, IV et al.	N/A	N/A
10258331	12/2018	Shelton, IV et al.	N/A	N/A

10258332	12/2018	Schmid et al.	N/A	N/A
10258333	12/2018	Shelton, IV et al.	N/A	N/A
10258336	12/2018	Baxter, III et al.	N/A	N/A
10258363	12/2018	Worrell et al.	N/A	N/A
10258418	12/2018	Shelton, IV et al.	N/A	N/A
10264797	12/2018	Zhang et al.	N/A	N/A
10265065	12/2018	Shelton, IV et al.	N/A	N/A
10265067	12/2018	Yates et al.	N/A	N/A
10265068	12/2018	Harris et al.	N/A	N/A
10265072	12/2018	Shelton, IV et al.	N/A	N/A
10265073	12/2018	Scheib et al.	N/A	N/A
10265074	12/2018	Shelton, IV et al.	N/A	N/A
10265090	12/2018	Ingmanson et al.	N/A	N/A
10271840	12/2018	Sapre	N/A	N/A
10271844	12/2018	Valentine et al.	N/A	N/A
10271845	12/2018	Shelton, IV	N/A	N/A
10271846	12/2018	Shelton, IV et al.	N/A	N/A
10271847	12/2018	Racenet et al.	N/A	N/A
10271849	12/2018	Vendely et al.	N/A	N/A
10271851	12/2018	Shelton, IV et al.	N/A	N/A
D847989	12/2018	Shelton, IV et al.	N/A	N/A
D848473	12/2018	Zhu et al.	N/A	N/A
D849046	12/2018	Kuo et al.	N/A	N/A
10278696	12/2018	Gurumurthy et al.	N/A	N/A
10278697	12/2018	Shelton, IV et al.	N/A	N/A
10278702	12/2018	Shelton, IV et al.	N/A	N/A
10278703	12/2018	Nativ et al.	N/A	N/A
10278707	12/2018	Thompson et al.	N/A	N/A
10278722	12/2018	Shelton, IV et al.	N/A	N/A
10278780	12/2018	Shelton, IV	N/A	N/A
10285694	12/2018	Viola et al.	N/A	N/A
10285695	12/2018	Jaworek et al.	N/A	N/A
10285699	12/2018	Vendely et al.	N/A	N/A
10285700	12/2018	Scheib	N/A	N/A
10285705	12/2018	Shelton, IV et al.	N/A	N/A
10285724	12/2018	Faller et al.	N/A	N/A
10285750	12/2018	Coulson et al.	N/A	N/A
10292701	12/2018	Scheib et al.	N/A	N/A
10292704	12/2018	Harris et al.	N/A	N/A
10292707	12/2018	Shelton, IV et al.	N/A	N/A
10293100	12/2018	Shelton, IV et al.	N/A	N/A
10293553	12/2018	Racenet et al.	N/A	N/A
10299787	12/2018	Shelton, IV	N/A	N/A
10299788	12/2018	Heinrich et al.	N/A	N/A
10299789	12/2018	Marczyk et al.	N/A	N/A
10299790	12/2018	Beardsley	N/A	N/A
10299792	12/2018	Huitema et al.	N/A	N/A
10299817	12/2018	Shelton, IV et al.	N/A	N/A
10299818	12/2018	Riva	N/A	N/A
10299878	12/2018	Shelton, IV et al.	N/A	N/A

10303851	12/2018	Nguyen et al.	N/A	N/A
D850617	12/2018	Shelton, IV et al.	N/A	N/A
D851676	12/2018	Foss et al.	N/A	N/A
D851762	12/2018	Shelton, IV et al.	N/A	N/A
10307159	12/2018	Harris et al.	N/A	N/A
10307160	12/2018	Vendely et al.	N/A	N/A
10307161	12/2018	Jankowski	N/A	N/A
10307163	12/2018	Moore et al.	N/A	N/A
10307170	12/2018	Parfett et al.	N/A	N/A
10307202	12/2018	Smith et al.	N/A	N/A
10314559	12/2018	Razzaque et al.	N/A	N/A
10314577	12/2018	Laurent et al.	N/A	N/A
10314578	12/2018	Leimbach et al.	N/A	N/A
10314579	12/2018	Chowaniec et al.	N/A	N/A
10314580	12/2018	Scheib et al.	N/A	N/A
10314582	12/2018	Shelton, IV et al.	N/A	N/A
10314584	12/2018	Scirica et al.	N/A	N/A
10314587	12/2018	Harris et al.	N/A	N/A
10314588	12/2018	Turner et al.	N/A	N/A
10314589	12/2018	Shelton, IV et al.	N/A	N/A
10314590	12/2018	Shelton, IV et al.	N/A	N/A
10315566	12/2018	Choi et al.	N/A	N/A
10321907	12/2018	Shelton, IV et al.	N/A	N/A
10321909	12/2018	Shelton, IV et al.	N/A	N/A
10321927	12/2018	Hinman	N/A	N/A
10327743	12/2018	St. Goar et al.	N/A	N/A
10327764	12/2018	Harris et al.	N/A	N/A
10327765	12/2018	Timm et al.	N/A	N/A
10327767	12/2018	Shelton, IV et al.	N/A	N/A
10327769	12/2018	Overmyer et al.	N/A	N/A
10327776	12/2018	Harris et al.	N/A	N/A
10327777	12/2018	Harris et al.	N/A	N/A
D854032	12/2018	Jones et al.	N/A	N/A
D854151	12/2018	Shelton, IV et al.	N/A	N/A
10335144	12/2018	Shelton, IV et al.	N/A	N/A
10335145	12/2018	Harris et al.	N/A	N/A
10335147	12/2018	Rector et al.	N/A	N/A
10335148	12/2018	Shelton, IV et al.	N/A	N/A
10335149	12/2018	Baxter, III et al.	N/A	N/A
10335150	12/2018	Shelton, IV	N/A	N/A
10335151	12/2018	Shelton, IV et al.	N/A	N/A
10337148	12/2018	Rouse et al.	N/A	N/A
10342533	12/2018	Shelton, IV et al.	N/A	N/A
10342535	12/2018	Scheib et al.	N/A	N/A
10342541	12/2018	Shelton, IV et al.	N/A	N/A
10342543	12/2018	Shelton, IV et al.	N/A	N/A
10342623	12/2018	Huelman et al.	N/A	N/A
10349937	12/2018	Williams	N/A	N/A
10349939	12/2018	Shelton, IV et al.	N/A	N/A
10349941	12/2018	Marczyk et al.	N/A	N/A

10349963	12/2018	Fiksen et al.	N/A	N/A
10350016	12/2018	Burbank et al.	N/A	N/A
10357246	12/2018	Shelton, IV et al.	N/A	N/A
10357247	12/2018	Shelton, IV et al.	N/A	N/A
10357248	12/2018	Dalessandro et al.	N/A	N/A
10357252	12/2018	Harris et al.	N/A	N/A
10363031	12/2018	Alexander, III et al.	N/A	N/A
10363033	12/2018	Timm et al.	N/A	N/A
10363036	12/2018	Yates et al.	N/A	N/A
10363037	12/2018	Aronhalt et al.	N/A	N/A
D855634	12/2018	Kim	N/A	N/A
D856359	12/2018	Huang et al.	N/A	N/A
10368838	12/2018	Williams et al.	N/A	N/A
10368861	12/2018	Baxter, III et al.	N/A	N/A
10368863	12/2018	Timm et al.	N/A	N/A
10368864	12/2018	Harris et al.	N/A	N/A
10368865	12/2018	Harris et al.	N/A	N/A
10368866	12/2018	Wang et al.	N/A	N/A
10368867	12/2018	Harris et al.	N/A	N/A
10368892	12/2018	Stulen et al.	N/A	N/A
10374544	12/2018	Yokoyama et al.	N/A	N/A
10376263	12/2018	Morgan et al.	N/A	N/A
10383626	12/2018	Soltz	N/A	N/A
10383628	12/2018	Kang et al.	N/A	N/A
10383629	12/2018	Ross et al.	N/A	N/A
10383630	12/2018	Shelton, IV et al.	N/A	N/A
10383631	12/2018	Collings et al.	N/A	N/A
10383633	12/2018	Shelton, IV et al.	N/A	N/A
10383634	12/2018	Shelton, IV et al.	N/A	N/A
10390823	12/2018	Shelton, IV et al.	N/A	N/A
10390825	12/2018	Shelton, IV et al.	N/A	N/A
10390828	12/2018	Vendely et al.	N/A	N/A
10390829	12/2018	Eckert et al.	N/A	N/A
10390830	12/2018	Schulz	N/A	N/A
10390841	12/2018	Shelton, IV et al.	N/A	N/A
10390897	12/2018	Kostrzewski	N/A	N/A
D859466	12/2018	Okada et al.	N/A	N/A
D860219	12/2018	Rasmussen et al.	N/A	N/A
D861035	12/2018	Park et al.	N/A	N/A
10398433	12/2018	Boudreaux et al.	N/A	N/A
10398434	12/2018	Shelton, IV et al.	N/A	N/A
10398436	12/2018	Shelton, IV et al.	N/A	N/A
10398460	12/2018	Overmyer	N/A	N/A
10404136	12/2018	Oktavec et al.	N/A	N/A
10405854	12/2018	Schmid et al.	N/A	N/A
10405857	12/2018	Shelton, IV et al.	N/A	N/A
10405859	12/2018	Harris et al.	N/A	N/A
10405863	12/2018	Wise et al.	N/A	N/A
10405914	12/2018	Manwaring et al.	N/A	N/A
10405932	12/2018	Overmyer	N/A	N/A

10405937	12/2018	Black et al.	N/A	N/A
10413155	12/2018	Inoue	N/A	N/A
10413291	12/2018	Worthington et al.	N/A	N/A
10413293	12/2018	Shelton, IV et al.	N/A	N/A
10413294	12/2018	Shelton, IV et al.	N/A	N/A
10413297	12/2018	Harris et al.	N/A	N/A
10413370	12/2018	Yates et al.	N/A	N/A
10413373	12/2018	Yates et al.	N/A	N/A
10420548	12/2018	Whitman et al.	N/A	N/A
10420549	12/2018	Yates et al.	N/A	N/A
10420550	12/2018	Shelton, IV	N/A	N/A
10420551	12/2018	Calderoni	N/A	N/A
10420552	12/2018	Shelton, IV et al.	N/A	N/A
10420553	12/2018	Shelton, IV et al.	N/A	N/A
10420554	12/2018	Collings et al.	N/A	N/A
10420555	12/2018	Shelton, IV et al.	N/A	N/A
10420558	12/2018	Nalagatla et al.	N/A	N/A
10420559	12/2018	Marczyk et al.	N/A	N/A
10420560	12/2018	Shelton, IV et al.	N/A	N/A
10420561	12/2018	Shelton, IV et al.	N/A	N/A
10420577	12/2018	Chowaniec et al.	N/A	N/A
D861707	12/2018	Yang	N/A	N/A
D862518	12/2018	Niven et al.	N/A	N/A
D863343	12/2018	Mazlish et al.	N/A	N/A
D864388	12/2018	Barber	N/A	N/A
D865174	12/2018	Auld et al.	N/A	N/A
D865175	12/2018	Widenhouse et al.	N/A	N/A
10426463	12/2018	Shelton, IV et al.	N/A	N/A
10426466	12/2018	Contini et al.	N/A	N/A
10426467	12/2018	Miller et al.	N/A	N/A
10426468	12/2018	Contini et al.	N/A	N/A
10426469	12/2018	Shelton, IV et al.	N/A	N/A
10426471	12/2018	Shelton, IV et al.	N/A	N/A
10426476	12/2018	Harris et al.	N/A	N/A
10426477	12/2018	Harris et al.	N/A	N/A
10426478	12/2018	Shelton, IV et al.	N/A	N/A
10426481	12/2018	Aronhalt et al.	N/A	N/A
10426555	12/2018	Crowley et al.	N/A	N/A
10433837	12/2018	Worthington et al.	N/A	N/A
10433839	12/2018	Scheib et al.	N/A	N/A
10433840	12/2018	Shelton, IV et al.	N/A	N/A
10433842	12/2018	Amariglio et al.	N/A	N/A
10433844	12/2018	Shelton, IV et al.	N/A	N/A
10433845	12/2018	Baxter, III et al.	N/A	N/A
10433846	12/2018	Vendely et al.	N/A	N/A
10433849	12/2018	Shelton, IV et al.	N/A	N/A
10433918	12/2018	Shelton, IV et al.	N/A	N/A
10441279	12/2018	Shelton, IV et al.	N/A	N/A
10441280	12/2018	Timm et al.	N/A	N/A
10441281	12/2018	Shelton, IV et al.	N/A	N/A

10441285	12/2018	Shelton, IV et al.	N/A	N/A
10441286	12/2018	Shelton, IV et al.	N/A	N/A
10441345	12/2018	Aldridge et al.	N/A	N/A
10441369	12/2018	Shelton, IV et al.	N/A	N/A
10448948	12/2018	Shelton, IV et al.	N/A	N/A
10448950	12/2018	Shelton, IV et al.	N/A	N/A
10448952	12/2018	Shelton, IV et al.	N/A	N/A
10456122	12/2018	Koltz et al.	N/A	N/A
10456132	12/2018	Gettinger et al.	N/A	N/A
10456133	12/2018	Yates et al.	N/A	N/A
10456137	12/2018	Vendely et al.	N/A	N/A
10456140	12/2018	Shelton, IV et al.	N/A	N/A
D865796	12/2018	Xu et al.	N/A	N/A
10463367	12/2018	Kostrzewski et al.	N/A	N/A
10463369	12/2018	Shelton, IV et al.	N/A	N/A
10463370	12/2018	Yates et al.	N/A	N/A
10463371	12/2018	Kostrzewski	N/A	N/A
10463372	12/2018	Shelton, IV et al.	N/A	N/A
10463373	12/2018	Mozdzierz et al.	N/A	N/A
10463382	12/2018	Ingmanson et al.	N/A	N/A
10463383	12/2018	Shelton, IV et al.	N/A	N/A
10463384	12/2018	Shelton, IV et al.	N/A	N/A
10470762	12/2018	Leimbach et al.	N/A	N/A
10470763	12/2018	Yates et al.	N/A	N/A
10470764	12/2018	Baxter, III et al.	N/A	N/A
10470767	12/2018	Gleiman et al.	N/A	N/A
10470768	12/2018	Harris et al.	N/A	N/A
10470769	12/2018	Shelton, IV et al.	N/A	N/A
10471282	12/2018	Kirk et al.	N/A	N/A
10471576	12/2018	Totsu	N/A	N/A
10471607	12/2018	Butt et al.	N/A	N/A
10478181	12/2018	Shelton, IV et al.	N/A	N/A
10478182	12/2018	Taylor	N/A	N/A
10478185	12/2018	Nicholas	N/A	N/A
10478187	12/2018	Shelton, IV et al.	N/A	N/A
10478188	12/2018	Harris et al.	N/A	N/A
10478189	12/2018	Bear et al.	N/A	N/A
10478190	12/2018	Miller et al.	N/A	N/A
10478207	12/2018	Lathrop	N/A	N/A
10482292	12/2018	Clouser et al.	N/A	N/A
10485536	12/2018	Ming et al.	N/A	N/A
10485537	12/2018	Yates et al.	N/A	N/A
10485539	12/2018	Shelton, IV et al.	N/A	N/A
10485541	12/2018	Shelton, IV et al.	N/A	N/A
10485542	12/2018	Shelton, IV et al.	N/A	N/A
10485543	12/2018	Shelton, IV et al.	N/A	N/A
10485546	12/2018	Shelton, IV et al.	N/A	N/A
10485547	12/2018	Shelton, IV et al.	N/A	N/A
D869655	12/2018	Shelton, IV et al.	N/A	N/A
D870742	12/2018	Cornell	N/A	N/A

10492783	12/2018	Shelton, IV et al.	N/A	N/A
10492785	12/2018	Overmyer et al.	N/A	N/A
10492787	12/2018	Smith et al.	N/A	N/A
10492814	12/2018	Snow et al.	N/A	N/A
10492847	12/2018	Godara et al.	N/A	N/A
10492851	12/2018	Hughett, Sr. et al.	N/A	N/A
10498269	12/2018	Zemlok et al.	N/A	N/A
10499890	12/2018	Shelton, IV et al.	N/A	N/A
10499914	12/2018	Huang et al.	N/A	N/A
10499917	12/2018	Scheib et al.	N/A	N/A
10499918	12/2018	Schellin et al.	N/A	N/A
10500000	12/2018	Swayze et al.	N/A	N/A
10500004	12/2018	Hanuschik et al.	N/A	N/A
10500309	12/2018	Shah et al.	N/A	N/A
10507034	12/2018	Timm	N/A	N/A
10508720	12/2018	Nicholas	N/A	N/A
10512461	12/2018	Gupta et al.	N/A	N/A
10512462	12/2018	Felder et al.	N/A	N/A
10512464	12/2018	Park et al.	N/A	N/A
10517590	12/2018	Giordano et al.	N/A	N/A
10517592	12/2018	Shelton, IV et al.	N/A	N/A
10517594	12/2018	Shelton, IV et al.	N/A	N/A
10517595	12/2018	Hunter et al.	N/A	N/A
10517596	12/2018	Hunter et al.	N/A	N/A
10517599	12/2018	Baxter, III et al.	N/A	N/A
10517682	12/2018	Giordano et al.	N/A	N/A
10524784	12/2019	Kostrzewski	N/A	N/A
10524787	12/2019	Shelton, IV et al.	N/A	N/A
10524788	12/2019	Vendely et al.	N/A	N/A
10524789	12/2019	Swayze et al.	N/A	N/A
10524790	12/2019	Shelton, IV et al.	N/A	N/A
10524795	12/2019	Nalagatla et al.	N/A	N/A
10524870	12/2019	Saraliev et al.	N/A	N/A
10531874	12/2019	Morgan et al.	N/A	N/A
10531887	12/2019	Shelton, IV et al.	N/A	N/A
10537324	12/2019	Shelton, IV et al.	N/A	N/A
10537325	12/2019	Bakos et al.	N/A	N/A
10537351	12/2019	Shelton, IV et al.	N/A	N/A
10542908	12/2019	Mei et al.	N/A	N/A
10542974	12/2019	Yates et al.	N/A	N/A
10542976	12/2019	Calderoni et al.	N/A	N/A
10542978	12/2019	Chowaniec et al.	N/A	N/A
10542979	12/2019	Shelton, IV et al.	N/A	N/A
10542982	12/2019	Beckman et al.	N/A	N/A
10542985	12/2019	Zhan et al.	N/A	N/A
10542988	12/2019	Schellin et al.	N/A	N/A
10542991	12/2019	Shelton, IV et al.	N/A	N/A
10548504	12/2019	Shelton, IV et al.	N/A	N/A
10548593	12/2019	Shelton, IV et al.	N/A	N/A
10548600	12/2019	Shelton, IV et al.	N/A	N/A

10548673	12/2019	Harris et al.	N/A	N/A
10561412	12/2019	Bookbinder et al.	N/A	N/A
10561418	12/2019	Richard et al.	N/A	N/A
10561419	12/2019	Beardsley	N/A	N/A
10561420	12/2019	Harris et al.	N/A	N/A
10561422	12/2019	Schellin et al.	N/A	N/A
10561432	12/2019	Estrella et al.	N/A	N/A
10561474	12/2019	Adams et al.	N/A	N/A
10562160	12/2019	Iwata et al.	N/A	N/A
10568493	12/2019	Blase et al.	N/A	N/A
10568621	12/2019	Shelton, IV et al.	N/A	N/A
10568624	12/2019	Shelton, IV et al.	N/A	N/A
10568625	12/2019	Harris et al.	N/A	N/A
10568626	12/2019	Shelton, IV et al.	N/A	N/A
10568629	12/2019	Shelton, IV et al.	N/A	N/A
10568632	12/2019	Miller et al.	N/A	N/A
10568652	12/2019	Hess et al.	N/A	N/A
10569071	12/2019	Harris et al.	N/A	N/A
D879808	12/2019	Harris et al.	N/A	N/A
D879809	12/2019	Harris et al.	N/A	N/A
10575868	12/2019	Hall et al.	N/A	N/A
10580320	12/2019	Kamiguchi et al.	N/A	N/A
10582928	12/2019	Hunter et al.	N/A	N/A
10588231	12/2019	Sgroi, Jr. et al.	N/A	N/A
10588623	12/2019	Schmid et al.	N/A	N/A
10588625	12/2019	Weaner et al.	N/A	N/A
10588626	12/2019	Overmyer et al.	N/A	N/A
10588629	12/2019	Malinouskas et al.	N/A	N/A
10588630	12/2019	Shelton, IV et al.	N/A	N/A
10588631	12/2019	Shelton, IV et al.	N/A	N/A
10588632	12/2019	Shelton, IV et al.	N/A	N/A
10588633	12/2019	Shelton, IV et al.	N/A	N/A
10589410	12/2019	Aho	N/A	N/A
10595835	12/2019	Kerr et al.	N/A	N/A
10595862	12/2019	Shelton, IV et al.	N/A	N/A
10595882	12/2019	Parfett et al.	N/A	N/A
10595887	12/2019	Shelton, IV et al.	N/A	N/A
10595929	12/2019	Boudreaux et al.	N/A	N/A
10603036	12/2019	Hunter et al.	N/A	N/A
10603039	12/2019	Vendely et al.	N/A	N/A
10603041	12/2019	Miller et al.	N/A	N/A
10603117	12/2019	Schings et al.	N/A	N/A
10603128	12/2019	Zergiebel et al.	N/A	N/A
D882783	12/2019	Shelton, IV et al.	N/A	N/A
10610224	12/2019	Shelton, IV et al.	N/A	N/A
10610225	12/2019	Reed et al.	N/A	N/A
10610236	12/2019	Baril	N/A	N/A
10610313	12/2019	Bailey et al.	N/A	N/A
10610346	12/2019	Schwartz	N/A	N/A
10617411	12/2019	Williams	N/A	N/A

10617412	12/2019	Shelton, IV et al.	N/A	N/A
10617413	12/2019	Shelton, IV et al.	N/A	N/A
10617414	12/2019	Shelton, IV et al.	N/A	N/A
10617416	12/2019	Leimbach et al.	N/A	N/A
10617417	12/2019	Baxter, III et al.	N/A	N/A
10617418	12/2019	Barton et al.	N/A	N/A
10617420	12/2019	Shelton, IV et al.	N/A	N/A
10617438	12/2019	O'Keefe et al.	N/A	N/A
10624616	12/2019	Mukherjee et al.	N/A	N/A
10624630	12/2019	Deville et al.	N/A	N/A
10624633	12/2019	Shelton, IV et al.	N/A	N/A
10624634	12/2019	Shelton, IV et al.	N/A	N/A
10624635	12/2019	Harris et al.	N/A	N/A
10624709	12/2019	Remm	N/A	N/A
10624861	12/2019	Widenhouse et al.	N/A	N/A
10625062	12/2019	Matlock et al.	N/A	N/A
10631857	12/2019	Kostrzewski	N/A	N/A
10631858	12/2019	Burbank	N/A	N/A
10631859	12/2019	Shelton, IV et al.	N/A	N/A
10631860	12/2019	Bakos et al.	N/A	N/A
10636104	12/2019	Mazar et al.	N/A	N/A
10639018	12/2019	Shelton, IV et al.	N/A	N/A
10639034	12/2019	Harris et al.	N/A	N/A
10639035	12/2019	Shelton, IV et al.	N/A	N/A
10639036	12/2019	Yates et al.	N/A	N/A
10639037	12/2019	Shelton, IV et al.	N/A	N/A
10639089	12/2019	Manwaring et al.	N/A	N/A
10639115	12/2019	Shelton, IV et al.	N/A	N/A
10642633	12/2019	Chopra et al.	N/A	N/A
10645905	12/2019	Gandola et al.	N/A	N/A
10646220	12/2019	Shelton, IV et al.	N/A	N/A
10646292	12/2019	Solomon et al.	N/A	N/A
10653413	12/2019	Worthington et al.	N/A	N/A
10653417	12/2019	Shelton, IV et al.	N/A	N/A
10653435	12/2019	Shelton, IV et al.	N/A	N/A
10660640	12/2019	Yates et al.	N/A	N/A
10667408	12/2019	Sgroi, Jr. et al.	N/A	N/A
D888953	12/2019	Baxter, III et al.	N/A	N/A
10667808	12/2019	Baxter, III et al.	N/A	N/A
10667809	12/2019	Bakos et al.	N/A	N/A
10667810	12/2019	Shelton, IV et al.	N/A	N/A
10667811	12/2019	Harris et al.	N/A	N/A
10667818	12/2019	McLain et al.	N/A	N/A
10674895	12/2019	Yeung et al.	N/A	N/A
10675021	12/2019	Harris et al.	N/A	N/A
10675024	12/2019	Shelton, IV et al.	N/A	N/A
10675025	12/2019	Swayze et al.	N/A	N/A
10675026	12/2019	Harris et al.	N/A	N/A
10675028	12/2019	Shelton, IV et al.	N/A	N/A
10675035	12/2019	Zingman	N/A	N/A

10675080	12/2019	Woloszko et al.	N/A	N/A
10675102	12/2019	Forgione et al.	N/A	N/A
10677035	12/2019	Balan et al.	N/A	N/A
10682134	12/2019	Shelton, IV et al.	N/A	N/A
10682136	12/2019	Harris et al.	N/A	N/A
10682137	12/2019	Stokes et al.	N/A	N/A
10682138	12/2019	Shelton, IV et al.	N/A	N/A
10682141	12/2019	Moore et al.	N/A	N/A
10682142	12/2019	Shelton, IV et al.	N/A	N/A
10687806	12/2019	Shelton, IV et al.	N/A	N/A
10687809	12/2019	Shelton, IV et al.	N/A	N/A
10687810	12/2019	Shelton, IV et al.	N/A	N/A
10687812	12/2019	Shelton, IV et al.	N/A	N/A
10687813	12/2019	Shelton, IV et al.	N/A	N/A
10687817	12/2019	Shelton, IV et al.	N/A	N/A
10687819	12/2019	Stokes et al.	N/A	N/A
10687904	12/2019	Harris et al.	N/A	N/A
10695053	12/2019	Hess et al.	N/A	N/A
10695055	12/2019	Shelton, IV et al.	N/A	N/A
10695057	12/2019	Shelton, IV et al.	N/A	N/A
10695058	12/2019	Lytle, IV et al.	N/A	N/A
10695062	12/2019	Leimbach et al.	N/A	N/A
10695063	12/2019	Morgan et al.	N/A	N/A
10695074	12/2019	Carusillo	N/A	N/A
10695081	12/2019	Shelton, IV et al.	N/A	N/A
10695119	12/2019	Smith	N/A	N/A
10695123	12/2019	Allen, IV	N/A	N/A
10695187	12/2019	Moskowitz et al.	N/A	N/A
D890784	12/2019	Shelton, IV et al.	N/A	N/A
10702266	12/2019	Parihar et al.	N/A	N/A
10702267	12/2019	Hess et al.	N/A	N/A
10702270	12/2019	Shelton, IV et al.	N/A	N/A
10702271	12/2019	Aranyi et al.	N/A	N/A
10705660	12/2019	Xiao	N/A	N/A
10709446	12/2019	Harris et al.	N/A	N/A
10709468	12/2019	Shelton, IV et al.	N/A	N/A
10709469	12/2019	Shelton, IV et al.	N/A	N/A
10709496	12/2019	Moua et al.	N/A	N/A
10716563	12/2019	Shelton, IV et al.	N/A	N/A
10716565	12/2019	Shelton, IV et al.	N/A	N/A
10716568	12/2019	Hall et al.	N/A	N/A
10716614	12/2019	Yates et al.	N/A	N/A
10717179	12/2019	Koenig et al.	N/A	N/A
10722232	12/2019	Yates et al.	N/A	N/A
10722233	12/2019	Wellman	N/A	N/A
10722292	12/2019	Arya et al.	N/A	N/A
10722293	12/2019	Arya et al.	N/A	N/A
10722317	12/2019	Ward et al.	N/A	N/A
D893717	12/2019	Messerly et al.	N/A	N/A
10729432	12/2019	Shelton, IV et al.	N/A	N/A

10729434	12/2019	Harris et al.	N/A	N/A
10729435	12/2019	Richard	N/A	N/A
10729436	12/2019	Shelton, IV et al.	N/A	N/A
10729443	12/2019	Cabrera et al.	N/A	N/A
10729458	12/2019	Stoddard et al.	N/A	N/A
10729501	12/2019	Leimbach et al.	N/A	N/A
10729509	12/2019	Shelton, IV et al.	N/A	N/A
10736616	12/2019	Scheib et al.	N/A	N/A
10736628	12/2019	Yates et al.	N/A	N/A
10736629	12/2019	Shelton, IV et al.	N/A	N/A
10736630	12/2019	Huang et al.	N/A	N/A
10736633	12/2019	Vendely et al.	N/A	N/A
10736634	12/2019	Shelton, IV et al.	N/A	N/A
10736636	12/2019	Baxter, III et al.	N/A	N/A
10736644	12/2019	Windolf et al.	N/A	N/A
10736702	12/2019	Harris et al.	N/A	N/A
10737398	12/2019	Remirez et al.	N/A	N/A
10743849	12/2019	Shelton, IV et al.	N/A	N/A
10743850	12/2019	Hibner et al.	N/A	N/A
10743851	12/2019	Swayze et al.	N/A	N/A
10743868	12/2019	Shelton, IV et al.	N/A	N/A
10743870	12/2019	Hall et al.	N/A	N/A
10743872	12/2019	Leimbach et al.	N/A	N/A
10743873	12/2019	Overmyer et al.	N/A	N/A
10743874	12/2019	Shelton, IV et al.	N/A	N/A
10743875	12/2019	Shelton, IV et al.	N/A	N/A
10743877	12/2019	Shelton, IV et al.	N/A	N/A
10743930	12/2019	Nagtegaal	N/A	N/A
10751048	12/2019	Whitman et al.	N/A	N/A
10751053	12/2019	Harris et al.	N/A	N/A
10751076	12/2019	Laurent et al.	N/A	N/A
10751138	12/2019	Giordano et al.	N/A	N/A
10758229	12/2019	Shelton, IV et al.	N/A	N/A
10758230	12/2019	Shelton, IV et al.	N/A	N/A
10758232	12/2019	Shelton, IV et al.	N/A	N/A
10758233	12/2019	Scheib et al.	N/A	N/A
10758259	12/2019	Demmy et al.	N/A	N/A
10765425	12/2019	Yates et al.	N/A	N/A
10765427	12/2019	Shelton, IV et al.	N/A	N/A
10765429	12/2019	Leimbach et al.	N/A	N/A
10765430	12/2019	Wixey	N/A	N/A
10765432	12/2019	Moore et al.	N/A	N/A
10765442	12/2019	Strobl	N/A	N/A
10772625	12/2019	Shelton, IV et al.	N/A	N/A
10772628	12/2019	Chen et al.	N/A	N/A
10772629	12/2019	Shelton, IV et al.	N/A	N/A
10772630	12/2019	Wixey	N/A	N/A
10772631	12/2019	Zergiebel et al.	N/A	N/A
10772632	12/2019	Kostrzewski	N/A	N/A
10772651	12/2019	Shelton, IV et al.	N/A	N/A

10779818	12/2019	Zemlok et al.	N/A	N/A
10779820	12/2019	Harris et al.	N/A	N/A
10779821	12/2019	Harris et al.	N/A	N/A
10779822	12/2019	Yates et al.	N/A	N/A
10779823	12/2019	Shelton, IV et al.	N/A	N/A
10779824	12/2019	Shelton, IV et al.	N/A	N/A
10779825	12/2019	Shelton, IV et al.	N/A	N/A
10779826	12/2019	Shelton, IV et al.	N/A	N/A
10779903	12/2019	Wise et al.	N/A	N/A
10780539	12/2019	Shelton, IV et al.	N/A	N/A
10786248	12/2019	Rousseau et al.	N/A	N/A
10786253	12/2019	Shelton, IV et al.	N/A	N/A
10786255	12/2019	Hodgkinson et al.	N/A	N/A
10792038	12/2019	Becerra et al.	N/A	N/A
10796471	12/2019	Leimbach et al.	N/A	N/A
10799240	12/2019	Shelton, IV et al.	N/A	N/A
10799306	12/2019	Robinson et al.	N/A	N/A
10806448	12/2019	Shelton, IV et al.	N/A	N/A
10806449	12/2019	Shelton, IV et al.	N/A	N/A
10806450	12/2019	Yates et al.	N/A	N/A
10806451	12/2019	Harris et al.	N/A	N/A
10806453	12/2019	Chen et al.	N/A	N/A
10806479	12/2019	Shelton, IV et al.	N/A	N/A
10813638	12/2019	Shelton, IV et al.	N/A	N/A
10813639	12/2019	Shelton, IV et al.	N/A	N/A
10813640	12/2019	Adams et al.	N/A	N/A
10813641	12/2019	Setser et al.	N/A	N/A
10813683	12/2019	Baxter, III et al.	N/A	N/A
10813705	12/2019	Hares et al.	N/A	N/A
10813710	12/2019	Grubbs	N/A	N/A
10820939	12/2019	Sartor	N/A	N/A
10828028	12/2019	Harris et al.	N/A	N/A
10828030	12/2019	Weir et al.	N/A	N/A
10828032	12/2019	Leimbach et al.	N/A	N/A
10828033	12/2019	Shelton, IV et al.	N/A	N/A
10828089	12/2019	Clark et al.	N/A	N/A
10835245	12/2019	Swayze et al.	N/A	N/A
10835246	12/2019	Shelton, IV et al.	N/A	N/A
10835247	12/2019	Shelton, IV et al.	N/A	N/A
10835249	12/2019	Schellin et al.	N/A	N/A
10835251	12/2019	Shelton, IV et al.	N/A	N/A
10835330	12/2019	Shelton, IV et al.	N/A	N/A
10842357	12/2019	Moskowitz et al.	N/A	N/A
10842473	12/2019	Scheib et al.	N/A	N/A
10842488	12/2019	Swayze et al.	N/A	N/A
10842489	12/2019	Shelton, IV	N/A	N/A
10842490	12/2019	DiNardo et al.	N/A	N/A
10842491	12/2019	Shelton, IV et al.	N/A	N/A
10842492	12/2019	Shelton, IV et al.	N/A	N/A
D904612	12/2019	Wynn et al.	N/A	N/A

D904613	12/2019	Wynn et al.	N/A	N/A
D906355	12/2019	Messerly et al.	N/A	N/A
10849621	12/2019	Whitfield et al.	N/A	N/A
10849623	12/2019	Dunki-Jacobs et al.	N/A	N/A
10849697	12/2019	Yates et al.	N/A	N/A
10856866	12/2019	Shelton, IV et al.	N/A	N/A
10856867	12/2019	Shelton, IV et al.	N/A	N/A
10856868	12/2019	Shelton, IV et al.	N/A	N/A
10856869	12/2019	Shelton, IV et al.	N/A	N/A
10856870	12/2019	Harris et al.	N/A	N/A
10863981	12/2019	Overmyer et al.	N/A	N/A
10863984	12/2019	Shelton, IV et al.	N/A	N/A
10863986	12/2019	Yates et al.	N/A	N/A
10869663	12/2019	Shelton, IV et al.	N/A	N/A
10869664	12/2019	Shelton, IV	N/A	N/A
10869665	12/2019	Shelton, IV et al.	N/A	N/A
10869666	12/2019	Shelton, IV et al.	N/A	N/A
10869669	12/2019	Shelton, IV et al.	N/A	N/A
10874290	12/2019	Walen et al.	N/A	N/A
10874391	12/2019	Shelton, IV et al.	N/A	N/A
10874392	12/2019	Scirica et al.	N/A	N/A
10874393	12/2019	Satti, III et al.	N/A	N/A
10874396	12/2019	Moore et al.	N/A	N/A
10874399	12/2019	Zhang	N/A	N/A
10879275	12/2019	Li et al.	N/A	N/A
D907647	12/2020	Siebel et al.	N/A	N/A
D907648	12/2020	Siebel et al.	N/A	N/A
D908216	12/2020	Messerly et al.	N/A	N/A
10881395	12/2020	Merchant et al.	N/A	N/A
10881396	12/2020	Shelton, IV et al.	N/A	N/A
10881399	12/2020	Shelton, IV et al.	N/A	N/A
10881401	12/2020	Baber et al.	N/A	N/A
10881446	12/2020	Strobl	N/A	N/A
10888318	12/2020	Parihar et al.	N/A	N/A
10888321	12/2020	Shelton, IV et al.	N/A	N/A
10888322	12/2020	Morgan et al.	N/A	N/A
10888323	12/2020	Chen et al.	N/A	N/A
10888325	12/2020	Harris et al.	N/A	N/A
10888328	12/2020	Shelton, IV et al.	N/A	N/A
10888329	12/2020	Moore et al.	N/A	N/A
10888330	12/2020	Moore et al.	N/A	N/A
10888369	12/2020	Messerly et al.	N/A	N/A
10892899	12/2020	Shelton, IV et al.	N/A	N/A
10893853	12/2020	Shelton, IV et al.	N/A	N/A
10893863	12/2020	Shelton, IV et al.	N/A	N/A
10893864	12/2020	Harris et al.	N/A	N/A
10893867	12/2020	Leimbach et al.	N/A	N/A
10898183	12/2020	Shelton, IV et al.	N/A	N/A
10898184	12/2020	Yates et al.	N/A	N/A
10898185	12/2020	Overmyer et al.	N/A	N/A

10898186	12/2020	Bakos et al.	N/A	N/A
10898190	12/2020	Yates et al.	N/A	N/A
10898193	12/2020	Shelton, IV et al.	N/A	N/A
10898194	12/2020	Moore et al.	N/A	N/A
10898195	12/2020	Moore et al.	N/A	N/A
10903685	12/2020	Yates et al.	N/A	N/A
D910847	12/2020	Shelton, IV et al.	N/A	N/A
10905415	12/2020	DiNardo et al.	N/A	N/A
10905418	12/2020	Shelton, IV et al.	N/A	N/A
10905420	12/2020	Jasemian et al.	N/A	N/A
10905422	12/2020	Bakos et al.	N/A	N/A
10905423	12/2020	Baber et al.	N/A	N/A
10905426	12/2020	Moore et al.	N/A	N/A
10905427	12/2020	Moore et al.	N/A	N/A
10911515	12/2020	Biasi et al.	N/A	N/A
10912559	12/2020	Harris et al.	N/A	N/A
10912562	12/2020	Dunki-Jacobs et al.	N/A	N/A
10912575	12/2020	Shelton, IV et al.	N/A	N/A
10918364	12/2020	Applegate et al.	N/A	N/A
10918380	12/2020	Morgan et al.	N/A	N/A
10918385	12/2020	Overmyer et al.	N/A	N/A
10918386	12/2020	Shelton, IV et al.	N/A	N/A
10919156	12/2020	Roberts et al.	N/A	N/A
10925600	12/2020	McCuen	N/A	N/A
10925605	12/2020	Moore et al.	N/A	N/A
D914878	12/2020	Shelton, IV et al.	N/A	N/A
10932772	12/2020	Shelton, IV et al.	N/A	N/A
10932774	12/2020	Shelton, IV	N/A	N/A
10932775	12/2020	Shelton, IV et al.	N/A	N/A
10932778	12/2020	Smith et al.	N/A	N/A
10932779	12/2020	Vendely et al.	N/A	N/A
10932784	12/2020	Mozdzierz et al.	N/A	N/A
10932804	12/2020	Scheib et al.	N/A	N/A
10932806	12/2020	Shelton, IV et al.	N/A	N/A
10932872	12/2020	Shelton, IV et al.	N/A	N/A
10944728	12/2020	Wiener et al.	N/A	N/A
10945727	12/2020	Shelton, IV et al.	N/A	N/A
10945728	12/2020	Morgan et al.	N/A	N/A
10945729	12/2020	Shelton, IV et al.	N/A	N/A
10945731	12/2020	Baxter, III et al.	N/A	N/A
10952708	12/2020	Scheib et al.	N/A	N/A
10952726	12/2020	Chowaniec	N/A	N/A
10952727	12/2020	Giordano et al.	N/A	N/A
10952728	12/2020	Shelton, IV et al.	N/A	N/A
10952759	12/2020	Messerly et al.	N/A	N/A
10952767	12/2020	Kostrzewski et al.	N/A	N/A
10959722	12/2020	Morgan et al.	N/A	N/A
10959725	12/2020	Kerr et al.	N/A	N/A
10959726	12/2020	Williams et al.	N/A	N/A
10959727	12/2020	Hunter et al.	N/A	N/A

10959731	12/2020	Casasanta, Jr. et al.	N/A	N/A
10959744	12/2020	Shelton, IV et al.	N/A	N/A
10959797	12/2020	Licht et al.	N/A	N/A
D917500	12/2020	Siebel et al.	N/A	N/A
10966627	12/2020	Shelton, IV et al.	N/A	N/A
10966717	12/2020	Shah et al.	N/A	N/A
10966718	12/2020	Shelton, IV et al.	N/A	N/A
10966791	12/2020	Harris et al.	N/A	N/A
10973515	12/2020	Harris et al.	N/A	N/A
10973516	12/2020	Shelton, IV et al.	N/A	N/A
10973517	12/2020	Wixey	N/A	N/A
10973519	12/2020	Weir et al.	N/A	N/A
10973520	12/2020	Shelton, IV et al.	N/A	N/A
10980534	12/2020	Yates et al.	N/A	N/A
10980535	12/2020	Yates et al.	N/A	N/A
10980536	12/2020	Weaner et al.	N/A	N/A
10980537	12/2020	Shelton, IV et al.	N/A	N/A
10980538	12/2020	Nalagatla et al.	N/A	N/A
10980539	12/2020	Harris et al.	N/A	N/A
10980560	12/2020	Shelton, IV et al.	N/A	N/A
10983646	12/2020	Yoon et al.	N/A	N/A
10987102	12/2020	Gonzalez et al.	N/A	N/A
10987178	12/2020	Shelton, IV et al.	N/A	N/A
10993713	12/2020	Shelton, IV et al.	N/A	N/A
10993715	12/2020	Shelton, IV et al.	N/A	N/A
10993716	12/2020	Shelton, IV et al.	N/A	N/A
10993717	12/2020	Shelton, IV et al.	N/A	N/A
11000274	12/2020	Shelton, IV et al.	N/A	N/A
11000275	12/2020	Shelton, IV et al.	N/A	N/A
11000277	12/2020	Giordano et al.	N/A	N/A
11000278	12/2020	Shelton, IV et al.	N/A	N/A
11000279	12/2020	Shelton, IV et al.	N/A	N/A
11005291	12/2020	Calderoni	N/A	N/A
11006951	12/2020	Giordano et al.	N/A	N/A
11006955	12/2020	Shelton, IV et al.	N/A	N/A
11007004	12/2020	Shelton, IV et al.	N/A	N/A
11007022	12/2020	Shelton, IV et al.	N/A	N/A
11013511	12/2020	Huang et al.	N/A	N/A
11013552	12/2020	Widenhouse et al.	N/A	N/A
11013563	12/2020	Shelton, IV et al.	N/A	N/A
11020016	12/2020	Wallace et al.	N/A	N/A
11020112	12/2020	Shelton, IV et al.	N/A	N/A
11020113	12/2020	Shelton, IV et al.	N/A	N/A
11020114	12/2020	Shelton, IV et al.	N/A	N/A
11020115	12/2020	Scheib et al.	N/A	N/A
11026678	12/2020	Overmyer et al.	N/A	N/A
11026680	12/2020	Shelton, IV et al.	N/A	N/A
11026684	12/2020	Shelton, IV et al.	N/A	N/A
11026687	12/2020	Shelton, IV et al.	N/A	N/A
11026712	12/2020	Shelton, IV et al.	N/A	N/A

11026713	12/2020	Stokes et al.	N/A	N/A
11026751	12/2020	Shelton, IV et al.	N/A	N/A
11033267	12/2020	Shelton, IV et al.	N/A	N/A
11039834	12/2020	Harris et al.	N/A	N/A
11039836	12/2020	Shelton, IV et al.	N/A	N/A
11039837	12/2020	Shelton, IV et al.	N/A	N/A
11039849	12/2020	Bucciaglia et al.	N/A	N/A
11045189	12/2020	Yates et al.	N/A	N/A
11045191	12/2020	Shelton, IV et al.	N/A	N/A
11045192	12/2020	Harris et al.	N/A	N/A
11045196	12/2020	Olson et al.	N/A	N/A
11045197	12/2020	Shelton, IV et al.	N/A	N/A
11045199	12/2020	Mozdzierz et al.	N/A	N/A
11045270	12/2020	Shelton, IV et al.	N/A	N/A
11051807	12/2020	Shelton, IV et al.	N/A	N/A
11051810	12/2020	Harris et al.	N/A	N/A
11051811	12/2020	Shelton, IV et al.	N/A	N/A
11051813	12/2020	Shelton, IV et al.	N/A	N/A
11051836	12/2020	Shelton, IV et al.	N/A	N/A
11051840	12/2020	Shelton, IV et al.	N/A	N/A
11051873	12/2020	Wiener et al.	N/A	N/A
11058418	12/2020	Shelton, IV et al.	N/A	N/A
11058420	12/2020	Shelton, IV et al.	N/A	N/A
11058422	12/2020	Harris et al.	N/A	N/A
11058423	12/2020	Shelton, IV et al.	N/A	N/A
11058424	12/2020	Shelton, IV et al.	N/A	N/A
11058425	12/2020	Widenhouse et al.	N/A	N/A
11058426	12/2020	Nalagatla et al.	N/A	N/A
11058498	12/2020	Shelton, IV et al.	N/A	N/A
11064997	12/2020	Shelton, IV et al.	N/A	N/A
11064998	12/2020	Shelton, IV	N/A	N/A
11065048	12/2020	Messerly et al.	N/A	N/A
11069012	12/2020	Shelton, IV et al.	N/A	N/A
11071542	12/2020	Chen et al.	N/A	N/A
11071543	12/2020	Shelton, IV et al.	N/A	N/A
11071545	12/2020	Baber et al.	N/A	N/A
11071554	12/2020	Parfett et al.	N/A	N/A
11071560	12/2020	Deck et al.	N/A	N/A
11076853	12/2020	Parfett et al.	N/A	N/A
11076854	12/2020	Baber et al.	N/A	N/A
11076921	12/2020	Shelton, IV et al.	N/A	N/A
11076929	12/2020	Shelton, IV et al.	N/A	N/A
11083452	12/2020	Schmid et al.	N/A	N/A
11083453	12/2020	Shelton, IV et al.	N/A	N/A
11083454	12/2020	Harris et al.	N/A	N/A
11083455	12/2020	Shelton, IV et al.	N/A	N/A
11083456	12/2020	Shelton, IV et al.	N/A	N/A
11083457	12/2020	Shelton, IV et al.	N/A	N/A
11083458	12/2020	Harris et al.	N/A	N/A
11090045	12/2020	Shelton, IV	N/A	N/A

11090046	12/2020	Shelton, IV et al.	N/A	N/A
11090047	12/2020	Shelton, IV et al.	N/A	N/A
11090048	12/2020	Fanelli et al.	N/A	N/A
11090049	12/2020	Bakos et al.	N/A	N/A
11090075	12/2020	Hunter et al.	N/A	N/A
11096688	12/2020	Shelton, IV et al.	N/A	N/A
11096689	12/2020	Overmyer et al.	N/A	N/A
11100631	12/2020	Yates et al.	N/A	N/A
11103241	12/2020	Yates et al.	N/A	N/A
11103248	12/2020	Shelton, IV et al.	N/A	N/A
11103268	12/2020	Shelton, IV et al.	N/A	N/A
11103269	12/2020	Shelton, IV et al.	N/A	N/A
11109858	12/2020	Shelton, IV et al.	N/A	N/A
11109859	12/2020	Overmyer et al.	N/A	N/A
11109860	12/2020	Shelton, IV et al.	N/A	N/A
11109866	12/2020	Shelton, IV et al.	N/A	N/A
11109878	12/2020	Shelton, IV et al.	N/A	N/A
11109925	12/2020	Cooper et al.	N/A	N/A
11116485	12/2020	Scheib et al.	N/A	N/A
11116502	12/2020	Shelton, IV et al.	N/A	N/A
11116594	12/2020	Beardsley	N/A	N/A
11123069	12/2020	Baxter, III et al.	N/A	N/A
11123070	12/2020	Shelton, IV et al.	N/A	N/A
11129611	12/2020	Shelton, IV et al.	N/A	N/A
11129613	12/2020	Harris et al.	N/A	N/A
11129615	12/2020	Scheib et al.	N/A	N/A
11129616	12/2020	Shelton, IV et al.	N/A	N/A
11129634	12/2020	Scheib et al.	N/A	N/A
11129636	12/2020	Shelton, IV et al.	N/A	N/A
11129666	12/2020	Messerly et al.	N/A	N/A
11129680	12/2020	Shelton, IV et al.	N/A	N/A
11132462	12/2020	Shelton, IV et al.	N/A	N/A
11133106	12/2020	Shelton, IV et al.	N/A	N/A
11134938	12/2020	Timm et al.	N/A	N/A
11134940	12/2020	Shelton, IV et al.	N/A	N/A
11134942	12/2020	Harris et al.	N/A	N/A
11134943	12/2020	Giordano et al.	N/A	N/A
11134944	12/2020	Wise et al.	N/A	N/A
11134947	12/2020	Shelton, IV et al.	N/A	N/A
11135352	12/2020	Shelton, IV et al.	N/A	N/A
11141153	12/2020	Shelton, IV et al.	N/A	N/A
11141154	12/2020	Shelton, IV et al.	N/A	N/A
11141155	12/2020	Shelton, IV	N/A	N/A
11141156	12/2020	Shelton, IV	N/A	N/A
11141159	12/2020	Scheib et al.	N/A	N/A
11141160	12/2020	Shelton, IV et al.	N/A	N/A
11147547	12/2020	Shelton, IV et al.	N/A	N/A
11147549	12/2020	Timm et al.	N/A	N/A
11147551	12/2020	Shelton, IV	N/A	N/A
11147553	12/2020	Shelton, IV	N/A	N/A

11147554	12/2020	Aronhalt et al.	N/A	N/A
11154296	12/2020	Aronhalt et al.	N/A	N/A
11154297	12/2020	Swayze et al.	N/A	N/A
11154298	12/2020	Timm et al.	N/A	N/A
11154299	12/2020	Shelton, IV et al.	N/A	N/A
11154300	12/2020	Nalagatla et al.	N/A	N/A
11154301	12/2020	Beckman et al.	N/A	N/A
11160551	12/2020	Shelton, IV et al.	N/A	N/A
11160553	12/2020	Simms et al.	N/A	N/A
11160601	12/2020	Worrell et al.	N/A	N/A
11166716	12/2020	Shelton, IV et al.	N/A	N/A
11166717	12/2020	Shelton, IV et al.	N/A	N/A
11166720	12/2020	Giordano et al.	N/A	N/A
11166772	12/2020	Shelton, IV et al.	N/A	N/A
11166773	12/2020	Ragosta et al.	N/A	N/A
11172580	12/2020	Gaertner, II	N/A	N/A
11172927	12/2020	Shelton, IV	N/A	N/A
11172929	12/2020	Shelton, IV	N/A	N/A
11179150	12/2020	Yates et al.	N/A	N/A
11179151	12/2020	Shelton, IV et al.	N/A	N/A
11179152	12/2020	Morgan et al.	N/A	N/A
11179153	12/2020	Shelton, IV	N/A	N/A
11179155	12/2020	Shelton, IV et al.	N/A	N/A
11179208	12/2020	Yates et al.	N/A	N/A
11185325	12/2020	Shelton, IV et al.	N/A	N/A
11185330	12/2020	Huitema et al.	N/A	N/A
11191539	12/2020	Overmyer et al.	N/A	N/A
11191540	12/2020	Aronhalt et al.	N/A	N/A
11191543	12/2020	Overmyer et al.	N/A	N/A
11191545	12/2020	Vendely et al.	N/A	N/A
11197668	12/2020	Shelton, IV et al.	N/A	N/A
11197670	12/2020	Shelton, IV et al.	N/A	N/A
11197671	12/2020	Shelton, IV et al.	N/A	N/A
11197672	12/2020	Dunki-Jacobs et al.	N/A	N/A
11202570	12/2020	Shelton, IV et al.	N/A	N/A
11202631	12/2020	Shelton, IV et al.	N/A	N/A
11202633	12/2020	Harris et al.	N/A	N/A
11207064	12/2020	Shelton, IV et al.	N/A	N/A
11207065	12/2020	Harris et al.	N/A	N/A
11207067	12/2020	Shelton, IV et al.	N/A	N/A
11207089	12/2020	Kostrzewski et al.	N/A	N/A
11207090	12/2020	Shelton, IV et al.	N/A	N/A
11207146	12/2020	Shelton, IV et al.	N/A	N/A
11213293	12/2021	Worthington et al.	N/A	N/A
11213294	12/2021	Shelton, IV et al.	N/A	N/A
11213302	12/2021	Parfett et al.	N/A	N/A
11213359	12/2021	Shelton, IV et al.	N/A	N/A
11219453	12/2021	Shelton, IV et al.	N/A	N/A
11219455	12/2021	Shelton, IV et al.	N/A	N/A
11224423	12/2021	Shelton, IV et al.	N/A	N/A

11224426	12/2021	Shelton, IV et al.	N/A	N/A
11224427	12/2021	Shelton, IV et al.	N/A	N/A
11224428	12/2021	Scott et al.	N/A	N/A
11224454	12/2021	Shelton, IV et al.	N/A	N/A
11224497	12/2021	Shelton, IV et al.	N/A	N/A
11229436	12/2021	Shelton, IV et al.	N/A	N/A
11229437	12/2021	Shelton, IV et al.	N/A	N/A
11234698	12/2021	Shelton, IV et al.	N/A	N/A
11234700	12/2021	Ragosta et al.	N/A	N/A
11241229	12/2021	Shelton, IV et al.	N/A	N/A
11241230	12/2021	Shelton, IV et al.	N/A	N/A
11241235	12/2021	Shelton, IV et al.	N/A	N/A
11246590	12/2021	Swayze et al.	N/A	N/A
11246592	12/2021	Shelton, IV et al.	N/A	N/A
11246616	12/2021	Shelton, IV et al.	N/A	N/A
11246618	12/2021	Hall et al.	N/A	N/A
11246678	12/2021	Shelton, IV et al.	N/A	N/A
11253254	12/2021	Kimball et al.	N/A	N/A
11253256	12/2021	Harris et al.	N/A	N/A
11259799	12/2021	Overmyer et al.	N/A	N/A
11259803	12/2021	Shelton, IV et al.	N/A	N/A
11259805	12/2021	Shelton, IV et al.	N/A	N/A
11259806	12/2021	Shelton, IV et al.	N/A	N/A
11259807	12/2021	Shelton, IV et al.	N/A	N/A
11266405	12/2021	Shelton, IV et al.	N/A	N/A
11266406	12/2021	Leimbach et al.	N/A	N/A
11266409	12/2021	Huitema et al.	N/A	N/A
11266410	12/2021	Shelton, IV et al.	N/A	N/A
11266468	12/2021	Shelton, IV et al.	N/A	N/A
11272927	12/2021	Swayze et al.	N/A	N/A
11272928	12/2021	Shelton, IV	N/A	N/A
11272931	12/2021	Boudreaux et al.	N/A	N/A
11272938	12/2021	Shelton, IV et al.	N/A	N/A
11278279	12/2021	Morgan et al.	N/A	N/A
11278280	12/2021	Shelton, IV et al.	N/A	N/A
11278284	12/2021	Shelton, IV et al.	N/A	N/A
11284890	12/2021	Nalagatla et al.	N/A	N/A
11284891	12/2021	Shelton, IV et al.	N/A	N/A
11284898	12/2021	Baxter, III et al.	N/A	N/A
11284953	12/2021	Shelton, IV et al.	N/A	N/A
11291440	12/2021	Harris et al.	N/A	N/A
11291441	12/2021	Giordano et al.	N/A	N/A
11291443	12/2021	Viola et al.	N/A	N/A
11291444	12/2021	Boudreaux et al.	N/A	N/A
11291445	12/2021	Shelton, IV et al.	N/A	N/A
11291447	12/2021	Shelton, IV et al.	N/A	N/A
11291449	12/2021	Swensgard et al.	N/A	N/A
11291451	12/2021	Shelton, IV	N/A	N/A
11291465	12/2021	Parihar et al.	N/A	N/A
11291510	12/2021	Shelton, IV et al.	N/A	N/A

11298125	12/2021	Ming et al.	N/A	N/A
11298127	12/2021	Shelton, IV	N/A	N/A
11298128	12/2021	Messerly et al.	N/A	N/A
11298129	12/2021	Bakos et al.	N/A	N/A
11298130	12/2021	Bakos et al.	N/A	N/A
11298132	12/2021	Shelton, IV et al.	N/A	N/A
11298134	12/2021	Huitema et al.	N/A	N/A
11304695	12/2021	Shelton, IV et al.	N/A	N/A
11304696	12/2021	Shelton, IV et al.	N/A	N/A
11304697	12/2021	Fanelli et al.	N/A	N/A
11304699	12/2021	Shelton, IV et al.	N/A	N/A
11304704	12/2021	Thomas et al.	N/A	N/A
11311290	12/2021	Shelton, IV et al.	N/A	N/A
11311292	12/2021	Shelton, IV et al.	N/A	N/A
11311294	12/2021	Swayze et al.	N/A	N/A
11311295	12/2021	Wingardner et al.	N/A	N/A
11311342	12/2021	Parihar et al.	N/A	N/A
D950728	12/2021	Bakos et al.	N/A	N/A
D952144	12/2021	Boudreaux	N/A	N/A
11317910	12/2021	Miller et al.	N/A	N/A
11317912	12/2021	Jenkins et al.	N/A	N/A
11317913	12/2021	Shelton, IV et al.	N/A	N/A
11317915	12/2021	Boudreaux et al.	N/A	N/A
11317917	12/2021	Shelton, IV et al.	N/A	N/A
11317919	12/2021	Shelton, IV et al.	N/A	N/A
11317978	12/2021	Cameron et al.	N/A	N/A
11324501	12/2021	Shelton, IV et al.	N/A	N/A
11324503	12/2021	Shelton, IV et al.	N/A	N/A
11324506	12/2021	Beckman et al.	N/A	N/A
11324557	12/2021	Shelton, IV et al.	N/A	N/A
11331100	12/2021	Boudreaux et al.	N/A	N/A
11331101	12/2021	Harris et al.	N/A	N/A
11337691	12/2021	Widenhouse et al.	N/A	N/A
11337693	12/2021	Hess et al.	N/A	N/A
11337698	12/2021	Baxter, III et al.	N/A	N/A
11344299	12/2021	Yates et al.	N/A	N/A
11344303	12/2021	Shelton, IV et al.	N/A	N/A
11350843	12/2021	Shelton, IV et al.	N/A	N/A
11350916	12/2021	Shelton, IV et al.	N/A	N/A
11350928	12/2021	Shelton, IV et al.	N/A	N/A
11350929	12/2021	Giordano et al.	N/A	N/A
11350932	12/2021	Shelton, IV et al.	N/A	N/A
11350934	12/2021	Bakos et al.	N/A	N/A
11350935	12/2021	Shelton, IV et al.	N/A	N/A
11350938	12/2021	Shelton, IV et al.	N/A	N/A
11357503	12/2021	Bakos et al.	N/A	N/A
11361176	12/2021	Shelton, IV et al.	N/A	N/A
11364027	12/2021	Harris et al.	N/A	N/A
11364046	12/2021	Shelton, IV et al.	N/A	N/A
11369368	12/2021	Shelton, IV et al.	N/A	N/A

11369376	12/2021	Simms et al.	N/A	N/A
11369377	12/2021	Boudreaux et al.	N/A	N/A
11373755	12/2021	Shelton, IV et al.	N/A	N/A
11376001	12/2021	Shelton, IV et al.	N/A	N/A
11376082	12/2021	Shelton, IV et al.	N/A	N/A
11376098	12/2021	Shelton, IV et al.	N/A	N/A
11382625	12/2021	Huitema et al.	N/A	N/A
11382626	12/2021	Shelton, IV et al.	N/A	N/A
11382627	12/2021	Huitema et al.	N/A	N/A
11382628	12/2021	Baxter, III et al.	N/A	N/A
11382638	12/2021	Harris et al.	N/A	N/A
11382697	12/2021	Shelton, IV et al.	N/A	N/A
11389160	12/2021	Shelton, IV et al.	N/A	N/A
11389161	12/2021	Shelton, IV et al.	N/A	N/A
11389162	12/2021	Baber et al.	N/A	N/A
11389164	12/2021	Yates et al.	N/A	N/A
11395651	12/2021	Shelton, IV et al.	N/A	N/A
11395652	12/2021	Parihar et al.	N/A	N/A
11399828	12/2021	Swayze et al.	N/A	N/A
11399829	12/2021	Leimbach et al.	N/A	N/A
11399831	12/2021	Overmyer et al.	N/A	N/A
11399837	12/2021	Shelton, IV et al.	N/A	N/A
11406377	12/2021	Schmid et al.	N/A	N/A
11406378	12/2021	Baxter, III et al.	N/A	N/A
11406380	12/2021	Yates et al.	N/A	N/A
11406381	12/2021	Parihar et al.	N/A	N/A
11406382	12/2021	Shelton, IV et al.	N/A	N/A
11406386	12/2021	Baber et al.	N/A	N/A
11406390	12/2021	Shelton, IV et al.	N/A	N/A
11406442	12/2021	Davison et al.	N/A	N/A
11410259	12/2021	Harris et al.	N/A	N/A
11413041	12/2021	Viola et al.	N/A	N/A
11413042	12/2021	Shelton, IV et al.	N/A	N/A
11413102	12/2021	Shelton, IV et al.	N/A	N/A
11419606	12/2021	Overmyer et al.	N/A	N/A
11419630	12/2021	Yates et al.	N/A	N/A
11424027	12/2021	Shelton, IV	N/A	N/A
11426160	12/2021	Shelton, IV et al.	N/A	N/A
11426167	12/2021	Shelton, IV et al.	N/A	N/A
11426251	12/2021	Kimball et al.	N/A	N/A
D964564	12/2021	Boudreaux	N/A	N/A
11432816	12/2021	Leimbach et al.	N/A	N/A
11432885	12/2021	Shelton, IV et al.	N/A	N/A
11439391	12/2021	Bruns et al.	N/A	N/A
11439470	12/2021	Spivey et al.	N/A	N/A
11446029	12/2021	Shelton, IV et al.	N/A	N/A
11446034	12/2021	Shelton, IV et al.	N/A	N/A
11452526	12/2021	Ross et al.	N/A	N/A
11452528	12/2021	Leimbach et al.	N/A	N/A
D966512	12/2021	Shelton, IV et al.	N/A	N/A

D967421	12/2021	Shelton, IV et al.	N/A	N/A
11457918	12/2021	Shelton, IV et al.	N/A	N/A
11464511	12/2021	Timm et al.	N/A	N/A
11464512	12/2021	Shelton, IV et al.	N/A	N/A
11464513	12/2021	Shelton, IV et al.	N/A	N/A
11464514	12/2021	Yates et al.	N/A	N/A
11464601	12/2021	Shelton, IV et al.	N/A	N/A
11471155	12/2021	Shelton, IV et al.	N/A	N/A
11471156	12/2021	Shelton, IV et al.	N/A	N/A
11471157	12/2021	Baxter, III et al.	N/A	N/A
11478241	12/2021	Shelton, IV et al.	N/A	N/A
11478242	12/2021	Shelton, IV et al.	N/A	N/A
11478244	12/2021	DiNardo et al.	N/A	N/A
D971232	12/2021	Siebel et al.	N/A	N/A
11484307	12/2021	Hall et al.	N/A	N/A
11484309	12/2021	Harris et al.	N/A	N/A
11484310	12/2021	Shelton, IV et al.	N/A	N/A
11484311	12/2021	Shelton, IV et al.	N/A	N/A
11484312	12/2021	Shelton, IV et al.	N/A	N/A
11490889	12/2021	Overmyer et al.	N/A	N/A
11497488	12/2021	Leimbach et al.	N/A	N/A
11497489	12/2021	Baxter, III et al.	N/A	N/A
11497492	12/2021	Shelton, IV	N/A	N/A
11497499	12/2021	Shelton, IV et al.	N/A	N/A
11504116	12/2021	Schmid et al.	N/A	N/A
11504119	12/2021	Shelton, IV et al.	N/A	N/A
11504122	12/2021	Shelton, IV et al.	N/A	N/A
11504192	12/2021	Shelton, IV et al.	N/A	N/A
11510671	12/2021	Shelton, IV et al.	N/A	N/A
11510741	12/2021	Shelton, IV et al.	N/A	N/A
11517304	12/2021	Yates et al.	N/A	N/A
11517306	12/2021	Miller et al.	N/A	N/A
11517309	12/2021	Bakos et al.	N/A	N/A
11517311	12/2021	Lytle, IV et al.	N/A	N/A
11517315	12/2021	Huitema et al.	N/A	N/A
11517325	12/2021	Shelton, IV et al.	N/A	N/A
11517390	12/2021	Baxter, III	N/A	N/A
11523821	12/2021	Harris et al.	N/A	N/A
11523822	12/2021	Shelton, IV et al.	N/A	N/A
11523823	12/2021	Hunter et al.	N/A	N/A
11523859	12/2021	Shelton, IV et al.	N/A	N/A
11529137	12/2021	Shelton, IV et al.	N/A	N/A
11529138	12/2021	Jaworek et al.	N/A	N/A
11529139	12/2021	Shelton, IV et al.	N/A	N/A
11529140	12/2021	Shelton, IV et al.	N/A	N/A
11529142	12/2021	Leimbach et al.	N/A	N/A
11534162	12/2021	Shelton, IV	N/A	N/A
11534259	12/2021	Leimbach et al.	N/A	N/A
D974560	12/2022	Shelton, IV et al.	N/A	N/A
D975278	12/2022	Shelton, IV et al.	N/A	N/A

D975850	12/2022	Shelton, IV et al.	N/A	N/A
D975851	12/2022	Shelton, IV et al.	N/A	N/A
D976401	12/2022	Shelton, IV et al.	N/A	N/A
11540824	12/2022	Shelton, IV et al.	N/A	N/A
11540829	12/2022	Shelton, IV et al.	N/A	N/A
11547403	12/2022	Shelton, IV et al.	N/A	N/A
11547404	12/2022	Shelton, IV et al.	N/A	N/A
11553911	12/2022	Shelton, IV et al.	N/A	N/A
11553916	12/2022	Vendely et al.	N/A	N/A
11553919	12/2022	Shelton, IV et al.	N/A	N/A
11553971	12/2022	Shelton, IV et al.	N/A	N/A
11559302	12/2022	Timm et al.	N/A	N/A
11559303	12/2022	Shelton, IV et al.	N/A	N/A
11559304	12/2022	Boudreaux et al.	N/A	N/A
11559307	12/2022	Shelton, IV et al.	N/A	N/A
11559308	12/2022	Yates et al.	N/A	N/A
11559496	12/2022	Widenhouse et al.	N/A	N/A
11564679	12/2022	Parihar et al.	N/A	N/A
11564682	12/2022	Timm et al.	N/A	N/A
11564686	12/2022	Yates et al.	N/A	N/A
11564688	12/2022	Swayze et al.	N/A	N/A
11564703	12/2022	Shelton, IV et al.	N/A	N/A
11564756	12/2022	Shelton, IV et al.	N/A	N/A
11571207	12/2022	Shelton, IV et al.	N/A	N/A
11571210	12/2022	Shelton, IV et al.	N/A	N/A
11571212	12/2022	Yates et al.	N/A	N/A
11571215	12/2022	Shelton, IV et al.	N/A	N/A
11571231	12/2022	Hess et al.	N/A	N/A
11576668	12/2022	Shelton, IV et al.	N/A	N/A
11576672	12/2022	Shelton, IV et al.	N/A	N/A
11576673	12/2022	Shelton, IV	N/A	N/A
11576677	12/2022	Shelton, IV et al.	N/A	N/A
12016564	12/2023	Harris et al.	N/A	N/A
2001/0000531	12/2000	Casscells et al.	N/A	N/A
2001/0025183	12/2000	Shahidi	N/A	N/A
2001/0025184	12/2000	Messerly	N/A	N/A
2001/0030219	12/2000	Green et al.	N/A	N/A
2001/0034530	12/2000	Malackowski et al.	N/A	N/A
2001/0045442	12/2000	Whitman	N/A	N/A
2002/0014510	12/2001	Richter et al.	N/A	N/A
2002/0022810	12/2001	Urich	N/A	N/A
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2002/0023126	12/2001	Flavin	N/A	N/A
2002/0029032	12/2001	Arkin	N/A	N/A
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2002/0042620	12/2001	Julian et al.	N/A	N/A
2002/0054158	12/2001	Asami	N/A	N/A
2002/0065535	12/2001	Kneifel et al.	N/A	N/A
2002/0066764	12/2001	Perry et al.	N/A	N/A

2002/0082612	12/2001	Moll et al.	N/A	N/A
2002/0087048	12/2001	Brock et al.	N/A	N/A
2002/0087148	12/2001	Brock et al.	N/A	N/A
2002/0091374	12/2001	Cooper	N/A	N/A
2002/0095175	12/2001	Brock et al.	N/A	N/A
2002/0103494	12/2001	Pacey	N/A	N/A
2002/0111621	12/2001	Wallace et al.	N/A	N/A
2002/0111624	12/2001	Witt et al.	N/A	N/A
2002/0116063	12/2001	Giannetti et al.	N/A	N/A
2002/0117533	12/2001	Milliman et al.	N/A	N/A
2002/0117534	12/2001	Green et al.	N/A	N/A
2002/0127265	12/2001	Bowman et al.	N/A	N/A
2002/0128633	12/2001	Brock et al.	N/A	N/A
2002/0133236	12/2001	Rousseau	N/A	N/A
2002/0134811	12/2001	Napier et al.	N/A	N/A
2002/0135474	12/2001	Sylliassen	N/A	N/A
2002/0138086	12/2001	Sixto et al.	N/A	N/A
2002/0143340	12/2001	Kaneko	N/A	N/A
2002/0151770	12/2001	Noll et al.	N/A	N/A
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2002/0161277	12/2001	Boone et al.	N/A	N/A
2002/0177848	12/2001	Truckai et al.	N/A	N/A
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2002/0188170	12/2001	Santamore et al.	N/A	N/A
2002/0188287	12/2001	Zvuloni et al.	N/A	N/A
2003/0009193	12/2002	Corsaro	N/A	N/A
2003/0011245	12/2002	Fiebig	N/A	N/A
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2003/0045835	12/2002	Anderson et al.	N/A	N/A
2003/0047230	12/2002	Kim	N/A	N/A
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2003/0050628	12/2002	Whitman et al.	N/A	N/A
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2003/0083648	12/2002	Wang et al.	N/A	N/A
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2003/0190584	12/2002	Heasley	N/A	N/A
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2003/0205029	12/2002	Chapolini et al.	N/A	N/A
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2003/0236505	12/2002	Bonadio et al.	N/A	N/A
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2004/0028502	12/2003	Cummins	N/A	N/A
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2008/0108443	12/2007	Jinno et al.	N/A	N/A
2008/0114250	12/2007	Urbano et al.	N/A	N/A

2008/0125634	12/2007	Ryan et al.	N/A	N/A
2008/0125749	12/2007	Olson	N/A	N/A
2008/0126984	12/2007	Fleishman et al.	N/A	N/A
2008/0128469	12/2007	Dalessandro et al.	N/A	N/A
2008/0129253	12/2007	Shiue et al.	N/A	N/A
2008/0135600	12/2007	Hiranuma et al.	N/A	N/A
2008/0140115	12/2007	Stopek	N/A	N/A
2008/0140159	12/2007	Bornhoft et al.	N/A	N/A
2008/0149682	12/2007	Uhm	N/A	N/A
2008/0154299	12/2007	Livneh	N/A	N/A
2008/0154335	12/2007	Thrope et al.	N/A	N/A
2008/0169328	12/2007	Shelton	N/A	N/A
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2008/0196419	12/2007	Dube	N/A	N/A
2008/0197167	12/2007	Viola et al.	N/A	N/A
2008/0200755	12/2007	Bakos	N/A	N/A
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2008/0200911	12/2007	Long	N/A	N/A
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2008/0200934	12/2007	Fox	N/A	N/A
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2008/0234709	12/2007	Houser	N/A	N/A
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2008/0242939	12/2007	Johnston	N/A	N/A
2008/0243088	12/2007	Evans	N/A	N/A
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2008/0249608	12/2007	Dave	N/A	N/A
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2010/0256675	12/2009	Romans	N/A	N/A
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2012/0197239	12/2011	Smith et al.	N/A	N/A
2012/0197272	12/2011	Oray et al.	N/A	N/A
2012/0203213	12/2011	Kimball et al.	N/A	N/A
2012/0211542	12/2011	Racenet	N/A	N/A
2012/0220990	12/2011	Mckenzie et al.	N/A	N/A
2012/0233298	12/2011	Verbandt et al.	N/A	N/A
2012/0234895	12/2011	O'Connor et al.	N/A	N/A
2012/0234897	12/2011	Shelton, IV et al.	N/A	N/A
2012/0239068	12/2011	Morris et al.	N/A	N/A
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2012/0241499	12/2011	Baxter, III et al.	N/A	N/A
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2012/0248169	12/2011	Widenhouse et al.	N/A	N/A
2012/0251861	12/2011	Liang et al.	N/A	N/A
2012/0253328	12/2011	Cunningham et al.	N/A	N/A
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2012/0271327	12/2011	West et al.	N/A	N/A
2012/0283707	12/2011	Giordano et al.	N/A	N/A
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2012/0289979	12/2011	Eskaros et al.	N/A	N/A

2012/0292367	12/2011	Morgan et al.	N/A	N/A
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2012/0310254	12/2011	Manzo et al.	N/A	N/A
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2013/0158390	12/2012	Tan et al.	N/A	N/A
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2013/0169217	12/2012	Watanabe et al.	N/A	N/A
2013/0172713	12/2012	Kirschenman	N/A	N/A
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2017/0056016	12/2016	Barton et al.	N/A	N/A
2017/0056018	12/2016	Zeiner et al.	N/A	N/A
2017/0066054	12/2016	Birky	N/A	N/A
2017/0079642	12/2016	Overmyer et al.	N/A	N/A
2017/0086829	12/2016	Vendely et al.	N/A	N/A
2017/0086830	12/2016	Yates et al.	N/A	N/A
2017/0086842	12/2016	Shelton, IV et al.	N/A	N/A
2017/0086930	12/2016	Thompson et al.	N/A	N/A
2017/0086932	12/2016	Auld et al.	N/A	N/A
2017/0095922	12/2016	Licht et al.	N/A	N/A
2017/0105727	12/2016	Scheib et al.	N/A	N/A
2017/0105733	12/2016	Scheib et al.	N/A	N/A
2017/0105786	12/2016	Scheib et al.	N/A	N/A
2017/0106302	12/2016	Cummings et al.	N/A	N/A
2017/0135711	12/2016	Overmyer et al.	N/A	N/A
2017/0135717	12/2016	Boudreaux et al.	N/A	N/A
2017/0135747	12/2016	Broderick et al.	N/A	N/A
2017/0143336	12/2016	Shah et al.	N/A	N/A
2017/0168187	12/2016	Calderoni et al.	N/A	N/A
2017/0172382	12/2016	Nir et al.	N/A	N/A
2017/0172549	12/2016	Smaby et al.	N/A	N/A
2017/0172662	12/2016	Panescu et al.	N/A	N/A
2017/0181803	12/2016	Mayer-Ullmann et al.	N/A	N/A
2017/0182195	12/2016	Wagner	N/A	N/A
2017/0182211	12/2016	Raxworthy et al.	N/A	N/A
2017/0196558	12/2016	Morgan et al.	N/A	N/A
2017/0196649	12/2016	Yates et al.	N/A	N/A
2017/0202605	12/2016	Shelton, IV et al.	N/A	N/A
2017/0202607	12/2016	Shelton, IV et al.	N/A	N/A
2017/0202770	12/2016	Friedrich et al.	N/A	N/A
2017/0224332	12/2016	Hunter et al.	N/A	N/A
2017/0231628	12/2016	Shelton, IV et al.	N/A	N/A
2017/0231629	12/2016	Stopek et al.	N/A	N/A
2017/0238962	12/2016	Hansen et al.	N/A	N/A
2017/0242455	12/2016	Dickens	N/A	N/A
2017/0245949	12/2016	Randle	N/A	N/A
2017/0249431	12/2016	Shelton, IV et al.	N/A	N/A
2017/0252060	12/2016	Ellingson et al.	N/A	N/A
2017/0255799	12/2016	Zhao et al.	N/A	N/A
2017/0262110	12/2016	Polishchuk et al.	N/A	N/A
2017/0265774	12/2016	Johnson et al.	N/A	N/A
2017/0281186	12/2016	Shelton, IV et al.	N/A	N/A
2017/0296173	12/2016	Shelton, IV et al.	N/A	N/A
2017/0296185	12/2016	Swensgard et al.	N/A	N/A
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2017/0303984	12/2016	Malackowski	N/A	N/A
2017/0312042	12/2016	Giordano et al.	N/A	N/A
2017/0319047	12/2016	Poulsen et al.	N/A	N/A
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2017/0333034	12/2016	Morgan et al.	N/A	N/A

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2017/0348010	12/2016	Chiang	N/A	N/A
2017/0348043	12/2016	Wang et al.	N/A	N/A
2017/0354413	12/2016	Chen et al.	N/A	N/A
2017/0358052	12/2016	Yuan	N/A	N/A
2017/0360441	12/2016	Sgroi	N/A	N/A
2018/0008265	12/2017	Hatanaka et al.	N/A	N/A
2018/0042610	12/2017	Sgroi, Jr.	N/A	N/A
2018/0042689	12/2017	Mozdzierz et al.	N/A	N/A
2018/0049738	12/2017	Meloul et al.	N/A	N/A
2018/0049794	12/2017	Swayze et al.	N/A	N/A
2018/0051780	12/2017	Shelton, IV et al.	N/A	N/A
2018/0055501	12/2017	Zemlok et al.	N/A	N/A
2018/0067004	12/2017	Sgroi, Jr.	N/A	N/A
2018/0085117	12/2017	Shelton, IV et al.	N/A	N/A
2018/0085120	12/2017	Viola	N/A	N/A
2018/0092710	12/2017	Bosisio et al.	N/A	N/A
2018/0114591	12/2017	Pribanic et al.	N/A	N/A
2018/0116658	12/2017	Aronhalt, IV et al.	N/A	N/A
2018/0125481	12/2017	Yates et al.	N/A	N/A
2018/0125487	12/2017	Beardsley	N/A	N/A
2018/0125488	12/2017	Morgan et al.	N/A	N/A
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2018/0132849	12/2017	Miller et al.	N/A	N/A
2018/0132850	12/2017	Leimbach et al.	N/A	N/A
2018/0132926	12/2017	Asher et al.	N/A	N/A
2018/0132952	12/2017	Spivey et al.	N/A	N/A
2018/0133521	12/2017	Frushour et al.	N/A	N/A
2018/0140299	12/2017	Weaner et al.	N/A	N/A
2018/0146960	12/2017	Shelton, IV et al.	N/A	N/A
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2018/0153634	12/2017	Zemlok et al.	N/A	N/A
2018/0161034	12/2017	Scheib et al.	N/A	N/A
2018/0168572	12/2017	Burbank	N/A	N/A
2018/0168574	12/2017	Robinson et al.	N/A	N/A
2018/0168575	12/2017	Simms et al.	N/A	N/A
2018/0168577	12/2017	Aronhalt et al.	N/A	N/A
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2018/0168609	12/2017	Fanelli et al.	N/A	N/A
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2018/0168618	12/2017	Scott et al.	N/A	N/A
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2018/0168625	12/2017	Posada et al.	N/A	N/A
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2018/0168756	12/2017	Liao et al.	N/A	N/A
2018/0206904	12/2017	Felder et al.	N/A	N/A
2018/0228490	12/2017	Richard et al.	N/A	N/A
2018/0231111	12/2017	Mika et al.	N/A	N/A
2018/0231475	12/2017	Brown et al.	N/A	N/A
2018/0235609	12/2017	Harris et al.	N/A	N/A
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2018/0236181	12/2017	Marlin et al.	N/A	N/A
2018/0242970	12/2017	Mozdzierz	N/A	N/A
2018/0247711	12/2017	Terry	N/A	N/A
2018/0250002	12/2017	Eschbach	N/A	N/A
2018/0271553	12/2017	Worrell	N/A	N/A
2018/0271604	12/2017	Grout et al.	N/A	N/A
2018/0273597	12/2017	Stimson	N/A	N/A
2018/0279994	12/2017	Schaer et al.	N/A	N/A
2018/0280073	12/2017	Sanai et al.	N/A	N/A
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2018/0296216	12/2017	Shelton, IV et al.	N/A	N/A
2018/0296290	12/2017	Namiki et al.	N/A	N/A
2018/0317905	12/2017	Olson et al.	N/A	N/A
2018/0317915	12/2017	McDonald, II	N/A	N/A
2018/0325514	12/2017	Harris et al.	N/A	N/A
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2018/0368844	12/2017	Bakos et al.	N/A	N/A
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2019/0008515	12/2018	Beardsley et al.	N/A	N/A
2019/0015102	12/2018	Baber et al.	N/A	N/A
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2019/0017311	12/2018	McGettrick et al.	N/A	N/A
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2019/0091183	12/2018	Tomat et al.	N/A	N/A
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2019/0110779	12/2018	Gardner et al.	N/A	N/A
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2019/0125320	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125336	12/2018	Deck et al.	N/A	N/A
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2019/0125342	12/2018	Beardsley et al.	N/A	N/A
2019/0125344	12/2018	DiNardo et al.	N/A	N/A
2019/0125361	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125377	12/2018	Shelton, IV	N/A	N/A
2019/0125378	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125388	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125430	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125431	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125432	12/2018	Shelton, IV et al.	N/A	N/A
2019/0125454	12/2018	Stokes et al.	N/A	N/A
2019/0125476	12/2018	Shelton, IV et al.	N/A	N/A
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2019/0138770	12/2018	Compaijen et al.	N/A	N/A
2019/0142423	12/2018	Satti, III et al.	N/A	N/A
2019/0150925	12/2018	Marczyk et al.	N/A	N/A
2019/0151029	12/2018	Robinson	N/A	N/A
2019/0175847	12/2018	Pocreva, III et al.	N/A	N/A
2019/0183502	12/2018	Shelton, IV et al.	N/A	N/A
2019/0192146	12/2018	Widenhouse et al.	N/A	N/A
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2019/0192155	12/2018	Shelton, IV et al.	N/A	N/A
2019/0192157	12/2018	Scott et al.	N/A	N/A
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2019/0200905	12/2018	Shelton, IV et al.	N/A	N/A
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2019/0200981	12/2018	Harris et al.	N/A	N/A
2019/0200986	12/2018	Shelton, IV et al.	N/A	N/A
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2019/0201045	12/2018	Yates et al.	N/A	N/A
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2019/0261987	12/2018	Viola et al.	N/A	N/A
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2019/0269402	12/2018	Murray et al.	N/A	N/A
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2019/0290264	12/2018	Morgan et al.	N/A	N/A
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2020/0000531	12/2019	Giordano et al.	N/A	N/A
2020/0008802	12/2019	Aronhalt et al.	N/A	N/A
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2020/0008827	12/2019	Dearden et al.	N/A	N/A
2020/0015817	12/2019	Harris et al.	N/A	N/A
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2020/0030020	12/2019	Wang et al.	N/A	N/A
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2020/0038020	12/2019	Yates et al.	N/A	N/A
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2020/0100783	12/2019	Yates et al.	N/A	N/A
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2020/0114505	12/2019	Kikuchi	N/A	N/A
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2020/0197027	12/2019	Hershberger et al.	N/A	N/A
2020/0205810	12/2019	Posey et al.	N/A	N/A
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2020/0229814	12/2019	Amariglio et al.	N/A	N/A
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2020/0275927	12/2019	Shelton, IV et al.	N/A	N/A
2020/0275930	12/2019	Harris et al.	N/A	N/A
2020/0280219	12/2019	Laughery et al.	N/A	N/A
2020/0289112	12/2019	Whitfield et al.	N/A	N/A
2020/0297341	12/2019	Yates et al.	N/A	N/A
2020/0297346	12/2019	Shelton, IV et al.	N/A	N/A
2020/0305862	12/2019	Yates et al.	N/A	N/A
2020/0305863	12/2019	Yates et al.	N/A	N/A
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2020/0305870	12/2019	Shelton, IV	N/A	N/A
2020/0305872	12/2019	Weidner et al.	N/A	N/A
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2020/0345349	12/2019	Kimball et al.	N/A	N/A
2020/0345352	12/2019	Shelton, IV et al.	N/A	N/A
2020/0345353	12/2019	Leimbach et al.	N/A	N/A
2020/0345356	12/2019	Leimbach et al.	N/A	N/A
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2020/0345358	12/2019	Jenkins	N/A	N/A
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2020/0345363	12/2019	Shelton, IV et al.	N/A	N/A
2020/0345435	12/2019	Traina	N/A	N/A
2020/0352562	12/2019	Timm et al.	N/A	N/A
2020/0367886	12/2019	Shelton, IV et al.	N/A	N/A

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2020/0375597	12/2019	Shelton, IV et al.	N/A	N/A
2020/0390444	12/2019	Harris et al.	N/A	N/A
2020/0397430	12/2019	Patel et al.	N/A	N/A
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2021/0228209	12/2020	Shelton, IV et al.	N/A	N/A
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2021/0307748	12/2020	Harris et al.	N/A	N/A
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2021/0369273	12/2020	Yates et al.	N/A	N/A
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2021/0393261	12/2020	Harris et al.	N/A	N/A
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2022/0031322	12/2021	Parks	N/A	N/A
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2022/0061845	12/2021	Shelton, IV et al.	N/A	N/A
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2022/0133310	12/2021	Ross	N/A	N/A
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2022/0218332	12/2021	Shelton, IV et al.	N/A	N/A
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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation application claiming priority under 35 U.S.C. § 120 to U.S. patent application Ser. No. 16/411,411, entitled METHOD FOR CREATING A FLEXIBLE STAPLE LINE, now U.S. Patent Application Publication No. 2019/0328390, which is a continuation application claiming priority under 35 U.S.C. § 120 to U.S. patent application Ser. No. 14/498,145, entitled METHOD FOR CREATING A FLEXIBLE STAPLE LINE, filed Sep. 26, 2014, which issued on Jun. 25, 2019 as U.S. Pat. No. 10,327,764, the entire disclosures of which are hereby incorporated by reference herein.

BACKGROUND
(1) The present invention relates to stapling instruments and, in various embodiments, to a surgical stapling instrument for producing one or more rows of staples.
(2) A stapling instrument can include a pair of cooperating elongate jaw members, wherein each jaw member can be adapted to be inserted into a patient and positioned relative to tissue that is to be stapled and/or incised. In various embodiments, one of the jaw members can support a staple cartridge with at least two laterally spaced rows of staples contained therein, and the other jaw member can support an anvil with staple-forming pockets aligned with the rows of staples in the staple cartridge. Generally, the stapling instrument can further include a pusher bar and a knife blade which are slidable relative to the jaw members to sequentially eject the staples from the staple cartridge via camming surfaces on the pusher bar and/or camming surfaces on a wedge sled that is pushed by the pusher bar. In at least one embodiment, the camming surfaces can be configured to activate a plurality of staple drivers carried by the cartridge and associated with the staples in order to push the staples against the anvil and form laterally spaced rows of deformed staples in the tissue gripped between the jaw members. In at least one embodiment, the knife blade can trail the camming surfaces and cut the tissue along a line between the staple rows. Examples of

such stapling instruments are disclosed in U.S. Pat. No. 7,794,475, entitled SURGICAL STAPLES HAVING COMPRESSIBLE OR CRUSHABLE MEMBERS FOR SECURING TISSUE THEREIN AND STAPLING INSTRUMENTS FOR DEPLOYING THE SAME, the entire disclosure of which is hereby incorporated by reference herein.
(3) The foregoing discussion is intended only to illustrate various aspects of the related art in the field of the invention at the time, and should not be taken as a disavowal of claim scope.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) Various features of the embodiments described herein are set forth with particularity in the appended claims. The various embodiments, however, both as to organization and methods of operation, together with advantages thereof, may be understood in accordance with the following description taken in conjunction with the accompanying drawings as follows:
(2) FIG. **1** is a perspective view of a surgical fastening instrument in accordance with at least one embodiment;
(3) FIG. **2** is an exploded view of an end effector of the surgical fastening instrument of FIG. **1**;
(4) FIG. **3** is a top plan view of a fastener cartridge of the end effector of FIG. **2**;
(5) FIG. **4** is a bottom plan view of an anvil of the end effector of FIG. **2**;
(6) FIG. **5** is a partial bottom plan view of an anvil in accordance with at least one embodiment;
(7) FIG. **6** is a partial bottom plan view of an anvil in accordance with at least one embodiment;
(8) FIG. **7** is an exploded perspective view of an end effector including a staple cartridge that includes angularly-oriented staples, a group of first multi-staple drivers, and a group of second multi-staple drivers, according to various embodiments of the present disclosure;
(9) FIG. **8** is a perspective view of one of the first multi-staple drivers of FIG. **7**;
(10) FIG. **8**A is a plan view of the first multi-staple driver of FIG. **8**;
(11) FIG. **8**B is a perspective view of the first multi-staple driver of FIG. **8** and further showing staples of FIG. **7** supported by the multi-staple driver;
(12) FIG. **8**C is perspective view of one of the second multi-staple drivers of FIG. **7**;
(13) FIG. **8**D is a plan view of the second multi-staple driver of FIG. **8**C;
(14) FIG. **9** is a perspective view of the second multi-staple driver of FIG. **8**C and further showing staples of FIG. **7** supported by the multi-staple driver;
(15) FIG. **10** is a plan view of a staple cartridge according to various embodiments of the present disclosure;
(16) FIG. **11** is a plan view of an arrangement of multi-staple drivers and driving wedges, according to various embodiments of the present disclosure;
(17) FIG. **12** is a plan view of an arrangement of multi-staple drivers and driving wedges, according to various embodiments of the present disclosure;
(18) FIG. **13** is a plan view of an arrangement of multi-staple drivers and driving wedges, according to various embodiments of the present disclosure;
(19) FIG. **14** is a plan view of an arrangement of single-staple drivers and driving wedges, according to various embodiments of the present disclosure;
(20) FIG. **15** is an elevation view of the driving wedges of FIG. **14**;
(21) FIG. **16** is a plan view of an arrangement of staples and driving wedges, according to various embodiments of the present disclosure;
(22) FIG. **17** is a perspective view of a staple in accordance with at least one embodiment illustrated in an unformed, or unfired, configuration;
(23) FIG. **18** is an elevational view of the staple of FIG. **17**;
(24) FIG. **19** is an elevational view of the staple of FIG. **17** in a formed, or fired, configuration;

(25) FIG. **20** is an elevational view of a staple comprising an expandable coating in accordance with at least one embodiment illustrated in an unformed, or unfired, configuration;
(26) FIG. **21** is a partial bottom plan view of the staple of FIG. **20** deployed into the tissue of a patient;
(27) FIG. **22** is a partial bottom plan view of the staple of FIG. **20** deployed into the tissue of a patient illustrating the coating in an expanded condition;
(28) FIG. **23** depicts tissue stapled by a staple line in accordance with at least one embodiment;
(29) FIG. **24** depicts tissue stapled by a staple line in accordance with at least one embodiment;
(30) FIG. **25** depicts tissue stapled by a staple line in accordance with at least one embodiment;
(31) FIG. **26** is an elevation view of a driving wedge and a staple, according to various embodiments of the present disclosure;
(32) FIG. **27** is a perspective view of the driving wedge and the staple of FIG. **26**;
(33) FIG. **28** is a plan view of the driving wedge and the staple of FIG. **26**;
(34) FIG. **29** is a perspective view of a circular stapling device;
(35) FIG. **29**A is perspective view of a portion of a stapling head of a circular stapling device and a fastener cartridge assembly;
(36) FIG. **30** is a perspective view of portion of a stapling head of a circular stapling device and another fastener cartridge assembly;
(37) FIG. **31** is a perspective view of portion of a stapling head of a circular stapling device and another fastener cartridge assembly;
(38) FIG. **32** depicts tissue stapled by a staple line in accordance with at least one embodiment wherein at least some of the staples in the staple line overlap;
(39) FIG. **33** is a partial plan view of a staple cartridge configured to deploy the staple line of FIG. **32**;
(40) FIG. **34** is a partial plan view of an anvil configured to deform the staples ejected from the staple cartridge of FIG. **33**;
(41) FIG. **35** is a partial plan view of a staple cartridge configured to deploy a staple line in accordance with at least one embodiment;
(42) FIG. **36** is a partial plan view of an anvil configured to deform the staples ejected from the staple cartridge of FIG. **35**;
(43) FIG. **37** is an exploded perspective view of an end effector including a driverless staple cartridge having a sled, according to various embodiments of the present disclosure;
(44) FIG. **38** is a perspective view of the sled of FIG. **37**;
(45) FIG. **38**A is a partial plan view of the sled of FIG. **37** and a staple, depicting the deployment progression of the staple;
(46) FIG. **38**B is an elevation view of the sled of FIG. **37** and a staple, depicting the deployment progression of the staple;
(47) FIG. **39** is a perspective view of a sled for the driverless staple cartridge depicted in FIG. **37**, according to various embodiments of the present disclosure;
(48) FIG. **39**A is a partial plan view of a driverless staple cartridge having angled staples and the sled of FIG. **39**, according to various embodiments of the present disclosure;
(49) FIG. **39**B is a partial perspective view of the sled of FIG. **39** and the staples of FIG. **20**, according to various embodiments of the present disclosure;
(50) FIG. **40** is a partial, perspective view of a sled and a staple, according to various embodiments of the present disclosure;
(51) FIG. **41** is a plan view of an array of staples, according to various embodiments of the present disclosure;
(52) FIG. **42** is a plan view of an array of staples and driving wedges, according to various embodiments of the present disclosure;
(53) FIG. **43** is a partial perspective view of a staple cartridge having an arrangement of angled

staple cavities therein, according to various embodiments of the present disclosure;
(54) FIG. **44** is a partial plan view of the staple cartridge of FIG. **43**;
(55) FIG. **45** is a perspective cross-sectional partial view of the staple cartridge of FIG. **43**, depicting staples and drivers positioned within the staple cartridge;
(56) FIG. **46** is a partial, perspective view of a staple cartridge having an arrangement of angled staple cavities therein, according to various embodiments of the present disclosure;
(57) FIG. **47** is a partial, plan view of the staple cartridge of FIG. **46**;
(58) FIG. **48** is a partial, perspective cross-sectional view of the staple cartridge of FIG. **46**;
(59) FIG. **49** is a partial, perspective view of a staple cartridge having an arrangement of angled staple cavities therein, according to various embodiments of the present disclosure;
(60) FIG. **50** is a partial, plan view of the staple cartridge of FIG. **49**;
(61) FIG. **51** is a partial, perspective cross-sectional view of the staple cartridge of FIG. **49**, depicting staples and multi-staple drivers positioned within the staple cartridge;
(62) FIG. **52** depicts a previous staple pattern implanted in tissue;
(63) FIG. **52**A depicts the staple pattern deployed by the staple cartridge of FIG. **3**;
(64) FIG. **52**B depicts the staple pattern of FIG. **52**A in a stretched condition;
(65) FIG. **53** is a partial plan view of a staple cartridge comprising a cartridge body and an implantable adjunct material positioned on the cartridge body in accordance with at least one embodiment;
(66) FIG. **54** is a partial plan view of an implantable adjunct material in accordance with at least one embodiment;
(67) FIG. **55** is a partial plan view of a staple cartridge comprising a cartridge body and an implantable adjunct material positioned on the cartridge body in accordance with at least one embodiment;
(68) FIG. **56** is a partial plan view of an implantable adjunct material in accordance with at least one embodiment;
(69) FIG. **57** is a partial plan view of an implantable adjunct material in accordance with at least one embodiment;
(70) FIG. **58** is an exploded perspective view of an end effector and a portion of a surgical stapling instrument;
(71) FIG. **59** is a perspective view of a surgical staple cartridge with a buttress member supported on the deck of the staple cartridge in a position wherein the buttress may be removed from the cartridge;
(72) FIG. **60** is a top view of the surgical staple cartridge and buttress member of FIG. **59**;
(73) FIG. **61** is a perspective view of a portion of the surgical staple cartridge and buttress member of FIGS. **59** and **60**;
(74) FIG. **62** is a top view of another portion of the surgical staple cartridge and buttress member of FIGS. **59-61**:
(75) FIG. **63** is a perspective view of a proximal end of the surgical staple cartridge and buttress member of FIGS. **59-62**;
(76) FIG. **64** is another perspective view of the proximal end of the surgical staple cartridge and buttress member of FIGS. **59-63** with the retaining tab folded over for insertion into the longitudinal slot in the cartridge;
(77) FIG. **65** is another perspective view of the proximal end of the surgical staple cartridge and buttress member of FIGS. **59-64** with the retaining tab inserted into the longitudinal slot and retained therein by the staple sled;
(78) FIG. **66** is an exploded assembly view of another surgical staple cartridge and another buttress member;
(79) FIG. **67** is a bottom view of the buttress member of FIG. **66**;
(80) FIG. **68** is an enlarged view of a portion of the buttress member of FIG. **67**, with positions of

the underlying staple cavities in the staple cartridge shown in broken lines;
(81) FIG. **69** is an enlarged view of a portion of another buttress member, with positions of the underlying staple cavities in the staple cartridge shown in broken lines;
(82) FIG. **70** is a top view of a portion of another buttress member, with positions of the underlying staple cavities in the staple cartridge shown in broken lines;
(83) FIG. **71** is a top view of a portion of another buttress member;
(84) FIG. **72** is a cross-sectional view of the buttress member of FIG. **71** taken along line **72-72** in FIG. **71**;
(85) FIG. **73** is a perspective view of another surgical staple cartridge;
(86) FIG. **74** is a top view of the surgical staple cartridge of FIG. **73**;
(87) FIG. **75** is an enlarged perspective view of a portion of the surgical staple cartridge of FIGS. **73** and **74**;
(88) FIG. **76** is a top view of another surgical staple cartridge;
(89) FIG. **77** is a side elevational view of a portion of a surgical stapling device with tissue “T” clamped between the surgical staple cartridge of FIG. **76** and the anvil of the device;
(90) FIG. **78** is an enlarged view of a portion of the surgical staple cartridge of FIGS. **76** and **77** with a portion thereof shown in cross-section;
(91) FIG. **79** is a partial, cross-sectional elevation view of a staple cartridge and an anvil, according to various embodiments of the present disclosure; and
(92) FIG. **80** is a partial, cross-sectional elevation view of a staple cartridge and an anvil, according to various embodiments of the present disclosure.
(93) Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate various embodiments of the invention, in one form, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.
DETAILED DESCRIPTION
(94) Applicant of the present application owns the following patent applications which were filed on Sep. 26, 2014 and which are each herein incorporated by reference in their respective entireties:
(95) U.S. patent application Ser. No. 14/498,070, entitled CIRCULAR FASTENER CARTRIDGES FOR APPLYING RADIALLY EXPANDABLE FASTENER LINES, now U.S. Patent Application Publication No. 2016/0089146;
(96) U.S. patent application Ser. No. 14/498,087, entitled SURGICAL STAPLE AND DRIVER ARRANGEMENTS FOR STAPLE CARTRIDGES, now U.S. Pat. No. 10,206,677;
(97) U.S. patent application Ser. No. 14/498,105, entitled SURGICAL STAPLE AND DRIVER ARRANGEMENTS FOR STAPLE CARTRIDGES, now U.S. Pat. No. 9,801,628;
(98) U.S. patent application Ser. No. 14/498,107, entitled SURGICAL STAPLING BUTTRESSES AND ADJUNCT MATERIALS, now U.S. Pat. No. 9,943,310; and
(99) U.S. patent application Ser. No. 14/498,121, entitled FASTENER CARTRIDGE FOR CREATING A FLEXIBLE STAPLE LINE, now U.S. Pat. No. 9,801,627.
(100) Applicant of the present application owns the following patent applications which were filed on Jun. 30, 2014 and which are each herein incorporated by reference in their respective entireties:
(101) U.S. patent application Ser. No. 14/318,996, entitled FASTENER CARTRIDGES INCLUDING EXTENSIONS HAVING DIFFERENT CONFIGURATIONS, now U.S. Patent Application Publication No. 2015/0297228;
(102) U.S. patent application Ser. No. 14/319,006, entitled FASTENER CARTRIDGE COMPRISING FASTENER CAVITIES INCLUDING FASTENER CONTROL FEATURES, now U.S. Pat. No. 10,010,324;
(103) U.S. patent application Ser. No. 14/319,014, entitled END EFFECTOR COMPRISING AN ANVIL INCLUDING PROJECTIONS EXTENDING THEREFROM, now U.S. Patent Application Publication No. 2015/0297234;

(104) U.S. patent application Ser. No. 14/318,991, entitled SURGICAL FASTENER CARTRIDGES WITH DRIVER STABILIZING ARRANGEMENTS, now U.S. Pat. No. 9,833,241;
(105) U.S. patent application Ser. No. 14/319,004, entitled SURGICAL END EFFECTORS WITH FIRING ELEMENT MONITORING ARRANGEMENTS, now U.S. Pat. No. 9,844,369;
(106) U.S. patent application Ser. No. 14/319,008, entitled FASTENER CARTRIDGE COMPRISING NON-UNIFORM FASTENERS, now U.S. Patent Application Publication No. 2015/0297232;
(107) U.S. patent application Ser. No. 14/318,997, entitled FASTENER CARTRIDGE COMPRISING DEPLOYABLE TISSUE ENGAGING MEMBERS, now U.S. Patent Application Publication No. 2015/0297229;
(108) U.S. patent application Ser. No. 14/319,002, entitled FASTENER CARTRIDGE COMPRISING TISSUE CONTROL FEATURES, now U.S. Pat. No. 9,877,721;
(109) U.S. patent application Ser. No. 14/319,013, entitled FASTENER CARTRIDGE ASSEMBLIES AND STAPLE RETAINER COVER ARRANGEMENTS, now U.S. Patent Application Publication No. 2015/0297233; and
(110) U.S. patent application Ser. No. 14/319,016, entitled FASTENER CARTRIDGE INCLUDING A LAYER ATTACHED THERETO, now U.S. Patent Application Publication No. 2015/0297235.
(111) Numerous specific details are set forth to provide a thorough understanding of the overall structure, function, manufacture, and use of the embodiments as described in the specification and illustrated in the accompanying drawings. It will be understood by those skilled in the art, however, that the embodiments may be practiced without such specific details. In other instances, well-known operations, components, and elements have not been described in detail so as not to obscure the embodiments described in the specification. Those of ordinary skill in the art will understand that the embodiments described and illustrated herein are non-limiting examples, and thus it can be appreciated that the specific structural and functional details disclosed herein may be representative and illustrative. Variations and changes thereto may be made without departing from the scope of the claims.
(112) The terms “comprise” (and any form of comprise, such as “comprises” and “comprising”), “have” (and any form of have, such as “has” and “having”), “include” (and any form of include, such as “includes” and “including”) and “contain” (and any form of contain, such as “contains” and “containing”) are open-ended linking verbs. As a result, a surgical system, device, or apparatus that “comprises,” “has,” “includes” or “contains” one or more elements possesses those one or more elements, but is not limited to possessing only those one or more elements. Likewise, an element of a system, device, or apparatus that “comprises,” “has,” “includes” or “contains” one or more features possesses those one or more features, but is not limited to possessing only those one or more features.
(113) The terms “proximal” and “distal” are used herein with reference to a clinician manipulating the handle portion of the surgical instrument. The term “proximal” referring to the portion closest to the clinician and the term “distal” referring to the portion located away from the clinician. It will be further appreciated that, for convenience and clarity, spatial terms such as “vertical”, “horizontal”, “up”, and “down” may be used herein with respect to the drawings. However, surgical instruments are used in many orientations and positions, and these terms are not intended to be limiting and/or absolute.
(114) A surgical fastening instrument **100** is depicted in FIG. **1**. The surgical fastening instrument **100** is configured to deploy an expandable staple line. Various expandable staple lines are disclosed herein and the surgical fastening instrument **100** is capable of deploying any one of these expandable staple lines. Moreover, surgical instruments other than the surgical fastening instrument **100** are capable of deploying any one of the expandable staple lines disclosed herein.

(115) The surgical fastening instrument **100** comprises a handle **110**, a shaft **120**, and an end effector **200**. The handle **110** comprises a pistol grip **140**, a closure trigger **150** configured to operate a closure system, a firing trigger **160** configured to operate a firing system, and an articulation actuator **170** configured to operate an articulation system for articulating the end effector **200** relative to the shaft **120**. The disclosure of U.S. Pat. No. 7,845,537, entitled SURGICAL INSTRUMENT HAVING RECORDING CAPABILITIES, which issued on Dec. 7, 2010, is incorporated by reference in its entirety. Other embodiments are envisioned which comprise a single trigger configured to operate a closure system and a firing system. Various embodiments are envisioned in which the end effector of the surgical instrument is not articulatable. The disclosure of U.S. patent application Ser. No. 13/974,166, entitled FIRING MEMBER RETRACTION DEVICES FOR POWERED SURGICAL INSTRUMENTS, which was filed on Aug. 23, 2013, now U.S. Pat. No. 9,700,310, is incorporated by reference in its entirety.
(116) The closure trigger **150** is rotatable toward the pistol grip **140** to actuate the closure system. Referring primarily to FIG. **2**, the closure system comprises a closure tube **122** which is advanced distally when the closure trigger **150** is moved toward the pistol grip **140**. The closure tube **122** is engaged with a first jaw including an anvil **220** of the end effector **200**. In at least one instance, the anvil **220** comprises one or more projections **228** extending therefrom which are positioned in one or more elongated slots **212** defined in a second jaw. The projections **228** and the elongated slots **212** are structured and arranged to permit the anvil **220** to be rotated between an open position and a closed position relative to a stationary, or fixed, cartridge channel **210** of the second jaw. In various alternative embodiments, a cartridge channel can be rotatable relative to a stationary, or fixed, anvil **220**. Regardless of whether the cartridge channel or the anvil of an end effector is fixed, the end effector may be articulatable or non-articulatable relative to the shaft.
(117) Referring again to FIG. **2**, the anvil **220** includes a tab **226** which is engaged with a slot **124** defined in the closure tube **122**. When the closure tube **122** is moved distally by the closure trigger **150**, a sidewall of the slot **124** can engage the tab **226** and rotate the anvil **220** toward the cartridge channel **210**. When the closure tube **122** is moved proximally, another sidewall of the slot **124** can engage the tab **226** and rotate the anvil **220** away from the cartridge channel **210**. In some instances, a biasing spring can be positioned intermediate the anvil **220** and the cartridge channel **210** which can be configured to bias the anvil **220** away from the cartridge channel **210**.
(118) Referring again to FIG. **2**, the firing trigger **160** is rotatable toward the pistol grip **140** to actuate the firing system. The firing system comprises a firing member extending within the shaft **120**. The firing system further comprises a sled **250** which is operably engaged with the firing member. When the firing trigger **160** is rotated toward the pistol grip **140**, the firing trigger **160** drives the firing member and the sled **250** distally within the end effector **200**. The end effector **200** further comprises a staple cartridge **230** positioned within the cartridge channel **210**. The staple cartridge **230** is replaceable and, thus, removable from the cartridge channel **210**; however, other embodiments are envisioned in which the staple cartridge **230** is not readily replaceable and/or removable from the cartridge channel **210**.
(119) The staple cartridge **230** comprises a plurality of staple cavities **270**. Each staple cavity **270** is configured to removably store a staple therein, although it is possible that some staple cavities **270** may not contain a staple stored therein. The staple cartridge **230** further comprises a plurality of staple drivers **240** movably positioned therein. Each driver **240** is configured to support three staples and/or lift the three staples out of their respective staple cavities **270** at the same time, or concurrently. Although each driver **240** of the embodiment depicted in FIGS. **1-4** deploys three staples concurrently, other embodiments are envisioned in which a driver may deploy less than three staples or more than three staples concurrently. The sled **250** comprises one or more ramp surfaces **252** which are configured to slide under the drivers **240** and lift the drivers **240** upwardly toward a deck surface **233** of the staple cartridge **230**. The sled **250** is movable from a proximal end **231** of the staple cartridge **230** toward a distal end **232** to sequentially lift the drivers **240**. When the

drivers **240** are lifted toward the deck by the sled **250**, the drivers **240** lift the staples toward the anvil **220**. As the sled **250** is progressed distally, the staples are driven against the anvil **220** and are ejected from the staple cavities **270** by the drivers **240**. The staple cartridge **230** can further comprise a support pan **260** attached thereto which extends around the bottom of the staple cartridge **230** and retains the drivers **240**, the staples, and/or the sled **250** within the cartridge **230**.
(120) The sled **250** and/or the pusher member which advances the sled **250** distally can be configured to engage the first jaw including the anvil **220** and/or the second jaw including the staple cartridge **230** and position the anvil **220** and the staple cartridge **230** relative to one another. In at least one instance, the sled **250** comprises at least one first projection **256** extending therefrom which is configured to engage the anvil **220** and at least one second projection **258** configured to engage the cartridge channel **210**. The projections **256** and **258** can position the anvil **220** and the staple cartridge **230** relative to one another. As the sled **250** is advanced distally, the projections **256** and **258** can position the anvil **220** and set the tissue gap between the anvil **220** and the deck **233**.
(121) The end effector **200** can further comprise a cutting member configured to incise tissue captured between the staple cartridge **230** and the anvil **220**. Referring again to FIG. **2**, the sled **250** includes a knife **254**; however, any suitable cutting member could be utilized. As the sled **250** is being advanced distally to deploy the staples from the staple cavities **270**, the knife **254** is moved distally to transect the tissue. In certain alternative embodiments, the firing member which pushes the sled **250** distally can include a cutting member. The cartridge **230** includes a longitudinal slot **234** configured to at least partially receive the knife **254**. The anvil **220** also includes a longitudinal slot configured to at least partially receive the knife **254**; however, embodiments are envisioned in which only one of the cartridge **230** and the anvil **220** includes a slot configured to receive a cutting member.
(122) Further to the above, referring primarily to FIG. **1**, the handle **110** of the surgical instrument **100** comprises an articulation actuator **170** which, when actuated, can articulate the end effector **200** about an articulation joint **180**. When the actuator **170** is pushed in a first direction, the end effector **200** can be rotated in a first direction and, when the actuator **170** is pushed in a second direction, the end effector **200** can be rotated in a second, or opposite, direction. Referring now to FIG. **2**, the end effector **200** includes an articulation lock plate **182** mounted to the proximal end thereof. In the illustrated embodiment, the lock plate **182** is mounted to the cartridge channel **210** via a pin **184** which extends through apertures **214** defined in the cartridge channel **210** and the lock plate **182**. The shaft **120** can further include a lock movable between a first, engaged, position in which the lock is engaged with the lock plate **182** and a second, or disengaged, position in which the lock is disengaged from the lock plate. When the lock is in its engaged position, the lock can hold the end effector **200** in position. When the lock is in its disengaged position, the end effector **200** can be rotated about the articulation joint **180**. The disclosure of U.S. patent application Ser. No. 14/314,788, entitled ROBOTICALLY-CONTROLLED SHAFT BASED ROTARY DRIVE SYSTEMS FOR SURGICAL INSTRUMENTS, which was filed on Jun. 25, 2014, now U.S. Pat. No. 9,186,143, is incorporated by reference in its entirety. The disclosure of U.S. Patent Application Publication No. 2013/0168435, entitled SURGICAL STAPLING INSTRUMENT WITH AN ARTICULATABLE END EFFECTOR, which was filed on Feb. 26, 2013, now U.S. Pat. No. 9,138,225, is incorporated by reference in its entirety.
(123) Turning now to FIGS. **3** and **4**, the staple cavities **270** of the staple cartridge **200** can be positioned and arranged such that the staples stored in the staple cavities are deployed as part of an extensible staple line. The staple cavities **270** are arranged in a staple cavity array. The staple cavity array comprises a first row of staple cavities **270***a* which removably stores a first row of staples. The first row of staple cavities **270***a* extends along a first longitudinal axis **272***a* adjacent the longitudinal slot **234**. The staple cavity array comprises a second row of staple cavities **270***b* which removably stores a second row of staples. The second row of staple cavities **270***b* extends along a second longitudinal axis **272***b* adjacent the first row of staple cavities **270***a*. The staple cavity array

comprises a third row of staple cavities **270***c* which removably stores a third row of staples. The third row of staple cavities **270***c* extends along the second row of staple cavities **270***b*.
(124) Referring again to FIGS. **3** and **4**, the first longitudinal axis **272***a* is parallel, or at least substantially parallel, to the second longitudinal axis **272***b*; however, other arrangements are possible in which the first longitudinal axis **272***a* is not parallel to the second longitudinal axis **272***b*. The second longitudinal axis **272***b* is parallel, or at least substantially parallel, to the third longitudinal axis **272***c*; however, other arrangements are possible in which the second longitudinal axis **272***b* is not parallel to the third longitudinal axis **272***c*. The first longitudinal axis **272***a* is parallel, or at least substantially parallel, to the third longitudinal axis **272***c*; however, other arrangements are possible in which the first longitudinal axis **272***a* is not parallel to the third longitudinal axis **272***c*.
(125) Referring again to FIGS. **3** and **4**, the staple cartridge **230** comprises a first potion of the staple cavity array including a first row **270***a*, a second row **270***b*, and a third row **270***c* on a first side of the longitudinal slot **234** and a second portion of the cavity array including a first row **270***a*, a second row **270***b*, and a third row **270***c* on a second side of the longitudinal slot **234**. The first cavity array portion is a mirror image of the second cavity array portion with respect to the longitudinal slot; however, other arrangements may be utilized.
(126) The staple cartridge **230** is configured to deploy the staple array depicted in FIG. **52**A. The staple cartridge **230** is configured to deploy a first row of staples **280***a* along a first longitudinal axis **282***a*, a second row of staples **280***b* along a second longitudinal axis **282***b*, and a third row of staples **280***c* along a third longitudinal axis **282***c*. In various instances, the staple cartridge **230** is configured to deploy a first row of staples **280***a*, a second row of staples **280***b*, and a third row of staples **280***c* on a first side of a longitudinal incision **284** and a first row of staples **280***a*, a second row of staples **280***b*, and a third row of staples **280***c* on a second side of the longitudinal incision **284**. The first rows of staples **280***a* can be positioned adjacent the longitudinal incision **284** and the third row of staples **280***c* can be positioned furthest away from the longitudinal incision **284**. Each second row of staples **280***b* can be positioned intermediate a first row of staples **280***a* and a third row of staples **280***c*.
(127) Further to the above, the first staples **280***a* are removably stored in the first staple cavities **270***a*, the second staples **280***b* are removably stored in the second staple cavities **270***b*, and the third staples **280***c* are removably stored in the third staple cavities **270***c*. The staple cavities **270***a*-**270***c* are configured and arranged to deploy the staples **280***a*-**280***c* in the arrangement depicted in FIG. **52**A. The first staples **280***a* are oriented at a first angle **274***a* with respect to the longitudinal axis **282***a*. The second staples **280***b* are oriented at a second angle **274***b* with respect to a longitudinal axis **282***b*. The third staples **280***c* are oriented at a third angle **274***c* with respect to the longitudinal axis **282***c*. The first angle **274***a* is different than the second angle **274***b*; however, in other embodiments, the first angle **274***a* and the second angle **274***b* can be the same. The third angle **274***c* is different than the second angle **274***b*; however, in other embodiments, the third angle **274***c* and the second angle **274***b* can be the same. The first angle **274***a* is the same as the third angle **274***c*; however, in other embodiments, the first angle **274***a* and the third angle **274***c* can be different.
(128) Further to the above, the first angle **274***a* can be measured with respect to the first longitudinal axis **282***a*, the second angle **274***b* can be measured with respect to the second longitudinal axis **282***b*, and the third angle **274***c* can be measured with respect to the third longitudinal axis **282***c*. When the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* are parallel to one another, the first angle **274***a*, the second angle **274***b*, and/or the third angle **274***c* can be measured with respect to any one of the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and the third longitudinal axis **282***c*. When the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* are parallel to the longitudinal slot **234**, the first angle **274***a*, the second angle **274***b*, and/or the third angle **274***c* can be measured with respect to the longitudinal slot **234**.

Correspondingly, when the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* are parallel to the tissue transection **284**, the first angle **274***a*, the second angle **274***b*, and/or the third angle **274***c* can be measured with respect to the tissue transection **284**.
(129) The first staples **280***a*, the second staples **280***b*, and the third staples **280***c* can be positioned and arranged such that they provide laterally-overlapping staple lines. More particularly, referring again to FIG. **52**A, the longitudinal row of second staples **280***b* is positioned laterally with respect to the longitudinal row of first staples **280***a* such that the second staples **280***b* are aligned with the gaps between the first staples **280***a* and, similarly, the longitudinal row of third staples **280***c* is positioned laterally with respect to the longitudinal row of second staples **280***b* such that the third staples **280***c* are aligned with the gaps between the second staples **280***b*. Such an arrangement can limit the flow of blood from the tissue T to the transection **284**.
(130) In the illustrated embodiment, each first staple **280***a* comprises a distal leg **283***a* which is distal with respect to a distal leg **283***b* of an adjacent second staple **280***b* and, in addition, a proximal leg **285***a* which is proximal with respect to the distal leg **283***b*. Similarly, each third staple **280***c* comprises a distal leg **283***c* which is distal with respect to the distal leg **283***b* of the adjacent second staple **280***b* and, in addition, a proximal leg **285***c* which is proximal with respect to the distal leg **283***b*. The second staple **280***b* adjacent the first staple **280***a* and the third staple **280***c* mentioned above comprises a proximal leg **285***b* which is proximal with respect to the proximal leg **285***a* of the first staple **280***a* and the proximal leg **285***c* of the third staple **280***c*. This is but one exemplary embodiment and any suitable arrangement could be utilized.
(131) Further to the above, the first staples **280***a* straddle the first longitudinal axis **282***a*. The distal legs **283***a* of the first staples **280***a* are positioned on one side of the first longitudinal axis **282***a* and the proximal legs **285***a* are positioned on the other side of the first longitudinal axis **282***a*. Stated another way, the legs of the first staples **280***a* are offset with respect to the first longitudinal axis **282***a*. Alternative embodiments are envisioned in which the first staples **280***a* are aligned with or collinear with the first longitudinal axis **282***a*.
(132) The second staples **280***b* straddle the second longitudinal axis **282***b*. The distal legs **283***b* of the second staples **280***b* are positioned on one side of the second longitudinal axis **282***b* and the proximal legs **285***b* are positioned on the other side of the second longitudinal axis **282***b*. Stated another way, the legs of the second staples **280***b* are offset with respect to the second longitudinal axis **282***b*. Alternative embodiments are envisioned in which the second staples **280***b* are aligned with or collinear with the second longitudinal axis **282***b*.
(133) The third staples **280***c* straddle the third longitudinal axis **282***c*. The distal legs **283***c* of the third staples **280***c* are positioned on one side of the third longitudinal axis **282***c* and the proximal legs **285***c* are positioned on the other side of the third longitudinal axis **282***c*. Stated another way, the legs of the third staples **280***c* are offset with respect to the third longitudinal axis **282***c*. Alternative embodiments are envisioned in which the third staples **280***c* are aligned with or collinear with the third longitudinal axis **282***c*.
(134) In certain embodiments, a first staple **280***a* can comprise a proximal leg **285***a* which is aligned with the distal leg **283***b* of an adjacent second staple **280***b*. Similarly, a third staple **280***c* can comprise a proximal leg **285***c* which is aligned with the distal leg **283***b* of an adjacent second staple **280***b*. In various embodiments, a first staple **280***a* can comprise a proximal leg **285***a* which is positioned distally with respect to the distal leg **283***b* of an adjacent second staple **280***b*. Similarly, a third staple **280***c* can comprise a proximal leg **285***c* which is positioned distally with respect to the distal leg **283***b* of an adjacent second staple **280***b*.
(135) The row of second staples **280***b* is bounded by the row of first staples **280***a* and the row of third staples **280***c*. A second staple **280***b* is bounded on one side by a first staple **280***a* and on the other side by a third staple **280***c*. More particularly, a first staple **280***a* is positioned laterally inwardly with respect to the proximal leg **285***b* of a second staple **280***b* and, similarly, a third staple

280*c* is positioned laterally outwardly with respect to the distal leg **283***b* of the second staple **280***b*. As a result, the first staples **280***a* can provide a boundary on one side of the second staples **280***b* and the third staples **280***b* can provide a boundary on the other side of the second staples **280***b*.

(136) A traditional staple array is illustrated in FIG. **52**. This staple array comprises a first row of staples **380***a* positioned along a first longitudinal axis **382***a*, a second row of staples **380***b* positioned along a second longitudinal axis **382***b*, and a third row of staples **380***c* positioned along a third longitudinal axis **382***c* positioned on a first side of an incision **384** in the tissue T. The staples **380***a* are aligned, or at least substantially aligned, with the first longitudinal axis **382***a*; the staples **380***b* are aligned, or at least substantially aligned, with the second longitudinal axis **382***b*; and the staples **380***c* are aligned, or at least substantially aligned, with the third longitudinal axis **382***c*. Stated another way, the first staples **380***a* are not oriented at an angle with respect to the first longitudinal axis **382***a*, the second staples **380***b* are not oriented at an angle with respect to the second longitudinal axis **382***b*, and the third staples **380***c* are not oriented at an angle with respect to the third longitudinal axis **382***c*. This staple array also comprises a first row of staples **380***a* positioned along a first longitudinal axis **382***a*, a second row of staples **380***b* positioned along a second longitudinal axis **382***b*, and a third row of staples **380***c* positioned along a third longitudinal axis **382***c* positioned on a second, or opposite, side of the incision **384**.

(137) When a longitudinal tensile force is applied to the tissue T stapled by the staple array illustrated in FIG. **52**, the tissue will stretch longitudinally. Moreover, in various instances, the staples **380***a*, **380***b*, and **380***c* can translate longitudinally as the tissue is stretched longitudinally. Such an arrangement can be suitable in many circumstances; however, the staples **380***a*, **380***b*, and **380***c* can restrict the stretching and/or movement of the tissue. In some instances, the tissue that has been stapled by the staples **380***a*, **380***b*, and **380***c* may be far less flexible than the adjacent tissue that has not been stapled. Stated another way, the staple array comprising the staples **380***a*, **380***b*, and **380***c* can create a sudden change in the material properties of the tissue. In at least one instance, a large strain gradient can be created within the tissue as a result of the staple array which, in turn, can create a large stress gradient within the tissue.

(138) When the staples **380***a*-**380***c* are ejected from the staple cartridge, the legs of the staples can puncture the tissue T. As a result, the staple legs create holes in the tissue. Various types of tissue are resilient and can stretch around the staple legs as the staple legs pass through the tissue. In various instances, the resiliency of the tissue can permit the tissue to stretch and resiliently return toward the staple legs to reduce or eliminate gaps present between the tissue and the staple legs. Such resiliency can also permit the tissue to stretch when a stretching force is applied to the tissue; however, such resiliency can be inhibited by certain staple patterns. In at least one instance, the staple pattern depicted in FIG. **52** can inhibit the longitudinal stretching of the tissue. When a longitudinal stretching force is applied to the tissue stapled by the staple pattern of FIG. **52**, the tissue may begin to pull away from the staple legs and create gaps therebetween. In some instances, especially in bariatric resection applications, such gaps can result in increased bleeding from the stomach tissue. In certain instances, especially in lung resection applications, air leaks can result in the lung tissue.

(139) The staple array depicted in FIG. **52**A is more flexible than the staple array depicted in FIG. **52**. When a longitudinal tensile force is applied to the tissue T, referring now to FIG. **52**B, the staples **280***a*, **280***b*, and **280***c* can, one, translate longitudinally as the tissue is stretched longitudinally and/or, two, rotate as the tissue is stretched longitudinally. The compliant staple array depicted in FIG. **52** can create significant extensibility along the staple lines, such as in the longitudinal direction defined by the staple lines, for example. Such longitudinal extensibility can reduce the stress and/or strain gradient within the stapled tissue T and/or the tissue T surrounding the stapled tissue T. Moreover, the compliant staple array depicted in FIG. **52**A can reduce or eliminate the gaps between the staple legs and the tissue T when a longitudinal stretching force is applied to the tissue and, as a result, reduce the bleeding and/or air leaks between the staple legs

and the tissue.
(140) With regard to the longitudinal translation of the staples **280***a*, **280***b*, and **280***c*, the first staples **280***a* can move along the first longitudinal axis **282***a*, the second staples **280***b* can move along the second longitudinal axis **282***b*, and the third staples **280***c* can move along the third longitudinal axis **282***c*. When the first staples **280***a* move along the first longitudinal axis **282***a*, the first staples **280***a* can spread out across the first longitudinal axis **282***a*. Stated another way, the distance between the first staples **280***a*, or gap distance, can increase when a longitudinal force is applied to the tissue along, and/or parallel to, the first longitudinal axis **282***a*. Similarly, the second staples **280***b* can spread out across the second longitudinal axis **282***b* when the second staples **280***b* move along the second longitudinal axis **282***b*. The distance between the second staples **280***b*, or gap distance, can increase when a longitudinal force is applied to the tissue along, and/or parallel to, the second longitudinal axis **282***b*. Also, similarly, the third staples **280***c* can spread out across the third longitudinal axis **282***c* when the third staples **280***c* move along the third longitudinal axis **282***c*. The distance between the third staples **280***c*, or gap distance, can increase when a longitudinal force is applied to the tissue along, and/or parallel to, the third longitudinal axis **282***c*.
(141) As discussed above, the staples **280***a*, **280***b*, and/or **280***c* can move with the tissue T when the tissue T is stretched. When the tissue T is pulled longitudinally, further to the above, the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* can remain parallel to one another. In some instances, the orientation of the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* can become non-parallel, such as when a transverse force, i.e., a force which is transverse to the longitudinal force, is applied to the tissue T, for example. In certain instances, the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* can move closer to each other when the tissue T is pulled longitudinally. Such movement can be the result of transverse contraction that occurs within the tissue T when a longitudinal stretching force is applied to the tissue T. In some instances, the first longitudinal axis **282***a*, the second longitudinal axis **282***b*, and/or the third longitudinal axis **282***c* can move away from each other, such as when a transverse force is applied to the tissue T, for example.
(142) With regard to the rotational movement of the staples **280***a*, **280***b*, and **280***c*, the first staples **280***a* can rotate with respect to the first longitudinal axis **282***a* when a longitudinal tensile force is applied to the tissue T. Each first staple **280***a* can rotate between an initial first angle **274***a* and another first angle **274***a* when a longitudinal tensile force is applied to the tissue T. In at least one instance, each first staple **280***a* can rotate between an initial orientation in which the first staple **280***a* extends in a transverse direction to the first longitudinal axis **282***a* and another orientation which is closer to being aligned with the first longitudinal axis **282***a*. In some instances, the application of a longitudinal tensile force to the tissue T can cause the first staples **280***a* to rotate into an orientation which is collinear with the first longitudinal axis **282***a*. In various instances, each first staple **280***a* can rotate about an axis extending through the first longitudinal axis **282***a*.
(143) As discussed above, a first staple **280***a* can rotate between an initial first angle **274***a* and another first angle **274***a* when a longitudinal tensile force is applied to the tissue T. In various embodiments, the initial, or unstretched, first angle **274***a* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain embodiments, the initial, or unstretched, first angle **274***a* can be between approximately 30 degrees and approximately 60 degrees, for example. In at least one embodiment, the initial, or unstretched, first angle **274***a* can be approximately 45 degrees, for example. In at least one embodiment, the initial, or unstretched, first angle **274***a* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.
(144) In various instances, the stretched first angle **274***a* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain instances, the stretched first angle **274***a* can

be between approximately 30 degrees and approximately 60 degrees, for example. In at least one instance, the stretched first angle **274***a* can be approximately 45 degrees, for example. In at least one instance, the stretched first angle **274***a* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.

(145) In various instances, the difference between the unstretched first angle **274***a* and the stretched first angle **274***a* can be between approximately 1 degree and approximately 45 degrees, for example. In certain instances, the difference between the unstretched first angle **274***a* and the stretched first angle **274***a* can be approximately 1 degree, approximately 2 degrees, approximately 3 degrees, approximately 4 degrees, and/or approximately 5 degrees, for example. In certain instances, the difference between the unstretched first angle **274***a* and the stretched first angle **274***a* can be approximately 5 degrees, approximately 10 degrees, approximately 15 degrees, approximately 20 degrees, and/or approximately 25 degrees, for example.

(146) Further to the above, the second staples **280***b* can rotate with respect to the second longitudinal axis **282***b* when a longitudinal tensile force is applied to the tissue T. Each second staple **280***b* can rotate between an initial second angle **274***b* and another second angle **274***b* when a longitudinal tensile force is applied to the tissue T. In at least one instance, each second staple **280***b* can rotate between an initial orientation in which the second staple **280***b* extends in a transverse direction to the second longitudinal axis **282***b* and another orientation which is closer to being aligned with the second longitudinal axis **282***b*. In some instances, the application of a longitudinal tensile force to the tissue T can cause the second staples **280***b* to rotate into an orientation which is collinear with the second longitudinal axis **282***b*. In various instances, each second staple **280***b* can rotate about an axis aligned with and/or extending through the second longitudinal axis **282***b*.

(147) As discussed above, a second staple **280***b* can rotate between an initial second angle **274***b* and another second angle **274***b* when a longitudinal tensile force is applied to the tissue T. In various embodiments, the initial, or unstretched, second angle **274***b* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain embodiments, the initial, or unstretched, second angle **274***b* can be between approximately 30 degrees and approximately 60 degrees, for example. In at least one embodiment, the initial, or unstretched, second angle **274***b* can be approximately 45 degrees, for example. In at least one embodiment, the initial, or unstretched, second angle **274***b* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.

(148) In various instances, the stretched second angle **274***b* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain instances, the stretched second angle **274***b* can be between approximately 30 degrees and approximately 60 degrees, for example. In at least one instance, the stretched second angle **274***b* can be approximately 45 degrees, for example. In at least one instance, the stretched second angle **274***b* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.

(149) In various instances, the difference between the unstretched second angle **274***b* and the stretched second angle **274***b* can be between approximately 1 degree and approximately 45 degrees, for example. In certain instances, the difference between the unstretched second angle **274***b* and the stretched second angle **274***b* can be approximately 1 degree, approximately 2 degrees, approximately 3 degrees, approximately 4 degrees, and/or approximately 5 degrees, for example. In certain instances, the difference between the unstretched second angle **274***b* and the stretched second angle **274***b* can be approximately 5 degrees, approximately 10 degrees, approximately 15 degrees, approximately 20 degrees, and/or approximately 25 degrees, for example.

(150) Further to the above, the third staples **280***c* can rotate with respect to the third longitudinal axis **282***c* when a longitudinal tensile force is applied to the tissue T. Each third staple **280***c* can rotate between an initial third angle **274***c* and another third angle **274***c* when a longitudinal tensile force is applied to the tissue T. In at least one instance, each third staple **280***c* can rotate between an initial orientation in which the third staple **280***c* extends in a transverse direction to the third longitudinal axis **282***c* and another orientation which is closer to being aligned with the third longitudinal axis **282***c*. In some instances, the application of a longitudinal tensile force to the tissue T can cause the third staples **280***c* to rotate into an orientation which is collinear with the third longitudinal axis **282***c*. In various instances, each third staple **280***c* can rotate about an axis aligned with and/or extending through the third longitudinal axis **282***c*.
(151) As discussed above, a third staple **280***c* can rotate between an initial third angle **274***c* and another third angle **274***c* when a longitudinal tensile force is applied to the tissue T. In various embodiments, the initial, or unstretched, third angle **274***c* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain embodiments, the initial, or unstretched, third angle **274***c* can be between approximately 30 degrees and approximately 60 degrees, for example. In at least one embodiment, the initial, or unstretched, third angle **274***c* can be approximately 45 degrees, for example. In at least one embodiment, the initial, or unstretched, third angle **274***c* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.
(152) In various instances, the stretched third angle **274***c* can be between approximately 5 degrees and approximately 85 degrees, for example. In certain instances, the stretched third angle **274***c* can be between approximately 30 degrees and approximately 60 degrees, for example. In at least one instance, the stretched third angle **274***c* can be approximately 45 degrees, for example. In at least one instance, the stretched third angle **274***c* can be approximately 10 degrees, approximately 20 degrees, approximately 30 degrees, approximately 40 degrees, approximately 50 degrees, approximately 60 degrees, approximately 70 degrees, and/or approximately 80 degrees, for example.
(153) In various instances, the difference between the unstretched third angle **274***c* and the stretched third angle **274***c* can be between approximately 1 degree and approximately 45 degrees, for example. In certain instances, the difference between the unstretched third angle **274***c* and the stretched third angle **274***c* can be approximately 1 degree, approximately 2 degrees, approximately 3 degrees, approximately 4 degrees, and/or approximately 5 degrees, for example. In certain instances, the difference between the unstretched third angle **274***c* and the stretched third angle **274***c* can be approximately 5 degrees, approximately 10 degrees, approximately 15 degrees, approximately 20 degrees, and/or approximately 25 degrees, for example.
(154) In various instances, the first staples **280***a* in the first row of staples can rotate a first amount and the second staples **280***b* in the second row of staples can rotate a second amount which is different than the first amount. The first amount can be less than or more than the second amount. In various instances, the first staples **280***a* in the first row of staples can rotate a first amount and the third staples **280***c* in the third row of staples can rotate a third amount which is different than the first amount. The first amount can be less than or more than the third amount. In various instances, the third staples **280***c* in the third row of staples can rotate a third amount and the second staples **280***b* in the second row of staples can rotate a second amount which is different than the third amount. The third amount can be less than or more than the second amount.
(155) In at least one application, it may be desirable for the innermost rows of staples, i.e., the row of staples closest to the incision, to be more inflexible, or inextensible, than the other rows of staples. It may also be desirable for the outermost rows of staples, i.e., the row of staples furthest away from the incision, to be more flexible, or extensible, than the other rows of staples. When the angle between the first staple axes and the first longitudinal axis is smaller than the angle between

the second staple axes and the second longitudinal axis, the first staples may have less room to rotate toward the first longitudinal axis than the second staples have to rotate toward the second longitudinal axis and, thus, may stiffen the tissue more than the second staples. Similarly, when the angle between the second staple axes and the second longitudinal axis is smaller than the angle between the third staple axes and the third longitudinal axis, the second staples may have less room to rotate toward the second longitudinal axis than the third staples have to rotate toward the third longitudinal axis and, thus, may stiffen the tissue more than the third staples

(156) Further to the above, the staple pattern disclosed in FIG. **52**A comprises six longitudinal rows of staples. Other embodiments are envisioned which comprise less than six rows of staples, such as four rows of staples, for example, or more than six rows of staples, such as eight rows of staples, for example.

(157) The first staples **280***a*, the second staples **280***b*, and the third staples **280***c* can comprise any suitable configuration such as, for example, a V-shaped configuration or a U-shaped configuration. A staple comprising a V-shaped configuration can include a base, a first leg extending from a first end of the base, and a second leg extending from a second end of the base, wherein the first leg and the second leg extend in directions which are non-parallel to one another. A staple comprising a U-shaped configuration can include a base, a first leg extending from a first end of the base, and a second leg extending from a second end of the base, wherein the first leg and the second leg extend in directions which are parallel to one another.

(158) With regard to the staple pattern disclosed in FIG. **52**A, for example, each first staple **280***a* comprises a proximal staple leg **285***a* and a distal staple leg **283***a*. A staple cartridge configured to deploy the staple pattern disclosed in FIG. **52**A can include a proximal end and a distal end. The proximal staple leg **285***a* can be closer to the proximal end of the staple cartridge than the distal staple leg **283***a* and, similarly, the distal staple leg **283***a* can be closer to the distal end of the staple cartridge than the proximal staple leg **285***a*. The base of each first staple **280***a* can define a first base axis. The proximal staple leg **285***a* and the distal staple leg **283***a* can extend from the first base axis. The first staples **280***a* can be positioned and arranged such that the first base axes extend toward the longitudinal cut line **284** and toward the distal end of the staple cartridge.

(159) With regard to the staple pattern disclosed in FIG. **52**A, for example, each second staple **280***b* comprises a proximal staple leg **285***b* and a distal staple leg **283***b*. As discussed above, a staple cartridge configured to deploy the staple pattern disclosed in FIG. **52**A can include a proximal end and a distal end. The proximal staple leg **285***b* can be closer to the proximal end of the staple cartridge than the distal staple leg **283***b* and, similarly, the distal staple leg **283***b* can be closer to the distal end of the staple cartridge than the proximal staple leg **285***b*. The base of each second staple **280***b* can define a second base axis. The proximal staple leg **285***b* and the distal staple leg **283***b* can extend from the second base axis. The second staples **280***b* can be positioned and arranged such that the second base axes extend toward the longitudinal cut line **284** and toward the proximal end of the staple cartridge.

(160) With regard to the staple pattern disclosed in FIG. **52**A, for example, each third staple **280***c* comprises a proximal staple leg **285***c* and a distal staple leg **283***c*. As discussed above, a staple cartridge configured to deploy the staple pattern disclosed in FIG. **52**A can include a proximal end and a distal end. The proximal staple leg **285***c* can be closer to the proximal end of the staple cartridge than the distal staple leg **283***c* and, similarly, the distal staple leg **283***c* can be closer to the distal end of the staple cartridge than the proximal staple leg **285***c*. The base of each third staple **280***c* can define a third base axis. The proximal staple leg **285***c* and the distal staple leg **283***c* can extend from the third base axis. The third staples **280***c* can be positioned and arranged such that the third base axes extend toward the longitudinal cut line **284** and toward the distal end of the staple cartridge.

(161) With regard to the staple pattern disclosed in FIG. **52**A, for example, the first staples **280***a* can be aligned with the third staples **280***c*. The proximal staple leg **285***a* of a first staple **280***a* can

be aligned with the proximal staple leg **285**c of a third staple **280**c. When the proximal staple leg **285**a is aligned with the proximal staple leg **285**c, the proximal staple leg **285**a and the proximal leg **285**c can be positioned along an axis which is perpendicular to the cut line **284**. The distal staple leg **283**a of the first staple **280**a can be aligned with the distal staple leg **283**c of the third staple **280**c. When the distal staple leg **283**a is aligned with the distal staple leg **283**c, the distal staple leg **283**a and the distal staple leg **283**c can be positioned along an axis which is perpendicular to the cut line **284**. In such circumstances, the third staple **280**c can seal the tissue in the event that the first staple **280**a is malformed. Similarly, the first staple **280**a can hold the tissue together in the event that the third staple **280**c is malformed. In other embodiments, the first staples **280**a may not be aligned with the third staples **280**c.
(162) Further to the above, the first staples **280**a can be aligned with the third staples **280**c when the staple pattern is in an unstretched condition. When the staple pattern is stretched longitudinally, the first staples **280**a and/or the third staples **280**c can translate and/or rotate. In various circumstances, the first staples **280**a can remain aligned with the third staples **280**c when the tissue is stretched longitudinally. In other circumstances, the first staples **280**a may not remain aligned with the third staples **280**c.
(163) With regard to the staple pattern disclosed in FIG. **52**A once again, the distal staple leg **283**b of a second staple **280**b can be aligned with the proximal staple leg **285**a of a first staple **280**a and/or the proximal leg **285**c of a third staple **280**c. The distal staple leg **283**b of the second staple **280**b, the proximal staple leg **285**a of the first staple **280**a, and/or the proximal staple leg **285**c of the third staple **280**c can be positioned along an axis which is perpendicular to the cut line **284**. The proximal staple leg **285**b of a second staple **280**b can be aligned with the distal staple leg **283**a of a first staple **280**a and/or the distal staple leg **283**c of a third staple **280**c. The proximal staple leg **285**b of the second staple **280**b, the distal staple leg **283**a of the first staple **280**a, and/or the distal staple leg **283**c of the third staple **280**c can be positioned along an axis which is perpendicular to the cut line **284**.
(164) Further to the above, the staple legs of the second staples **280**b can be aligned with the staple legs of the first staples **280**a and/or the third staples **280**c when the staple pattern is in an unstretched condition. When the staple pattern is stretched longitudinally, the first staples **280**a, the second staples **280**b, and/or the third staples **280**c can translate and/or rotate. In various circumstances, the legs of the second staples **280**b may not remain aligned with the legs of the first staples **280**a and/or the third staples **280**c when the tissue is stretched longitudinally. In other circumstances, the legs of the second staples **280**b can remain aligned with the legs of the first staples **280**a and/or the third staples **280**c when the tissue is stretched longitudinally.
(165) In various embodiments, a staple pattern can be arranged such that the staples in one longitudinal staple row overlap with the staples in another longitudinal staple row. For instance, the distal staple leg **283**b of a second staple **280**b can be positioned distally with respect to the proximal staple leg **285**a of a first staple **280**a and/or the proximal leg **285**c of a third staple **280**c. For instance, the proximal staple leg **285**b of a second staple **280**b can be positioned proximally with the distal staple leg **283**a of a first staple **280**a and/or the distal staple leg **283**c of a third staple **280**c. The proximal staple leg **285**b of the second staple **280**b, the distal staple leg **283**a of the first staple **280**a, and/or the distal staple leg **283**c of the third staple **280**c can be positioned along an axis which is perpendicular to the cut line **284**.
(166) As discussed above, the second staples **280**b can overlap with the first staples **280**a and/or the third staples **280**c when the staple pattern is in an unstretched condition. When the staple pattern is stretched longitudinally, the first staples **280**a, the second staples **280**b, and/or the third staples **280**c can translate and/or rotate. In various circumstances, the second staples **280**b can remain overlapped with the first staples **280**a and/or the third staples **280**c when the tissue is stretched longitudinally. In some circumstances, the second staples **280**b may no longer be overlapped with the first staples **280**a and/or the third staples **280**c when the tissue is stretched longitudinally.

(167) The staple pattern depicted in FIG. **52**A is depicted in an unstretched condition. When the tissue stapled by the staple pattern depicted in FIG. **52**A is stretched longitudinally, the staples can move longitudinally with the tissue and/or rotate within the tissue, as illustrated in FIG. **52**B. Such movement is also illustrated in FIG. **24**.

(168) The surgical instrument **100** is configured to be used during a laparoscopic surgical procedure. The end effector **200** and the shaft **120** are sized and dimensioned to be inserted through a trocar, or cannula, into a patient. The trocar can comprise an inner passage comprising an inner diameter. In some instances, the inner diameter can be approximately 5 mm or approximately 12 mm, for example. The end effector **200** is a linear end effector that applies staples along straight lines. Other surgical instruments are envisioned which apply staples along at least partially curved lines, such as those disclosed in U.S. Pat. No. 8,827,133, entitled SURGICAL STAPLING DEVICE HAVING SUPPORTS FOR A FLEXIBLE DRIVE MECHANISM, which issued on Sep. 9, 2014, for example. The entire disclosure of U.S. Pat. No. 8,827,133, entitled SURGICAL STAPLING DEVICE HAVING SUPPORTS FOR A FLEXIBLE DRIVE MECHANISM, which issued on Sep. 9, 2014, is incorporated by reference in its entirety. Such surgical instruments could be adapted to apply curved expandable staple lines utilizing the principles disclosed herein. While the surgical instrument **100** is adapted to be used during laparoscopic surgical procedures, the surgical instrument **100** could be utilized during an open surgical procedure where the surgical instrument **100** is inserted through a large incision in the patient. Moreover, the expandable staple lines disclosed herein could be applied by an open surgical stapler, such as those disclosed in U.S. Patent Application Publication No. 2014/0042205, entitled SURGICAL STAPLING INSTRUMENT, which was filed on Oct. 21, 2013, now U.S. Pat. No. 9,687,231, for example. The disclosure of U.S. Patent Application Publication No. 2014/0042205, entitled SURGICAL STAPLING INSTRUMENT, which was filed on Oct. 21, 2013, now U.S. Pat. No. 9,687,231, is incorporated by reference herein in its entirety.

(169) Turning now to FIG. **4**, the anvil **220** includes an array of forming pockets **290***a*, **290***b*, and **290***c* defined therein configured to deform the staples **280***a*, **280***b*, and **280***c*, respectively. The first forming pockets **290***a* are positioned along a first longitudinal axis **292***a*, the second longitudinal pockets **290***b* are positioned along a second longitudinal axis **292***b*, and the third forming pockets **290***c* are positioned along a third longitudinal axis **292***c*. The longitudinal axes **292***a*, **292***b*, and **292***c* are parallel and extend between a proximal end **221** and a distal end **222** of the anvil **220**. The anvil **220** further comprises a longitudinal slot **224** defined therein configured to receive at least a portion of a firing member. In at least one instance, the firing member includes a cutting portion that extends between the anvil **220** and the staple cartridge **230**. The anvil **220** comprises a row of first forming pockets **290***a*, a row of second forming pockets **290***b*, and a row of third forming pockets **290***c* on one side of the longitudinal slot **224** and another row of first forming pockets **290***a*, row of second forming pockets **290***b*, and row of third forming pockets **290***c* on the other side of the longitudinal slot **224**. As the reader will appreciate, the forming pockets **290***a*, **290***b*, and **290***c* are aligned with and correspond to the staple cavities **270***a*, **270***b*, and **270***c*, respectively, defined in the staple cartridge **230**.

(170) The forming pockets **290***a*, **290***b*, and **290***c* are configured to deform the staples **280***a*, **280***b*, and **280***c* into a B-shaped configuration, for example. In various instances, the forming pockets **290***a*, **290***b*, and **290***c* are configured to deform U-shaped staples and/or V-shaped staples, for example, into such a B-shaped configuration. Each forming pocket **290***a*, **290***b*, and **290***c* comprises a proximal end configured to receive a proximal leg of a staple and a distal end configured to receive the distal leg of the staple. That said, any suitable anvil can be utilized to form the staples ejected from a staple cartridge into any suitable shape. Each forming pocket **290***a*, **290***b*, and **290***c* can comprise a groove extending between the proximal end and the distal end thereof. The groove can include sidewalls configured to deform a staple within a plane and prevent, or at least limit, the movement of the staple legs out of that plane as the staple legs are deformed.

(171) Turning now to FIG. **5**, an anvil **320** comprises an array of forming pockets **390***a*, **390***b*, and **390***c* defined therein. Similar to the above, a plurality of first forming pockets **390***a* are arranged along a first longitudinal axis, a plurality of second forming pockets **390***b* are arranged along a second longitudinal axis, and a plurality of third forming pockets **390***c* are arranged along a third longitudinal axis. Each forming pocket **390***a*, **390***b*, and **390***c* includes a proximal forming pocket end and a distal forming pocket end. For example, each first forming pocket **390***a* includes a proximal end **393***a* configured to receive a proximal leg of a first staple and a distal end **395***a* configured to receive a distal leg of the first staple, each second forming pocket **390***b* includes a proximal end **393***b* configured to receive a proximal leg of a second staple and a distal end **395***b* configured to receive a distal leg of the second staple, and each forming pocket **390***c* includes a proximal end **393***c* configured to receive a proximal leg of a third staple and a distal end **395***c* configured to receive a distal leg of the third staple.
(172) The proximal ends **393***a*, **393***b*, and **393***c* and the distal ends **395***a*, **395***b*, and **395***c* can comprise any suitable configuration. Referring again to FIG. **5**, the proximal ends **393***a*, **393***b*, and **393***c* and the distal ends **395***a*, **395***b*, and **395***c* each comprise an enlarged cup. The enlarged cups are wider than a groove **397** defined therebetween. In certain instances, the enlarged cups and the groove extending therebetween can comprise an hourglass shape, for example. When the legs of a staple enter such a forming pocket, the legs can enter the enlarged cups and, as the staple legs are deformed, the enlarged cups can guide the staple legs into the groove **397**. Each enlarged cup can include curved and/or angled sidewalls which can be configured to guide a staple leg toward the groove **397**. The enlarged cups can, in certain instances, adjust the orientation of a misaligned staple leg.
(173) The staple forming pockets **390***a*, **390***b*, and **390***c* are nested. For instance, the distal enlarged cup **395***b* of a second forming pocket **390***b* is positioned intermediate the enlarged cups **393***c*, **395***c* of an adjacent third staple forming pocket **390***c* and, additionally, the proximal enlarged cup **393***b* of a second forming pocket **390***b* is positioned intermediate the enlarged cups **393***a*, **395***a* of an adjacent first forming pocket **390***a*. Also, for instance, the proximal enlarged cup **393***a* of a first forming pocket **390***a* is positioned intermediate the enlarged cups **393***b*, **395***b* of an adjacent second forming pocket **390***b*. Additional, for instance, the distal enlarged cup **395***c* of a third forming pocket **390***c* is positioned intermediate the enlarged cups **393***b*, **395***b* of an adjacent second forming pocket **390***b*. The enlarged forming cups of each staple cavity can define a rectangular perimeter within which the entire forming pocket can be positioned. As a result of the nesting arrangement described above, the rectangular perimeter of one staple forming cavity can overlap the rectangular perimeter of another forming cavity. For instance, the rectangular perimeter of a second forming cavity **390***b* can overlap the rectangular perimeter of a first forming cavity **390***a* and/or the rectangular perimeter of a third forming cavity **390***c*.
(174) Turning now to FIG. **6**, an anvil **420** comprises an array of forming pockets **490***a*, **490***b*, and **490***c* defined therein. Similar to the above, a plurality of first forming pockets **490***a* are arranged along a first longitudinal axis, a plurality of second forming pockets **490***b* are arranged along a second longitudinal axis, and a plurality of third forming pockets **490***c* are arranged along a third longitudinal axis. Each forming pocket **490***a*, **490***b*, and **490***c* includes a proximal forming pocket end and a distal forming pocket end. For example, each first forming pocket **490***a* includes a proximal end **493***a* configured to receive a proximal leg of a first staple and a distal end **495***a* configured to receive a distal leg of the first staple, each second forming pocket **490***b* includes a proximal end **493***b* configured to receive a proximal leg of a second staple and a distal end **495***b* configured to receive a distal leg of the second staple, and each forming pocket **490***c* includes a proximal end **493***c* configured to receive a proximal leg of a third staple and a distal end **495***c* configured to receive a distal leg of the third staple.
(175) The proximal ends **493***a*, **493***b*, and **493***c* and the distal ends **495***a*, **495***b*, and **495***c* can comprise any suitable configuration. Referring again to FIG. **6**, the proximal ends **493***a*, **493***b*, and

493*c* and the distal ends **495***a*, **495***b*, and **495***c* each comprise an enlarged cup. The enlarged cups are wider than a groove **497** defined therebetween. In certain instances, the enlarged cups and the groove extending therebetween can comprise an hourglass shape, for example. When the legs of a staple enter such a forming pocket, the legs can enter the enlarged cups and, as the staple legs are deformed, the enlarged cups can guide the staple legs into the groove **497**. Each enlarged cup can include curved and/or angled sidewalls which can be configured to guide a staple leg toward the groove **497**. The enlarged cups can, in certain instances, adjust the orientation of a misaligned staple leg.

(176) The staple forming pockets **490***a*, **490***b*, and **490***c* are nested. For instance, the distal enlarged cup **495***b* of a second forming pocket **490***b* is positioned intermediate the enlarged cups **493***c*, **495***c* of an adjacent third staple forming pocket **490***c* and, additionally, the proximal enlarged cup **493***b* of a second forming pocket **490***b* is positioned intermediate the enlarged cups **493***a*, **495***a* of an adjacent first forming pocket **490***a*. Also, for instance, the proximal enlarged cup **493***a* of a first forming pocket **490***a* is positioned intermediate the enlarged cups **493***b*, **495***b* of an adjacent second forming pocket **490***b*. Additional, for instance, the distal enlarged cup **495***c* of a third forming pocket **490***c* is positioned intermediate the enlarged cups **493***b*, **495***b* of an adjacent second forming pocket **490***b*. The enlarged forming cups of each staple cavity can define a rectangular perimeter within which the entire forming pocket can be positioned. As a result of the nesting arrangement described above, the rectangular perimeter of one staple forming cavity can overlap the rectangular perimeter of another forming cavity. For instance, the rectangular perimeter of a second forming cavity **490***b* can overlap the rectangular perimeter of a first forming cavity **490***a* and/or the rectangular perimeter of a third forming cavity **490***c*.

(177) Referring again to FIG. **52**A, the staples **280***a*, **280***b*, and **280***c* do not overlap. Other embodiments are envisioned in which at least some of the staples in a staple pattern overlap. Turning now to FIG. **32**, a staple pattern disclosed therein comprises a first row of longitudinal staples **580***a* and a second row of longitudinal staples **580***b*. As the reader will appreciate, some of the staples **580***a* in the first row and the staples **580***b* in the second row are overlapped. In at least one instance, the base of a second staple **580***b* extends under the base of a first staple **580***a*. In such an instance, the distal leg **585***b* of the second staple **580***b* is positioned on one side of the base of the first staple **580***a* and the proximal leg **583***b* of the second staple **580***b* is positioned on the other side of the base of the first staple **580***a*. Similarly, in at least one instance, the base of a first staple **580***a* extends under the base of a second staple **580***b*. In such an instance, the distal leg **585***a* of the first staple **580***a* is positioned on one side of the base of the second staple **580***b* and the proximal leg **583***a* of the first staple **580***a* is positioned on the other side of the base of the second staple **580***b*. As a result of the above, the first staples **580***a* are interweaved with the second staples **580***b*.

(178) Referring again to FIG. **32**, the staple pattern comprises a first row of staples **580***a* and a second row of staples **580***b* positioned on one side of a longitudinal tissue incision and a first row of staples **580***a* and a second row of staples **580***b* positioned on the other side of the longitudinal tissue incision. The first staples **580***a* are oriented distally and toward the longitudinal tissue incision and the second staples **580***b* are oriented proximally and toward the longitudinal tissue incision.

(179) Referring again to FIG. **32**, the first row of staples **580***a* is positioned along a first longitudinal axis and the second row of staples **580***b* is positioned along the second longitudinal axis. As a result of the overlap between the first staples **580***a* and the second staples **580***b*, the first longitudinal axis can be adjacent the second longitudinal axis, in certain instances. In some instances, the overlap between a first row of staples and a second row of staples can permit angled staples in these rows of staples to have the same centerline spacing that can be achieved with traditional, longitudinally-arranged staple patterns, such as the staple pattern illustrated in FIG. **52**, for example. In some instances, the overlap between a first row of staples and a second row of staples can permit angled staples in these rows of staples to have a closer centerline spacing than

can be achieved with traditional, longitudinally-arranged staple patterns. In at least one embodiment, the first longitudinal axis can be collinear with the second longitudinal axis.

(180) The staple pattern depicted in FIG. **32** comprises a repeating pattern. The repeating pattern comprises two first staples **580***a* followed by two second staples **580***b* followed by two first staples **580***a* followed by two second staples **580***b*, and so forth. This repeating pattern extends longitudinally in the proximal-distal direction. The first row of staples **580***a* has breaks therein which are filled by staples **580***b* and, similarly, the second row of staples **580***b* has breaks therein which are filled by staples **580***a*. A repeating pattern is present on one side of the longitudinal incision and a repeating pattern is present on the other side of the longitudinal incision. These repeating patterns are mirror-images of one another. Other repeating patterns are contemplated.

(181) A staple cartridge **530** configured to removably store and deploy the staple pattern disclosed in FIG. **32** is illustrated in FIG. **33**. The staple cartridge **530** includes a first row of staple cavities **570***a* for removably storing the first staples **580***a* and a second row of staple cavities **570***b* for removably storing the second staples **580***b*. At least some of the first staple cavities **570***a* and the second staple cavities **570***b* are interconnected to removably store the overlapping first staples **580***a* and second staples **580***b*. A first row of staple cavities **570***a* can be arranged along a first longitudinal axis and a row of second staple cavities **570***b* can be arranged along a second longitudinal axis. The first longitudinal axis and the second longitudinal axis can be adjacent or collinear, as appropriate, in order to deploy the staple patterns disclosed herein. A first row of staple cavities **570***a* and a second row of staple cavities **570***b* are positioned on a first side of a longitudinal slot **534** and a first row of staple cavities **570***a* and a second row of staple cavities **570***b* are positioned on a second side of the longitudinal slot **534**. The longitudinal slot **534** is configured to receive a firing member. The firing member can include a cutting element, such as a knife, for example.

(182) An anvil **520** configured to deform the staples of the staple pattern disclosed in FIG. **32** is illustrated in FIG. **34**. The anvil **520** includes a repeating pattern of forming cavities including first forming cavities **590***a* configured to deform the legs of the first staples **580***a* and second forming cavities **590***b* configured to deform the legs of the second staples **580***b*. The first forming cavities **590***a* and the second forming cavities **590***b* are arranged in an alternating pattern. The alternating pattern comprises arrays of first forming cavities **590***a* and second forming cavities **590***b* positioned along a first longitudinal axis and arrays of first forming cavities **590***a* and second forming cavities **590***b* positioned along a second longitudinal axis which are positioned on one side of a longitudinal slot **524**. The alternating pattern further comprises arrays of first forming cavities **590***a* and second forming cavities **590***b* positioned along a first longitudinal axis and arrays of first forming cavities **590***a* and second forming cavities **590***b* positioned along a second longitudinal axis which are positioned on the other side of the longitudinal slot **524**. The arrays of forming cavities **590***a*, **590***b* can define a mirror image with respect to the longitudinal slot **524**. The longitudinal slot **524** is configured to receive a firing member. The firing member can include a cutting element, such as a knife, for example.

(183) The staple pattern depicted in FIG. **32** comprises two rows of staples on each side of the longitudinal tissue incision; however, such a staple pattern could include more than two rows of staples, such as three rows of staples, for example. Such a third row of staples could be interweaved with the first row of staples **580***a* and/or the second row of staples **580***b*. Alternatively, such a third row of staples may not be interweaved with either the first row of staples **580***a* or the second row of staples **580***b*. In such an embodiment, the first row of staples **580***a* and the second row of staples **580***b* can be interweaved and the third row of staples could be adjacent the first row of staples **580***a* and/or the second row of staples **580***b*, for example.

(184) The staple pattern depicted in FIG. **35** includes a longitudinal row of first staples **680***a*, a longitudinal row of second staples **680***b*, and a longitudinal row of third staples **6870***c*. The first staples **680***a* have a first base width. The second staples **680***b* have a second base width. The third

staples **680**c have a third base width. The width of a staple base can be defined as the distance between a first staple leg extending from the base and a second staple leg extending from the base measured along the base extending between the first staple leg and the second staple leg. In at least one instance, the base width is measured between the cross-sectional center of the first staple leg and the cross-sectional center of the second staple leg. In any event, the first base width is shorter than the second base width; however, other embodiments are envisioned in which the second base width is shorter than the first base width. The third base width is shorter than the first base width and the second base width; however, other embodiments are envisioned in which the third base width is longer than the first base width and/or the second base width.

(185) In the embodiment depicted in FIG. **35**, the second staples **680**b have the longest base width. As a result, when the staples in the staple pattern rotate within tissue as the tissue is being stretched longitudinally, the second staples **680**b will sweep through a larger arc length than the first staples **680**a. Similarly, the first staples **680**a will sweep through a larger arc length than the third staples **680**c. In various instances, as a result, the first staples **680**a will sweep through a first arc length, the second staples **680**b will sweep through a second arc length, and the third staples **680**c will sweep through a third arc length, wherein the first arc length, the second arc length, and the third arc length are different. Such arc lengths can be different even though the degree in which the staples **680**a, **680**b, and/or **680**c are the same. In certain instances, the first arc length, the second arc length, and/or the third arc length can be the same.

(186) In the embodiment depicted in FIG. **35**, the first staples **680**a are positioned and arranged in an alternating arrangement in a staple cartridge **630**. The distal most first staple **680**a is oriented toward the distal end of the staple cartridge **630** and toward a longitudinal slot **634** defined in the staple cartridge **630**. The next first staple **680**a in the second longitudinal row is oriented toward the proximal end of the staple cartridge **630** and toward the longitudinal slot **634**. This pattern then repeats within the longitudinal row of first staples **680**a.

(187) The second staples **680**b are positioned and arranged in an alternating arrangement in a staple cartridge **630**. The distal most second staple **680**b is oriented toward the distal end of the staple cartridge **630** and toward a longitudinal slot **634** defined in the staple cartridge **630**. The next second staple **680**b in the second longitudinal row is oriented toward the proximal end of the staple cartridge **630** and toward the longitudinal slot **634**. This pattern then repeats within the longitudinal row of second staples **680**b.

(188) The third staples **680**c are positioned and arranged in an alternating arrangement in a staple cartridge **630**. The distal most third staple **680**c is oriented toward the distal end of the staple cartridge **630** and toward a longitudinal slot **634** defined in the staple cartridge **630**. The next third staple **680**c in the third longitudinal row is oriented toward the proximal end of the staple cartridge **630** and toward the longitudinal slot **634**. This pattern then repeats within the longitudinal row of third staples **680**c.

(189) With further reference to the staple pattern depicted in FIG. **35**, the longitudinal row of first staples **380**a is nested within the longitudinal row of second staples **380**b. Similarly, the longitudinal row of third staples **380**c is nested within the longitudinal row of second staples **380**b.

(190) The staple cartridge **630**, further to the above, comprises a plurality of first staple cavities **670**a configured to removably store the first staples **680**a therein. The staple cartridge **630** further comprises a plurality of second staple cavities **670**b configured to removably store the second staples **680**b and a plurality of third staple cavities **670**c configured to removably store the third staples **680**c. Referring to FIG. **36**, an anvil **620** can be configured to deform the staples **680**a, **680**b, and **680**c as they are ejected from the staple cartridge **630**. The anvil **620** comprises a staple forming pocket pattern that is aligned with the staple cavities **670**a, **670**b, and **670**c. For instance, the anvil **620** comprises a plurality of first forming pockets **690**a aligned with the first staple cavities **670**a, a plurality of second forming pockets **690**b aligned with the second staple cavities **670**b, and a plurality of third forming pockets **690**c aligned with the third staple cavities **670**c.

(191) As discussed above, a staple pattern can comprise several rows. The staples in each row can have the same orientation or different orientations. FIG. **23** illustrates an embodiment comprising a row of staples having a first group of staples **780***a* oriented in a first direction and a second group of staples **780***b* oriented in a second direction. The first staples **780***a* and the second staples **780***b* are positioned along a longitudinal axis. The first staples **780***a* are angled with respect to the longitudinal axis and the second staples **780***b* are aligned with the longitudinal axis. Other arrangements are possible. The staples **780***a* are arranged in an alternating pattern with the staples **780***b*.
(192) With continued reference to FIG. **23** and referring again to FIG. **24**, the staples within a staple row can translate and rotate within tissue when the tissue is stretched longitudinally. In some instances, the translation and/or rotation of the staples within the tissue can create holes, or gaps, between the staples and the tissue. Such holes, or gaps, can create leaks. Even though various staple patterns disclosed herein can minimize such leaks, certain improvements to the staples themselves can be made to reduce and/or eliminate these leaks.
(193) Turning now to FIGS. **17** and **18**, a staple, such as staples **280***a*, **280***b*, **280***c*, **380***a*, **380***b*, **380***c*, **580***a*, **580***b*, **680***a*, **680***b*, **680***c*, **780***a*, and/or **780***b*, for example, is depicted in an unfired configuration. The unfired configuration of this staple is V-shaped; however, the principles discussed herein can be applied to any suitably-shaped staple. FIG. **19** illustrates the staple of FIGS. **17** and **18** in a fired configuration. The fired configuration of this staple is B-shaped; however, the principles discussed herein can be applied to any suitably-shaped staple. FIG. **20** depicts the staple of FIGS. **17-19** including a coating **881** thereon; this staple will hereinafter be referred to as staple **880**. FIG. **21** illustrates the staple **880** deployed into tissue and a hole, or gap, **882** present between the staple **880** and the tissue. FIG. **22** illustrates the coating **881** on the staple **880** in an expanded state. The expanded coating **881** can fill the entirety of the gap **882**. In some circumstances, the expanded coating **881** can stretch the tissue. In various other circumstances, the coating **881** may not fill the entirety of the gap **882**.
(194) The staple **880** can be comprised of any suitable material, such as metal, for example. In certain instances, the staple **880** can be comprised of titanium and/or stainless steel, for example.
(195) The expandable staple coating **881** can be comprised of any suitable material. The staple coating **881** can be comprised of Poly-L-lactic acid and/or Poly-95L/5D-lactic acid, for example. Other copolymer compositions of PLA could be utilized. In various instances, the staple coating **881** can begin to form a gel as soon as the staple **880** is implanted into the tissue wherein the gel can expand to fill, or at least partially fill, the gap **882**. In various instances, the coating **881** can be applied to the staple **880** by immersing the staple wire in one or more solutions that coat the wire. In at least one instance, the staple wire can be immersed in a first solution to apply a base coating and then a second solution to apply the PLA, for example. In some instances, the coating **881** can be applied to staples **880** when the staples **880** are positioned in a staple cartridge. The entire disclosure of ELASTOMERIC BIOMATERIALS FOR TISSUE ENGINEERING, Progress In Polymer Science 38 (2013) 584-671 by Q. Chen et al. is hereby incorporated by reference herein.
(196) The staple coating **881** can be comprised of a hydrophilic material, for example. A hydrophilic material can comprise a hydrogel derivitized with a peptide containing RGD peptide sequence microspheres, for example. The metal wire of the staple **880** can be coated with a natural biopolymer, such as hyaluronan or hyaluronic acid, for example. Other hydrogels could be utilized. In various instances, the staple coating **881** can begin to expand as soon as the staple **880** is implanted into the tissue wherein the coating **881** can expand to fill, or at least partially fill, the gap **882**. In various instances, the coating **881** can be applied to the staple **880** by immersing the staple wire in one or more solutions that coat the wire. In at least one instance, the staple wire can be immersed in a first solution to apply a base coating and then a second solution to apply the hyaluronan loaded with peptides, for example. In some instances, the coating **881** can be applied to staples **880** when the staples **880** are positioned in a staple cartridge. The entire disclosure of

ATTACHMENT OF HYALURONAN TO METALLIC SURFACES, J. Biomed. Mater. Res. 68A: 95-106 (2004) by William G. Pitt et al. is incorporated by reference herein.
(197) The staple coating **881** can be comprised of xerogel, for example. The staple coating **881** can be comprised of gelatin microspheres and/or nanospheres, for example. Gelatin comprises an at least partially denatured, or completely denatured, form of collagen that cells can bind to and degrade through enzymatic action. In various instances, the gelatin can be loaded with fibroblast and/or platelet-derived growth factor, for example. As the coating **881** degrades, the coating **881** can at least partially fill and at least partially seal the gap **882**. In various instances, the coating **881** can be applied to the staple **880** by immersing the staple wire in a water-in-oil emulsion and then lyophilizing the gelatin microspheres and/or nanospheres onto the staple wire. The entire disclosure of GELATIN MICROSPHERES CROSS-LINKED WITH GENIPIN FOR LOCAL DELIVERY OF GROWTH FACTORS, J. Tissue Eng. Regen. Med. 4:514-523 (2010) by Luis Solorio et al. is incorporated by reference herein.
(198) The staple **880** is comprised of a wire having a circular cross-section; however, the staple **880** can be comprised of a wire having any suitable cross-section, such as a polygonal cross-section, for example. Non-circular cross-sections can have larger perimeters than circular cross-sections for a certain overall width. Such non-circular cross-sections can support a larger quantity of coating material than circular cross-sections which can allow the coating to expand and fill larger holes than staples having circular cross-sections. In certain instances, a non-circular cross section can be formed be creating one or more grooves in a circular cross-section. In at least one such instance, such grooves can extend longitudinally along the staple legs. In some instances, a longitudinal groove can extend along an axis. In certain instances, a longitudinal groove can wrap around a staple leg. In at least one instance, such a longitudinal groove can extend around a leg in a helical manner.
(199) The staples of a staple cartridge can be deployed with or without the use of an adjunct material, such as buttress material, for example. Often, an adjunct material can be placed on the top surface, or deck, of a staple cartridge such that, when the staples are ejected from the staple cartridge, the staples can capture the adjunct material against the tissue. FIG. **55** illustrates two pieces of adjunct material **239** positioned on a deck surface **238** of the staple cartridge **230**. A first piece of adjunct material **239** is positioned on a first side of the longitudinal slot **234** and a second piece of adjunct material **239** is positioned on a second side of the longitudinal slot **234**. Alternative embodiments are envisioned in which a single piece of adjunct material is supported by the deck surface **238** which extends over the longitudinal slot **234** and both sides of the staple cartridge **230**. Referring again to FIG. **55**, each piece of adjunct material **239** is substantially rectangular and extends over a staple pattern including a row of first staple cavities **270***a*, a row of second staple cavities **270***b*, and a row of third staple cavities **270***c*. The staples **280***a*, **280***b*, and **280***c* stored in the staple cavities **270***a*, **270***b*, and **270***c*, respectively, penetrate the adjunct material **239** when they are ejected from the staple cartridge **230** and capture a portion of the adjunct material **239** therein as the staples **280***a*, **280***b*, and **280***c* are formed by the anvil **220**.
(200) In addition to or in lieu of the adjunct material positioned on the staple cartridge, adjunct material may be positioned on an anvil. The staples penetrating the tissue could penetrate the anvil adjunct before contacting the anvil and then re-penetrate the anvil adjunct before re-entering into the tissue.
(201) After the staples **280***a*, **280***b*, and **280***c* have been deformed by the anvil **220**, further to the above, the adjunct material **239** is captured against the tissue by the staples **280***a*, **280***b*, and **280***c*. Stated another way, the adjunct material **239** is implanted against the tissue by the staples **280***a*, **280***b*, and **280***c*. When the tissue is stretched longitudinally, as discussed above, the adjunct material **239** can stretch with the tissue.
(202) Adjunct materials can provide many benefits. Adjunct materials can assist in sealing the puncture holes created by the staple legs. In various instances, the staple legs can push the adjunct

material into the puncture holes as the staple legs pass through the tissue. Adjunct materials can also assist in sealing gaps created between the staple legs and the tissue when the tissue is stretched longitudinally. Adjunct materials can bolster the tissue. In various instances, the adjunct material can strengthen the tissue and inhibit the staples from tearing through the tissue.
(203) Referring again to FIG. **55**, the reader will appreciate that portions of the adjunct material **239** are not captured by the staples **280***a*, **280***b*, and **280***c*. For instance, the portions of the adjunct material extending around the perimeter thereof may not be captured by the staples. Similarly, portions of the adjunct material positioned intermediate the staples may not be captured by the staples. Such uncaptured portions of the adjunct material **239** may not provide the sealing benefits discussed above and, at the same time, inhibit the extensibility provided by the staple patterns discussed herein. Such uncaptured portions may also inhibit the rotation of the staples within the tissue, as discussed above. Improvements to the embodiment of FIG. **55** are depicted in FIGS. **53**, **54**, **56**, and **57**. Such embodiments comprise recesses, notches, cuts, slits, apertures, and/or any other suitable interruptions configured to increase the extensibility of an adjunct material. Moreover, such interruptions may facilitate the rotation of the staples within the tissue.
(204) Referring to FIG. **53**, an adjunct material **939** comprises scalloped edges, or sides, **938**. The scalloped sides **938** include recesses, or notches, **937** defined therein. Notches **937** comprise a curved configuration; however, any suitable configuration can be utilized. The notches **937** reduce the perimeter of uncaptured material extending around the perimeter of the adjunct material **939** and increase the flexibility and extensibility of the adjunct material **939**.
(205) Referring again to FIG. **53**, the adjunct material **939** further comprises apertures **936** defined therein. The apertures **936** are oblong and comprise through holes; however, alternative embodiments are envisioned. The apertures **936** are located intermediate adjacent second staple cavities **270***b* and intermediate a first staple cavity **270***a* and a third staple cavity **270***c*; however, alternate locations are envisioned. The apertures **936** reduce the uncaptured material within the staples lines and increase the flexibility and extensibility of the adjunct material **939**.
(206) Referring again to FIG. **53**, the body of the adjunct material **939** extends over the staple cavities **270***a*, **270***b*, and **270***c*. Alternative embodiments are envisioned in which the adjunct material **939** does not extend over the staple cavities **270***a*, **270***b*, and/or **270***c*. Turning now to FIG. **54**, the adjunct material **939′** includes slots, or openings, **935***a*, **935***b*, and **935***c* which partially extend over the staple cavities **270***a*, **270***b*, and **270***c*, respectively. The openings **935***a*, **935***b*, and **935***c* are larger than the apertures **936**; however, the openings **935***a*, **935***b*, and/or **935***c* can be the same size as and/or larger than the apertures **936**.
(207) Referring to FIG. **56**, an adjunct material **1039** comprises notched edges, or sides, **1038**. The notched sides **1038** include recesses, or notches, **1037** defined therein. Notches **1037** comprise an angular configuration; however, any suitable configuration can be utilized. The notches **1037** reduce the perimeter of uncaptured material extending around the adjunct material **1039** and increase the flexibility and extensibility of the adjunct material **1039**.
(208) Referring again to FIG. **56**, the adjunct material **1039** further comprises slits **1036** defined therein. The slits **1036** are oblong and comprise through holes; however, alternative embodiments are envisioned. The adjunct material **1039** comprises a first row of slits **1036***a* and a second row of slits **1036***b*. The slits **1036***a* are located intermediate adjacent second staples **1080***b* and intermediate a first staple **1080***a* and a third staple **1080***c*; however, alternate locations are envisioned. The slits **1036***b* are located intermediate adjacent third staples **1080***c* and intermediate a second staple **1080***b* and a fourth staple **1080***d*; however, alternate locations are envisioned. The slits **1036***a* are parallel to the first staples **1080***a* and the third staples **1080***c* and, similarly, the slits **1036***b* are parallel to the second staples **1080***b* and the fourth staples **1080***d*; however, the slits may have any suitable direction. The slits **1036***a* and**1036***b* reduce the uncaptured material within the staple lines and increase the flexibility and extensibility of the adjunct material **1039**. The slits **1036***a* and **1036***b* are shorter than the bases of the staples **1080***a*, **1080***b*, **1080***c*, and **1080***d*;

however, embodiments are envisioned in which the slits **1036***a* and/or **1036***b* are the same length as and/or longer than the bases of staples **1080***a*, **1080***b*, **1080***c*, and **1080***d*.
(209) Referring to FIG. **57**, an adjunct material **1139** comprises notched edges, or sides, **1138**. The notched sides **1138** include recesses, or notches, **1137** defined therein. Notches **1137** comprise a curved configuration; however, any suitable configuration can be utilized. The notches **1137** reduce the perimeter of uncaptured material extending around the adjunct material **1139** and increase the flexibility and extensibility of the adjunct material **1139**.
(210) Referring again to FIG. **57**, the adjunct material **1139** further comprises slits **1136** defined therein. The slits **1136** are oblong and comprise through holes; however, alternative embodiments are envisioned. The adjunct material **1139** comprises a first row of slits **1136***a* and a second row of slits **1136***b*. The slits **1136***a* are located intermediate adjacent second staples **1180***b* and intermediate a first staple **1180***a* and a third staple **1180***c*; however, alternate locations are envisioned. The slits **1136***b* are located intermediate adjacent third staples **1180***c* and intermediate a second staple **1180***b* and a fourth staple **1180***d*; however, alternate locations are envisioned. The slits **1136***a* are parallel to the first staples **1180***a* and the third staples **1180***c* and, similarly, the slits **1136***b* are parallel to the second staples **1180***b* and the fourth staples **1180***d*; however, the slits may have any suitable direction. The slits **1136***a* and **1136***b* reduce the uncaptured material within the staple lines and increase the flexibility and extensibility of the adjunct material **1139**. The slits **1136***a* and **1136***b* are shorter than the bases of the staples **1180***a*, **1180***b*, **1180***c*, and **1180***d*; however, embodiments are envisioned in which the slits **1136***a* and/or **1136***b* are the same length as and/or longer than the bases of the staples **1180***a*, **1180***b*, **1180***c*, and **1180***d*.
(211) As described herein, a firing member and/or wedge sled can traverse a staple cartridge to fire and/or eject staples from the staple cavities that are defined into the staple cartridge. For example, a firing member and/or a wedge sled can translate along a firing path within a staple cartridge, and the firing member and/or the wedge sled can engage a staple driver and/or the staple itself along the firing path to drive the staple from the staple cavity. As also described herein, staple arrangements that include angularly-oriented staples can provide various benefits and advantages. For example, an array of angularly-oriented staples can provide increased flexibility and/or longitudinal stretchability within stapled tissue.
(212) When a staple is angularly-oriented relative to the firing path, at least a portion of the staple driver and/or the staple may not overlap and/or overlie the firing path. For example, the base of an angularly-oriented staple can cross the firing path such that the staple legs are positioned on opposite sides of the firing path. Additionally, an angularly-oriented staple driver can traverse the firing path, and the ends of the staple driver can be positioned on opposite sides of the firing path. In other instances, only an end of the staple and/or the staple driver may overlie the firing path and, in still other instances, the staple and/or the staple driver may be entirely offset from the firing path, for example.
(213) In instances where at least a portion of the staple and/or the staple driver is offset from the firing path, a moment arm between the firing path and the portion(s) of the staple and/or the staple driver positioned on either side of the firing path may generate a torque within the staple and/or within the staple driver. Torque could affect tilting and/or tipping of the staples during deployment. As a result, the staple legs of a torqued staple may not engage tissue with equivalent force and/or speed, and/or the staple legs may not pierce and/or capture the tissue simultaneously. Because torqueing and/or rotation of a staple during deployment may adversely impact tissue penetration and/or staple formation, in various instances, it can be desirable to prevent and/or minimize torque generation during deployment of an array of angularly-oriented staples.
(214) When a staple driver is angled relative to the firing path of a wedge sled, only a portion of the angled driver may receive the driving or lifting force from the wedge sled. For example, the driving force can be applied to the angled driver along a diagonal path. To stabilize the angled driver and prevent torqueing and/or rotation of the driver, and thus, of the staple supported thereon, the wedge

sled can include multiple driving wedges, and at least two driving wedges can contact the driver to apply the driving force at multiple locations on the driver. For example, a pair of laterally-spaced driving wedges can engage and lift an angled driver such that the driving force is distributed at laterally-spaced intervals along the length of the driver. Moreover, in at least one instance, the laterally-spaced driving wedges can be equidistant from the center of mass of the angled driver, such that the driver is mass balanced relative to the multiple driving wedges.

(215) Additionally or alternatively, to stabilize the angled drivers and prevent torqueing and/or rotation of the drivers, and thus, torqueing and/or rotation of the angled staples supported thereon, multiple drivers can be connected and/or linked together. In some instances, an angled multi-staple driver can be integrally formed. Connected drivers and/or a multi-staple driver can support multiple staples, which can reduce the number of moving parts within a staple cartridge and can prevent relative movement between the staple supporting surfaces of each interconnected and/or integrally formed staple cradle. Moreover, an angled multi-staple driver can be larger, i.e., wider and/or longer, than a single-staple driver. As a result, a multi-staple driver can be have an increased aspect ratio. For example, a multi-staple driver can have an aspect ratio of 1:1. In certain instances, the aspect ratio may be 3:2 or 2:1. In still other instances, the aspect ratio can be less than 1:1 or more than 2:1, for example. The greater aspect ratio of a multi-staple driver can provide greater stability to the staples supported thereon.

(216) In various instances, a single driving wedge can engage an angled multi-staple driver, and, in certain instances, the driving force exerted on the driver by the driving wedge can be balanced relative to the center of mass of the driver. In other instances, multiple driving wedges can engage an angled multi-staple driver, which can distribute the driving force laterally across the driver. In various instances, the cumulative driving force exerted on an angled multi-staple driver by laterally-spaced driving wedges can be balanced relative to the center of mass of the driver.

(217) In other circumstances, to stabilize angled staples within a staple cartridge and prevent torqueing and/or rotation thereof during deployment, the staples can be fired without drivers. For example, the wedge sled can include a staple-engagement surface that directly engages sled-engagement surfaces of staples in a driverless staple cartridge. The wedge sled can contact each staple at multiple laterally-spaced positions along the base of the staple. For example, the wedge sled can include multiple driving wedges, and at least two driving wedges can contact the angled staple to apply the driving force at multiple locations. In various instances, a pair of laterally-spaced driving wedges can engage and lift the angled staple such that the driving force is equally distributed at laterally-spaced intervals along the length of the base of the staple. Moreover, in at least one instance, the laterally-spaced driving wedges can be equidistant from the center of mass of the angled staple, such that the staple is mass balanced relative to the driving wedges.

(218) An end effector assembly **2000** is disclosed in FIG. **7**. As depicted, the end effector assembly **2000** includes a first jaw **2002**, a second jaw **2004**, a closure tube or frame **2006**, and an end effector articulation joint **2009**. The end effector assembly **2000** is movable between a first or open position and a second or closed position. As depicted, the first jaw **2002** includes pivot pins **2008**, which are movably positioned within closure slots **2010** of the second jaw **2004**. For example, the pivot pins **2008** are configured to pivot and translate in the closure slots **2010** of the second jaw **2004** as the first jaw **2002** pivots relative to the second jaw **2004** and relative to the frame **2006** of the depicted end effector assembly **2000**.

(219) In other instances, the first jaw **2002** can be fixed relative to the frame **2006**, and the second jaw **2004** can pivot relative to the first jaw **2002** to open and close the jaws **2002**, **2004** of the end effector assembly **2000**. In still other instances, both jaws **2002**, **2004** can pivot and/or otherwise move to open and/or close the jaws **2002**, **2004** of the end effector assembly **2000**. For example, at least one of the jaws **2002**, **2004** can rotate, spin, slide and/or translate relative to the other jaw **2002**, **2004** and/or relative to the frame **2006** to open and/or close the jaws **2002**, **2004** of the end effector assembly **2000**.

(220) Referring still to FIG. **7**, the end effector assembly **2000** is dimensioned and structured to receive a staple cartridge **2020**, which is configured for removable positioning within the end effector assembly **2000**. For example, the depicted staple cartridge **2020** can be a single-use and/or disposable cartridge, which can be replaced with another staple cartridge after firing the staples **2012** therefrom. The staple cartridge **2020** disclosed in FIG. **7** includes a deck **2026**, a cartridge body **2024**, and a casing **2022** which partially surrounds or encloses the cartridge body **2024**. The depicted staple cartridge **2020** also includes staples **2012** which can be ejectably positioned in the cartridge body **2024**. The staples **2012** disclosed in FIG. **7** are generally "V-shaped" staples, which have non-parallelly extending legs.
(221) In various instances, a staple cartridge, such as the staple cartridge **2020**, for example, can be integrally formed with the end effector assembly **2000** and/or can be permanently fixed within one of the jaws **2002**, **2004**, for example. In such instances, the end effector assembly **2000** can be a single-use and/or disposable end effector. In other instances, a staple cartridge that is fixed to the end effector assembly **2000** can be reloaded with additional staples for subsequent firings, for example.
(222) Referring again to the staple cartridge **2020** disclosed in FIG. **7**, a longitudinal slot **2032** is defined at least partially though the cartridge body **2024**. The depicted longitudinal slot **2032** extends along a longitudinal axis L, which extends between a proximal end **2023** and a distal end **2025** of the cartridge body **2024**. The longitudinal slot **2032** shown in FIG. **7** extends from the proximal end **2023** toward the distal end **2025** and traverses a portion of the length of the cartridge body **2024**.
(223) In some instances, the longitudinal slot **2032** can traverse the entire length of the cartridge body **2024**. In other instances, the longitudinal slot **2032** can extend from the distal end **2023** toward the proximal end **2025**, for example. In still other instances, the cartridge body **2024** may not include a predefined and/or preformed longitudinal slot. For example, a firing member and/or a cutting element can transect and/or cut the cartridge body **2024** during the firing stroke to form a slot therein.
(224) The staple cartridge **2020** disclosed in FIG. **7** is configured to fire an array **2011** of staples **2012** into tissue. The staple array **2011** shown in FIG. **7** includes angled staples **2012**, which are angled relative to the longitudinal axis L and relative to the firing paths of the driving wedges **2064***a*, **2064***b*, which are further described herein. The staple cartridge **2020** disclosed in FIG. **7** also includes multi-staple drivers **2040***a*, **2040***b*, which are further described herein, to drivingly support the angled staples **2012** in the array **2011**.
(225) The angled staples **2012** are removably positioned in angled staple cavities **2028** which are defined into the cartridge body **2024** disclosed in FIG. **7**. For example, the depicted staple cavities **2028** are angularly-oriented relative to the longitudinal axis L. The depicted arrangement of staple cavities **2028** corresponds to the depicted staple array **2011** positioned in the staple cartridge **2020**. Each staple cavity **2028** shown in FIG. **7** includes an opening **2030** in the deck **2026**, and each opening **2030** includes a proximal end, a distal end, and a staple axis extending between the proximal end and the distal end. The staple axis of the openings **2030** are skewed and/or angled relative to the longitudinal axis L of the cartridge body **2024**. For example, in the staple cartridge **2020** of FIG. **7**, all the staple cavities **2028** defined into the cartridge body **2024** are angularly-oriented relative to the longitudinal axis L and various staple cavities **2028** are angularly-oriented relative to other staple cavities **2028**.
(226) The staple cavities **2028** disclosed in FIG. **7** are arranged in multiple rows on each side of the longitudinal slot **2032**. For example, a portion of the staple cavities **2028** are arranged in a first inside row **2033**, a first outside row **2035**, and a first intermediate row **2037** on a first side **2027** of the longitudinal slot **2032**, and another portion of the staple cavities **2028** are arranged in a second inside row **2034**, a second outside row **2038**, and a second intermediate row **2036** on a second side **2029** of the longitudinal slot **2032**. In the staple cartridge **2020** depicted in FIG. **7**, the staple

cavities **2028** and rows **2033**, **2034**, **2035**, **2036**, **2037**, **2038** thereof are symmetrical relative to the longitudinal slot **2032**.

(227) Though the depicted staple cavities **2028** do not cross or otherwise contact each other, the longitudinal rows **2033**, **2034**, **2035**, **2036**, **2037**, **2038** of staple cavities **2028** overlap. For example, various staple cavities **2028** shown in FIG. **7** extend laterally outboard and/or laterally inboard past the staple cavities **2028** in adjacent rows of staple cavities **2028**. Additionally, various depicted staple cavities **2028** extend proximally and/or distally past the staple cavities **2028** in adjacent rows of staple cavities **2028**. Because the staples **2012** are arranged in an overlapping array **2011**, bleeding and/or fluid flow in the stapled tissue can be controlled. An overlapping array of staples, like the staple array **2011**, for example, could be incorporated into other staple cartridges and/or end effector assemblies disclosed herein.

(228) In other instances, greater than or fewer than three rows of staple cavities **2028** can be positioned on either side **2027**, **2029** of the longitudinal slot **2032**. In some instances, one of the sides **2027**, **2029** of the staple cartridge **2020** can include a different number of rows of staple cavities **2028** than the other side **2027**, **2029**. In some instances, the staple cavities **2028** may not longitudinally and/or laterally overlap the staple cavities **2028** in adjacent rows. Additionally or alternatively, in certain instances, the staple cavities **2028** and/or rows thereof can be asymmetrical relative to the longitudinal slot **2032** and/or the longitudinal axis L.

(229) Referring still to FIG. **7**, the depicted staple cavities **2028** in each longitudinal row are parallel or substantially parallel. For example, as disclosed in FIG. **7**, the staple cavities **2028** in the first inside row **2033** are parallel to each other, the staple cavities **2028** in the first outside row **2035** are parallel to each other, the staple cavities **2028** in the first intermediate row **2037** are parallel to each other, the staple cavities **2028** in the second inside row **2034** are parallel to each other, the staple cavities **2028** in the second outside row **2036** are parallel to each other, and the staple cavities **2028** in the second intermediate row **2038** are parallel to each other.

(230) As also disclosed in FIG. **7**, the staple cavities **2028** in each longitudinal row are angularly-oriented relative to the staple cavities **2028** in the adjacent longitudinal row(s). For example, on the first side **2027** of the depicted cartridge body **2024**, the staple cavities **2028** in the first intermediate row **2037** are angularly-oriented relative to the staple cavities **2028** in the first inner row **2033** and in the first outer row **2035**. Additionally, on the second side **2029** of the depicted cartridge body **2024**, the staple cavities **2028** in the second intermediate row **2038** are angularly-oriented relative to the staple cavities **2028** in the second inner row **2034** and the second outer row **2036**.

(231) In other instances, only a portion of the staples cavities **2028** in each longitudinal row **2033**, **2034**, **2035**, **2036**, **2037**, **2038** may be parallel to each other and/or less than all of the longitudinal rows **2033**, **2034**, **2035**, **2036**, **2037**, **2038** can include staple cavities **2028** that are parallel to each other. Additionally or alternatively, in certain instances, at least a portion of the staple cavities **2028** can be randomly oriented. In some instances, at least one of the staple cavities **2028** in a longitudinal row **2033**, **2034**, **2035**, **2036**, **2037**, **2038** can be parallel to at least one of the staple cavities **2028** in an adjacent longitudinal row **2033**, **2034**, **2035**, **2036**, **2037**, **2038**. In certain instances, the staple cartridge **2020** can include at least one staple cavity **2028** and/or at least one row of staple cavities that are parallel to the longitudinal axis L of the cartridge body **2024**. See, for example, FIG. **10**.

(232) The staple cartridge **2020** disclosed in FIG. **7** includes drivers **2040***a*, **2040***b*, which are structured and dimensioned to movably fit within the cartridge body **2024** (FIG. **7**). Referring to FIGS. **7-9**, the drivers **2040***a*, **2040***b* include first drivers **2040***a* (FIGS. **8-8**B) and second drivers **2040***b* (FIGS. **8**C-**9**). The first and second drivers **2040***a*, **2040***b* are each configured to support multiple staples **2012**. As shown in FIGS. **7-9**, the multi-staple first drivers **2040***a* have a first geometry and the multi-staple second drivers **2040***b* have a second geometry. The geometry of the multi-staple drivers **2040***a*, **2040***b* corresponds to the array **2011** of staples **2012** and to the arrangement of staple cavities **2028** shown in FIG. **7**.

(233) As described herein, the arrangement of staples **2012** and staple cavities **2028** on the first side **2027** of the longitudinal slot **2032** is a mirror image of the arrangement of staples **2012** and staple cavities **2028** on the second side **2029** of the longitudinal slot **2032**. Additionally, the geometry of the first drivers **2040***a* is a mirror image of the geometry of the second drivers **2040***b*. As depicted in FIG. **7**, the first drivers **2040***a* are positioned on a first side **2027** of the longitudinal slot **2032**, and the second drivers **2040***b* are positioned on a second side **2029** of the longitudinal slot **2032**.
(234) In some instances, the drivers on one side of a cartridge body may not be a mirror image of the drivers on the other side of the cartridge body. Additionally, the first multi-staple drivers **2040***a* and/or the second multi-staple drivers **2040***b* can be positioned on different and/or both sides **2027**, **2029** of the longitudinal slot **2032**. For example, multi-staple drivers having different geometries can be positioned on the same side of the longitudinal slot **2032**. In still other instances, the staple cartridge **2020** can include multi-staple drivers of three or more different geometries. For example, a specialized and/or different staple driver can correspond to a particular staple and/or group of staples. Alternatively, in some instances, all multi-staple drivers in the staple cartridge **2020** can have the same geometry.
(235) The first and second multi-staple drivers **2040***a*, **2040***b* disclosed in FIGS. **7-9** include multiple troughs or staple supporting cradles **2042**. Moreover, each depicted driver **2040***a*, **2040***b* is configured to drive multiple staples **2012**. For example, the first drivers **2040***a* (FIGS. **8-8**B) include a first cradle **2042***a*, a second cradle **2042***b*, and a third cradle **2042***c*, which are each dimensioned and structured to support one staple **2012**. For example, the base **2014** (FIG. **8**B) of a staple **2012** is positioned in each cradle **2042***a*, **2042***b*, **2042***c* of the first driver **2040***a*. Additionally, referring primarily to FIGS. **8**C-**9**, the second drivers **2040***b* also include a first cradle **2042***a*, a second cradle **2042***b*, and a third cradle **2042***c*, which are each dimensioned and structured to support one staple **2012**. For example, the base **2014** (FIG. **9**) of a staple **2012** is positioned in each cradle **2042***a*, **2042***b*, **2042***c* of the second driver **2040***a*.
(236) As disclosed in FIG. **7**, the first drivers **2040***a* are right-side drivers, which are positioned in the right side, or the first side **2027**, of the staple cartridge **2020**. The first cradle **2042***a* (FIGS. **8-8**B) of each first driver **2040***a* is configured to be aligned with a staple **2012** in the first outer row **2035** of staple cavities **2028**, the second cradle **2042***b* (FIGS. **8-8**B) of each first driver **2040***a* is configured to be aligned with a staple **2012** in the first intermediate row **2037** of staple cavities **2028**, and the third cradle **2042***c* (FIGS. **8-8**B) of each first driver **2040***a* is configured to be aligned with a staple **2012** in the first inner row **2033** of staple cavities **2028**.
(237) As further disclosed in the FIG. **7**, the second drivers **2040***b* are left-side drivers, which are positioned in the left side, or second side **2029**, of the staple cartridge **2020**. For example, the first cradle **2042***a* (FIGS. **8**C-**9**) of each second driver **2040***b* is configured to be aligned with a staple **2012** in the second outer row **2036** of staple cavities **2028**, the second cradle **2042***b* (FIGS. **8**C-**9**) of each second driver **2040***b* is configured to be aligned with a staple **2012** in the second intermediate row **2038** of staple cavities **2028**, and the third cradle **2042***c* (FIGS. **8**C-**9**) of each second driver **2040***b* is configured to be aligned with a staple **2012** in the second inner row **2034** of staple cavities **2028**.
(238) Each cradle **2042***a*, **2042***b*, **2042***c* disclosed in FIGS. **8-9** is defined into a step or platform **2045** of the first driver **2040***a* or the second driver **2040***b*. For example, the depicted first drivers **2040***a* and depicted second drivers **2040***b* include platforms **2045**, and a cradle **2042***a*, **2042***b*, **2042***c* is defined into each of the platforms **2045**. The platforms **2045** disclosed in FIGS. **8-9** of the driver **2040***a*, **2040***b* are the same height or elevation, and are configured to hold each staple **2012** in the array **2011** at the same height or elevation relative to the other staples **2012** in the array **2011**. Referring still to FIGS. **8-9**, a connecting flange **2048** is also disclosed, which extends between the steps **2045** of each driver **2040***a*, **2040***b*. The connecting flange **2048** can limit and/or restrain relative movement between the steps **2045**.
(239) In other instances, the steps or platforms **2045** can have different heights and/or elevations.

For example, the height of each step **2045** can be varied to control the formed height of staples **2012**, and thus, the compression of tissue captured within the formed staples **2012**. Additionally or alternatively, the depth of each cradle **2042***a*, **2042***b*, **2042***c* can be varied to control the height of the formed staples **2012**, and thus, the compression of tissue captured within the formed staples **2012**.

(240) The first and second drivers **2040***a*, **2040***b* and the cradles **2042***a*, **2042***b*, **2042***c* thereof are oriented in an arrangement that complements the arrangement of staple cavities **2028** and staple array **2011** in the staple cartridge **2020** As disclosed in FIGS. **8**A and **8**D, each cradle **2042***a*, **2042***b*, **2042***c* includes a first end **2044** and a second end **2046**, and the first end **2044** of each cradle **2042***a*, **2042***b*, **2042***c* is distal to the second end **2046** of the same cradle **2042***a*, **2042***b*, **2042***c*. Additionally, an axis is defined between the first end **2044** and the second end **2046** of each cradle **2042***a*, **2042***b*, **2042***c*. For example, a first axis A.sub.a is defined by the first cradle **2042***a*, a second axis Ab is defined by the second cradle **2042***b*, and a third axis A.sub.c is defined by the third cradle **2042***c*.

(241) In the depicted arrangement, the orientation of the first axis A.sub.a is configured to match or correspond to the orientation of the angled staple **2012** supported by the first cradle **2042***a*, the orientation of the second axis Ab is configured to match or correspond to the orientation of the angled staple **2012** supported by the second cradle **2042***b*, and the orientation of the third axis A.sub.c is configured to match or correspond to the orientation of the angled staple **2012** supported by the third cradle **2042***c*.

(242) As disclosed in FIGS. **8**A and **8**D, the first axis A.sub.a is parallel, or generally parallel, to the third axis A.sub.c. Additionally, the second axis A.sub.b depicted in FIGS. **8**A and **8**D traverses both the first axis A.sub.a and the third axis A.sub.c. For example, as disclosed in FIGS. **8**A and **8**D, the second axis A.sub.b is perpendicular, or generally perpendicular, to the first axis A.sub.a and the third axis A.sub.c.

(243) In instances where the drivers **2040***a*, **2040***b* are used in a staple cartridge having a different arrangement of staples **2012** and staple cavities **2028**, the relative orientations of the cradles **2042***a*, **2042***b*, **2042***c* can be different. In some arrangements, for example, all of the axes A.sub.a, A.sub.b, A.sub.c may be parallel. In still other arrangements, for example, all of the axes A.sub.a, A.sub.b, A.sub.c may cross. In certain instances, one axis A.sub.a, A.sub.b, A.sub.c may be perpendicular to at least one other axis A.sub.a, A.sub.b, A.sub.c. Additionally or alternatively, in some instances, one axis A.sub.a, A.sub.b, A.sub.c may be parallel to at least one other axis A.sub.a, A.sub.b, A.sub.c.

(244) Referring primarily to FIGS. **8**-**8**C, the first and second drivers **2040***a*, **2040***b* are integrally formed pieces. For example, each driver **2040***a*, **2040***b* consists of an integrally molded part. In other instances, at least one step **2045** and/or connecting flange **2048** can be independently formed. In such instances, the multiple pieces can be glued, welded, and/or otherwise adhered together, for example, to form a unitary piece.

(245) The multi-staple drivers **2040***a*, **2040***b* disclosed in FIGS. **7**-**9** are configured to drive staples **2012** from staple cavities **2028** across multiple longitudinal rows **2033**, **2034**, **2035**, **2036**, **2037**, **2039**. In the staple cartridge **2020** depicted in FIG. **7**, the staples **2012** are arranged in three longitudinal rows on each side of the slot **2032**, and the drivers **2040***a*, **2040***b* are configured to support and drive staples **2012** in each of the three longitudinal rows. For example, each depicted first driver **2040***a* is configured to drive a staple **2012** positioned in the first inner row **2033**, a staple **2012** positioned in the first intermediate row **2037**, and a staple **2012** positioned in the first outer row **2035** of staple cavities **2028**. Additionally, each depicted second driver **2040***b* is configured to drive a staple **2012** positioned in the second inner row **2034**, a staple **2012** positioned in the second intermediate row **2038**, and a staple **2012** positioned in the second outer row **2036** of staple cavities **2028**.

(246) In other instances, the staples **2012** can be arranged in more than three longitudinal rows or

less than three longitudinal rows on each side of the slot **2032**, and the drivers **2040***a*, **2040***b* can be configured to engage staples **2012** in each of the longitudinal rows on each side of the slot **2032**. For example, the staple cartridge **2020** can have two rows of staple cavities **2028** on either side of the longitudinal axis L, and a multi-staple driver positioned therein can include two cradles, which can be configured to support a staple in each of the two rows. In some instances, a multi-staple driver can fire multiple staples **2012** from the same row of staple cavities **2028**. For example, a multi-staple driver can fire adjacent staples **2012** in the same row, such as a more proximal staple **2012** and a more distal staple **2012**, for example. In certain instances, a multi-staple driver may not engage staples **2012** in every row on a side of the longitudinal slot **2032**. For example, a separate and distinct driver may engage staples in one of the rows, such as an outermost row and/or an innermost row, for example. Additionally or alternatively, in certain instances, the staple cartridge **2020** can include at least one multi-staple driver and at least one single-staple driver. See, for example, FIG. **12**.
(247) The end effector assembly **2000** disclosed in FIG. **7** further includes a firing member **2060**, which is configured to move relative to the cartridge body **2024**. During a firing stroke, the firing member **2060** is configured to traverse the cartridge body **2024**, and drivingly engage a sled **2058** to move the sled **2058** through the cartridge body **2024**. For example, a portion of the depicted firing member **2060** is dimensioned and positioned to fit within the longitudinal slot **2032**. As disclosed in FIG. **7**, the portion of the firing member **2060** that is configured to fit within the longitudinal slot **2032** includes a cutting edge **2061**, which is configured to incise tissue clamped between the first jaw **2002** and the second jaw **2004** of the end effector assembly **2000**.
(248) The wedge sled **2058** disclosed in FIG. **7** is configured to engage the drivers **2040***a*, **2040***b* to lift the drivers **2040***a*, **2040***b*, and thus, fire the staples **2012** supported thereon, into tissue. In the depicted end effector assembly **2000**, an intermediate wedge **2062** of the sled **2058** can slide and/or translate within the longitudinal slot **2032**, and laterally positioned driving wedges or driving rails **2064***a*, **2064***b* defined on the sled **2058** can engage the staple drivers **2040***a*, **2040***b*. For example, the sled **2058** shown in FIG. **7** includes driving wedges or rails **2064***a*, **2064***b*, which are configured to move along firing paths F.sub.1 (FIG. **8**A) and F.sub.2 (FIG. **8**D) during a firing stroke to contact the multi-staple first and second drivers **2040***a*, **2040***b* that are longitudinally aligned with the firing paths F.sub.1, F.sub.2.
(249) As disclosed in FIG. **7**, the sled **2058** includes a driving wedge **2064***a*, **2064***b* on either side of the central portion **2062**. The driving wedge **2064***a* on the first side **2027** of the staple cartridge **2020** is configured to move along the first firing path F.sub.1 (FIG. **8**A), and the driving wedge **2064***b* on the second side **2029** of the staple cartridge **2020** is configured to move along the second firing path F.sub.2 (FIG. **8**D).
(250) Each driving wedge **2064***a*, **2064***b* disclosed in FIG. **7** is configured to engage one of the multi-staple drivers **2040***a*, **2040***b* to lift the drivers **2040***a*, **2040***b* within the staple cavities **2028** and eject the staples **2012** from the cartridge body **2024**. In the depicted arrangement, the three steps **2045** of each first driver **2040***a* remain fixed relative to each other, and the three steps **2045** of each second driver **2040***b* remain fixed relative to each other. In other words, the steps **2045** of a single driver **2040***a*, **2040***b* do not move and/or rotate relative to each other. Because the steps **2045** of a single driver **2040***a*, **2040***b* do not move and/or rotate relative to each other, relative movement of the staples **2012** supported by each driver **2040***a*, **2040***b* is also restrained. Additionally, each driver **2040***a*, **2040***b* has a larger base or footprint within the cartridge body **2042**, which can further reduce rotation and/or torqueing of the drivers **2040***a*, **2040***b*. As a result, shifting and/or tilting of the staples **2012** during deployment may be prevented, minimized and/or controlled by the multi-staple drivers **2040***a*, **2040***b*. Multi-staple drivers, like the drivers **2040***a*, **2040***b*, for example, could be incorporated into other staple cartridge and/or end effector assemblies disclosed herein.
(251) In various instances, the driving wedges **2064***a*, **2064***b* of the sled **2058** can be dimensioned,

structured and positioned to engage a driving surface of the drivers **2040***a*, **2040***b*, respectively. For example, the drivers **2040***a*, **2040***b* can include a ramped surface and/or track, which is configured to guide and/or receive a portion of a driving wedge **2064***a*, **2064***b*, respectively, as the firing member **2060** and the sled **2058** move through the staple cartridge **2020**.

(252) The relative placement of the driving wedges **2064***a*, **2064***b*, and their corresponding firing paths F.sub.1, F.sub.2, respectively, to the drivers **2040***a*, **2040***b* and the staples **2012** supported by the drivers **2040***a*, **2040***b* may be selected to prevent, reduce, and/or control torqueing of the drivers **2040***a*, **2040***b* and/or the staples **2012** during firing. For example, the geometry and/or material of the drivers **2040***a*, **2040***b* can be selected to place the center of mass (COM) of each driver **2040***a*, **2040***b* into alignment with the corresponding firing path F.sub.1, F.sub.2, respectively. Additionally or alternatively, the driving wedges **2064***a*, **2064***b*, and thus the firing paths F.sub.1, F.sub.2, respectively, can be positioned within the cartridge **2020** to extend through the center of mass (COM) of the drivers **2040***a*, **2040***b*, respectively.

(253) In other instances, as further described herein, the sled **2058** can include more than one driving wedge **2064***a*, **2064***b* on each side of the intermediate portion **2062**. For example, multiple driving wedges **2064***a*, **2064***b* can move through either side **2027**, **2029** of the cartridge body **2024**. Additionally or alternatively, the driving wedges **2064***a*, **2064***b* of the wedge sled **2058** can be configured to directly engage and drive the staples **2012**, as further described herein.

(254) Referring primarily to FIGS. **8**A and **8**D, the first and second drivers **2040***a*, **2040***b* overlie the firing paths F.sub.1, F.sub.2, respectively, of the driving wedges **2064***a*, **2064***b*, respectively.

(255) For example, the first driver **2040***a* overlies the first firing path F.sub.1 and the second driver **2040***b* overlies the second firing path F.sub.2. Moreover, various portions of each driver **2040***a*, **2040***b* are positioned on either side of the respective driving wedge **2064***a*, **2064***b*, and thus, on either side of the firing paths F.sub.1, F.sub.2. Referring still to FIGS. **8**A and **8**D, the depicted drivers **2040***a*, **2040***b* are dimensioned and structured such that the center of mass (COM) of each driver **2040***a*, **2040***b* overlaps the corresponding firing path F.sub.1, F.sub.2 of the driving wedge **2064***a*, **2064***b*, respectively, for example. In other words, each depicted driver **2040***a*, **2040***b* is mass balanced relative to the corresponding firing path F.sub.1, F.sub.2.

(256) For example, as disclosed in FIG. **8**A, a first portion **2047** of the first driver **2040***a* is positioned on a first side of the firing path F.sub.1, and a second portion **2049** of the first driver **2040***a* is positioned on a second side of the firing path F.sub.1. The first portion **2047** of the first driver **2040***a* has a first mass m.sub.1 and the second portion **2049** of the first driver **2040***a* has a mass m.sub.2, which equals, or substantially equals, the first mass m.sub.1. Additionally, as disclosed in FIG. **8**D, a first portion **2047** of the second driver **2040***b* is positioned on a first side of the firing path F.sub.2, and a second portion **2049** of the second driver **2040***b* is positioned on a second side of the firing path F.sub.2. The first portion **2047** of the second driver **2040***b* has a first mass m.sub.1 and the second portion **2049** of the second driver **2040***b* has a mass m.sub.2, which equals or substantially equals the first mass m.sub.1. Because the drivers **2040***a*, **2040***b* are mass balanced relative to the respective firing paths F.sub.1, F.sub.2, torqueing of the drivers **2040***a*, **2040***b* and the staples **2012** supported thereon during firing can be minimized and/or otherwise controlled. Additionally, the group of staples **2012** deployed by each driver **2040***a*, **2040***b* can be synchronously lifted relative to the cartridge body **2024** and simultaneously driven or fired into tissue. Mass balanced drivers, like the drivers **2040***a*, **2040***b*, for example, could be incorporated into other embodiments disclosed herein.

(257) Additionally, as disclosed in FIGS. **8-9**, at least one cutout **2050** is defined into the first and second multi-staple drivers **2040***a*, **2040***b*. For example, various cutouts **2050** are defined into the connecting flange **2048** of the drivers **2040***a*, **2040***b*. The cutouts **2050** are dimensioned and positioned to adjust the mass of the drivers **2040***a*, **2040***b*, and balance the center of mass (COM) of each driver **2040***a*, **2040***b* relative to the corresponding firing path F.sub.1, F.sub.2. Additionally, the cutouts **2050** are dimensioned and positioned to accommodate for the geometry of the staple

cavities **2028**, in which the drivers **2040**_a_, **2040**_b_ are movably positioned.
(258) In certain instances, multiple staple cavities can be defined into a staple cartridge, at least one staple cavity can be parallel to the longitudinal axis of the staple cartridge, and at least one staple cavity can be angularly-oriented relative to the longitudinal axis of the staple cartridge. Referring to the staple cartridge **2120** depicted in FIG. **10**, for example, multiple staple cavities **2128** are defined into the staple cartridge **2120**, and multiple staple cavities **2128** are parallel to the longitudinal axis L of the staple cartridge **2120**.
(259) In the depicted staple cartridge **2120**, a longitudinal slot **2032** is defined partially through the cartridge body **2124**. Also defined in the cartridge body **2124** is a row of staple cavities **2128** on either side of the longitudinal slot **2032** which includes staple cavities **2128** that are oriented parallel to the longitudinal axis L. In the depicted staple cartridge **2120**, a first row **2137** of staple cavities **2128** and a second row **2138** of staple cavities **2128** are adjacent to the longitudinal slot **2032**, and the staple cavities **2128** in the first row **2137** and in the second row **2138** are oriented parallel to the longitudinal axis L. For example, as disclosed in FIG. **10**, the staple cavities **2128** in the first row **2137** are aligned with an axis A.sub.b, which is parallel to the longitudinal axis L.
(260) The staple cartridge **2120** disclosed in FIG. **10** includes additional rows of staple cavities **2128**. For example, the depicted staple cartridge **2120** includes a third row **2135** of staple cavities **2128** and a fourth row **2136** of staple cavities **2128**, which include staple cavities **2128** that are angularly-oriented relative to the longitudinal axis L. In such instances, the staple cavities **2128** in the third and fourth rows **2135**, **2136** are also angularly-oriented relative to the staple cavities **2128** in the first and second rows **2137**, **2138** and are also angularly-oriented relative to each other. For example, a staple cavity **2128** in the third row **2135** is aligned with an axis A.sub.a, which traverses the longitudinal axis L and traverses the axis A.sub.b of the first row **2137** of staple cavities **2128**. As further disclosed in FIG. **10**, the staple cavities **2128** in the fourth row **2136** extend along an axis that traverses the axis A.sub.a of a staple cavity **2128** in the third row **2135**. The first and third rows **2137**, **2135** of staple cavities **2128** are positioned on a first side **2127** of the depicted cartridge body **2124**, and the second and fourth rows **2136**, **2138** are positioned on a second side **2129** of the depicted cartridge body **2124**.
(261) In various instances, the staple cartridge **2120** disclosed in FIG. **10** can be used with the end effector assembly **2000** depicted in FIG. **7**. For example, the staple cartridge **2120** can be loaded into the elongate channel of the second jaw **2004** of the end effector assembly **2000**. The staple cartridge **2120** can be fired with single-staple drivers, multi-staple drivers, and/or a combination thereof. For example, a multi-staple driver may be configured to fire staples from the staple cavities **2128** in the first and third rows **2137**, **2135** on the first side **2127** of the cartridge body **2124**, and another multi-staple driver can be configured to fire staples from the staple cavities **2128** in the second and fourth rows **2136**, **2138** on the second side **2129** of the cartridge body **2124**. In various instances, the drivers can be positioned within the cartridge body **2124** such that the cradles of the drivers are aligned with the staples positioned in the staple cavities **2128**. In such instances, the drivers and/or the staples supported thereon can be mass balanced relative to the firing path(s) of a sled, such as the sled **2058** (FIG. **7**), for example, which can be configured to traverse the cartridge body **2124** and engage the drivers therein.
(262) In other instances, the staple cartridge **2120** may not include drivers. For example, a firing member and/or sled, such as the firing member **2060** and/or the sled **2058** (FIG. **7**), for example, can be configured to directly contact, engage, and/or drive the staples movably positioned in the staple cavities **2128**. In such instances, the staples can be mass balanced relative to the firing path(s) of the sled **2058**. In still other instances, the staples can be held in position within the cartridge body **2124**, and can be crushed and/or otherwise deformed within the cartridge body **2124**, for example.
(263) In various instances, a multi-staple driver can be balanced relative to multiple driving wedges that concurrently engage and cooperatively lift the driver during deployment. For example, multi-

staple drivers **2240** and a pair of driving wedges **2264***a*, **2264***b* are depicted in FIG. **11**. The multi-staple drivers **2240** are configured for use with the staple cartridge **2020**, for example. Additionally or alternatively, the drivers **2240** can be used with various other staple cartridges having a staple array that matches the array **2011** (FIG. **7**) and corresponds to the arrangement of drivers **2240** shown in FIG. **11**.
(264) In various instances, a staple that is fired from the staple cartridge **2120** can be formed to a variable formed height. For example, the staple can have a greater height between one of the staple legs and the base than between the other staple leg and the base. In such instances, the staple can exert a greater compressive force on tissue at the shorter end of the staple. As described in greater detail herein, the height of a staple can be varied when the staple driver comprises a step or height differential (see, for example, FIG. **79**), and/or when the staple forming pockets in the anvil comprise a step or height differential (see, for example, FIG. **80**).
(265) When an angled staple is deformed to a variable height, the compressive force exerted on the tissue by the angled staple can vary longitudinally and laterally. In certain instances, for example, it can be desirable to compress tissue closer to the cutline, i.e., laterally inboard, more than tissue farther from the cutline, i.e., laterally outboard. In such instances, the lateral tissue variation afforded by an angled staple that has been deformed to different compressed heights can exert a greater compressive force on a laterally inboard portion of tissue and a reduced compressive force on a laterally outboard portion of tissue.
(266) Referring again to FIG. **10**, in certain instances, the staples ejected from the third row **2135** of staple cavities **2128** and from the fourth row **2136** of staple cavities **2128** can be deformed to variable heights. For example, the staples can have a reduced height closer to the longitudinal axis L, and a greater height farther from the longitudinal axis L. Additionally or alternatively, the staples ejected from the first row **2137** of staple cavities **2128** and from the second row of staple cavities **2138** can be deformed to a uniform height, which can be less than the reduced, or smaller height, of the staples ejected from the third row **2135** and the fourth row **2136** of staple cavities **2128**. In such instances, the compressive force exerted on the tissue can be greatest closer to the cutline, and can gradually decrease farther outboard toward the lateral sides of the staple line.
(267) Each driver **2240** disclosed in FIG. **11** includes multiple troughs or staple supporting cradles **2242***a*, **2242***b*, **2242***c*. For example, each driver **2240** includes a first cradle **2242***a*, a second cradle **2242***b*, and a third cradle **2242***c*, which are each dimensioned and structured to support one staple, such as one of the staples **2012** (FIG. **7**). For example, the base of a staple can be positioned in each cradle **2242***a*, **2242***b*, **2242***c*. Referring again to the staple cartridge **2020** depicted in FIG. **7**, the first cradle **2242***a* can be aligned with a staple **2012** in the first outer row **2035** of staple cavities **2028**, the second cradle **2242***b* can be aligned with a staple **2012** in the first intermediate row **2037** of staple cavities **2028**, and the third cradle **2242***c* can be aligned with a staple **2012** in the first inner row **2033** of staple cavities **2028**. In such instances, the first cradle **2242***a* corresponds to an outer cradle, the second cradle **2242***b* corresponds to an intermediate cradle, and the third cradle **2242***c* corresponds to an inner cradle. In various instances, another driver arrangement can be positioned on the opposite side of the staple cartridge, and the other driver arrangement can be the mirror image reflection of the driver arrangement depicted in FIG. **11**.
(268) The cradles **2242***a*, **2242***b*, **2242***c* depicted in FIG. **11** are defined into a support member **2248**. The support member **2248** can support staples across multiple rows of staple cavities. Additionally, the support member **2248** can support staples **2012** oriented at varying angles relative to the longitudinal axis L of the staple cartridge, and/or relative to the longitudinal firing paths of the driving wedges **2264***a*, **2264***b*, for example. Referring to the depicted support member **2248**, the support member **2248** is angularly-oriented relative to the firing paths of the driving wedges **2264***a*, **2264***b*. Additionally, the support member **2248** is angularly-oriented relative to at least one of the cradles **2242***a*, **2242***b*, **2242***c* defined therein. For example, the intermediate cradle **2242***b* disclosed in FIG. **11** is angularly-oriented relative to the support member **2248**. Moreover, as disclosed in

FIG. **11**, the outer cradle **2242***c* and the inner cradle **2242***a* are aligned with the support member **2248**.
(269) In certain instances, the height of the support member **2248** can be uniform, or generally uniform, such that each staple supported by the support member **2248** is positioned at the same height or elevation. In other instances, the support member **2248** can include steps having different heights and/or elevations. For example, the height of a step can be varied to control the height of the formed staples, and thus, the compression of tissue captured within the formed staples. Additionally or alternatively, the depth of each cradle **2242***a*, **2242***b*, **2242***b* can be varied to control the height of the formed staples, and thus, the compression of tissue captured within the formed staples.
(270) Each cradle **2242***a*, **2242***b*, **2242***c* disclosed in FIG. **11** includes a first end **2244** and a second end **2246**. The first end **2244** of each cradle **2242***a*, **2242***b*, **2242***c* is distal to the second end **2246** of the same cradle **2242***a*, **2242***b*, **2242***c*. Additionally, an axis is defined between the first end **2244** and the second end **2246** of each cradle **2242***a*, **2242***b*, **2242***c*. For example, a first axis A.sub.a is defined by the first cradle **2242***a* and the third cradle **2242***c*, and a second axis A.sub.b is defined by the second cradle **2242***b*. As depicted in FIG. **11**, the second axis A.sub.b traverses the first axes A.sub.a. In certain instances, the second axis A.sub.b can be perpendicular, or generally perpendicular, to the first axis A.sub.a.
(271) Referring still to FIG. **11**, the multi-staple drivers **2240** include rails **2245***a*, **2045***b*, which are connected to the support member **2248**. The rails **2245***a*, **2245***b* are positioned to engage the driving wedges **2264***a*, **2264***b* of a wedge sled. For example, the depicted rails **2245***a*, **2245***b* are aligned with the firing paths F.sub.1, F.sub.2 of the driving wedges **2264***a*, **2264***b*. In such instances, the rails **2245***a*, **2245***b* can provide an elongated surface area for receiving the driving force from the driving wedges and for stabilizing the multi-staple drivers **2240** when the driving wedges **2264***a*, **2264***b* drivingly engage the rails **2245***a*, **2245***b*.
(272) The drivers **2240** can include multiple independently formed parts, which can be glued, welded, and/or otherwise adhered together. For example, the support member **2248** can be joined together with the rails **2245***a*, **2245***b* to form the driver **2240**. In other instances, each driver **2240** can be an integrally molded part, which includes the support member **2248** and the rails **2245***a*, **2245***b*.
(273) The drivers **2240** that are disclosed in FIG. **11** overlie the firing paths F.sub.1, F.sub.2 of the driving wedges **2264***a*, **2264***b*. Moreover, various portions of each depicted driver **2240** are positioned on either side of the wedges **2264***a*, **2264***b*. As shown in FIG. **11**, the drivers **2240** are dimensioned and structured such that the center of mass (COM) of each driver **2240** is equidistant from the drive axes, e.g., equidistant from the firing paths F.sub.1, F.sub.2 of the driving wedges **2264***a*, **2264***b*. For example, the firing paths F.sub.1, F.sub.2, depicted in FIG. **11**, are separated by a width w, and the center of mass of each driver **2240** is positioned between the firing paths F.sub.1, F.sub.2. As shown in FIG. **11**, the center of mass of each driver **2240** is laterally offset from the first firing path F.sub.1 by a width w/2 and laterally offset from the second firing path F.sub.2 by a width w/2. As a result, each depicted driver **2240** is mass balanced relative to the firing paths F.sub.1, F.sub.2. Because the drivers **2240** are mass balanced relative to the firing paths F.sub.1, F.sub.2, torqueing of the drivers **2240** and staples during deployment may be prevented, minimized and/or otherwise controlled. Mass balanced drivers, like the drivers **2240**, for example, could be incorporated into other staple cartridges and end effector assemblies disclosed herein.
(274) In other instances, the firing member can include a single driving wedge aligned with the drivers **2240**, and the drivers **2240** can be mass balanced relative to the driving wedge. For example, the driving wedge can define a firing path that extends through the center of mass (COM) of each driver **2240**. In such instances, the driving wedge may have a greater width to increase the stability of the drivers **2240**. In other instances, the firing member can include three or more driving wedges, and the cumulative drive force exerted by the driving wedges can be balanced relative to

the geometry of the driver **2240**.
(275) Each rail **2245***a*, **2245***b* disclosed in FIG. **11** is aligned with one of the firing paths F.sub.1, F.sub.2. Specifically, the first rail **2245***a* is aligned with the first firing path F.sub.1, and the second rail **2245***b* is aligned with the second firing path F.sub.2. The driving wedges **2264***a*, **2264***b* are configured to contact the rails **2245***a*, **2245***b* to lift the drivers **2240** and the staples supported thereon. Referring still to FIG. **11**, the depicted driving wedges **2264***a*, **2264***b* are longitudinally staggered by a distance x. For example, the first wedge **2264***a* trails the second wedge **2264***b* by the distance x indicated in FIG. **11**. Additionally, the first rail **2245***a* is longitudinally staggered relative to the second rail **2245***b*. For example, the second rail **2245***b* is distally offset from the first rail **2245***a* by the distance y indicated in FIG. **11**. In the arrangement disclosed in FIG. **11**, the distance x equal, or substantially equals, the distance y, such that driving wedges **2264***a*, **2264***b* simultaneously contact and drive the rails **2245***a*, **2245***b*, respectively, during a firing stroke.
(276) Because the driving wedges **2264***a*, **2264***b* disclosed in FIG. **11** simultaneously engage and drivingly lift the rails **2245***a*, **2245***b*, respectively, on either side of the center of mass (COM) of the driver **2240** and equidistant therefrom, the cumulative driving force is balanced throughout the entire deployment of the driver **2240**. As a result, torqueing and/or rotation of the driver **2240**, and thus of the staples supported thereon, may be prevented, minimized, and/or controlled. Longitudinally offset driving wedges, like the driving wedges **2264***a*, **2264***b*, for example, could be incorporated into other embodiments disclosed herein.
(277) An arrangement of multi-staple drivers **2340***a* and single-staple drivers **2340***b* is disclosed in FIG. **12**. Because the arrangement of drivers **2340***a*, **2340***b* corresponds to the array **2011** of staples **2012** depicted in FIG. **7**, the drivers **2340***a*, **2340***b* can be used with the staple cartridge **2020** (FIG. **7**). Additionally or alternatively, the drivers **2340***a*, **2340***b* can be used with various other staple cartridges having a staple array that corresponds to the arrangement of drivers **2340***a*, **2340***b* depicted in FIG. **12**.
(278) The drivers **2340***a*, **2340***b* include multiple troughs or staple supporting cradles **2342***a*, **2342***b*, **2342***c*. For example, the multi-staple drivers **2340***a* include a first cradle **2342***a* and a second cradle **2342***b*, which are each dimensioned and structured to support a staple, such as two of the staples **2012** shown in FIG. **7**. Additionally, the single-staple drivers **2340***b* include a third cradle **2342***c*, which is dimensioned and structured to support another staple, such as another of the staples **2012** shown in FIG. **7**. For example, the base of a staple **2012** can reside in each cradle **2342***a*, **2342***b*, **2342***c*.
(279) Referring again to the staple cartridge **2020** depicted in FIG. **7**, the first cradle **2342***a* can be aligned with a staple **2012** in the first outer row **2035** of staple cavities **2028**, the second cradle **2342***b* can be aligned with a staple **2012** in the intermediate row **2037** of staple cavities **2028**, and the third cradle **2342***c* can be aligned with a staple **2012** in the inner row **2033** of staple cavities **2028**. In such instances, the first cradle **2342***a* corresponds to an outer cradle, the second cradle **2342***b* corresponds to an intermediate cradle, and the third cradle **2342***c* corresponds to an inner cradle. Additionally, another driver arrangement can be positioned on the opposite side of the staple cartridge **2020**, which can be the mirror image of the driver arrangement disclosed in FIG. **12**.
(280) Referring still to FIG. **12**, each cradle **2342***a*, **2342***b*, **2342***c* is defined into a step and/or support portion **2345**. Additionally, each of the drivers **2340***a*, **2340***b* includes a base **2348**, **2349**, respectively. The base **2348** of each multi-staple driver **2340***a* extends between the steps **2345** of the driver **2340***a*. Additionally, the base **2349** of each single-staple driver **2340***b* extends from the step **2345** thereof.
(281) As disclosed in FIG. **12**, each driver **2340***a*, **2340***b* is aligned with a firing path F.sub.1, F.sub.2 within a staple cartridge. Specifically, each first driver **2340***a* is aligned with the first firing path F.sub.1, and each second driver **2340***b* is aligned with the second firing path F.sub.2. The depicted driving wedges **2364***a*, **2364***b* are configured to move along the firing paths F.sub.1, F.sub.2 during a firing stroke. Additionally, the driving wedges **2364***a*, **2364***b* contact the drivers

2340*a*, **2340***b*, respectively, to lift the drivers **2240***a*, **2340***b* and the staples supported thereon.
(282) The bases **2348**, **2349** can act as counterweights to adjust and/or control the center of mass of the drivers **2340***a*, **2340***b*. For example, the geometry and material of each base **2348**, **2349** can be selected to maintain and/or shift the center of mass of each driver **2340***a*, **2340***b* into alignment with the corresponding firing path F.sub.1, F.sub.2. As depicted in FIG. **12**, the first bases **2348** include at least one cutout **2350**. The dimensions, placement, and geometry of the cutouts **2350** are selected to mass balance the first drivers **2340***a* relative to the first firing path F.sub.1. For example, each first base **2348** can be configured to shift or maintain the center of mass of the multi-staple driver **2340***a* into alignment with the first firing path F.sub.1, and each second base **2349** can be configured to shift the center of mass of the single-staple driver **2340***b* into alignment with the second firing path F.sub.2.
(283) Additionally, the bases **2348**, **2349** provide an elongated surface area for stabilizing the drivers **2340** when the driving wedges **2364***a*, **2364***b* drivingly engage the drivers **2340***a*, **2340***b*. For example, the larger footprint of the drivers **2340***a*, **2340***b* may promote stability and prevent torqueing and/or rotation of the drivers **2340***a*, **2340***b* during deployment. Moreover, because the bases **2348**, **2349** provide a larger surface area, the driving force can be distributed to promote a balanced driver and staple deployment. Drivers having elongated surface areas, such as the bases **2348**, **2349**, for example, could be incorporated into other embodiments disclosed herein.
(284) Referring still to FIG. **12**, the depicted driving wedges **2364***a*, **2364***b* are longitudinally staggered by a distance x. For example, the first wedge **2364***a* trails the second wedge **2364***b* by the distance x. As further depicted in FIG. **12**, the depicted drivers **2340***a*, **2340***b* are longitudinally staggered by a distance y. In the depicted arrangement, the distance x is different than the distance y, such that the driving wedges **2364***a*, **2364***b* do not contact the drivers **2340***a*, **2340** simultaneously. For example, in the depicted arrangement, the first wedge **2364***a* contacts the first driver **2340***a* before the second wedge **2364***b* contacts the second driver **2340***b*. In such instances, deployment of the first driver **2340***a*, and thus movement of the first cradle **2342***a* and the second cradle **2342***c*, is initiated before deployment of the second staple **2340***b*, and thus movement of the third cradle **2342***c*. As a result, the staples aligned with the first driver **2340***a* are fired before the staples aligned with the second driver **2340***b*.
(285) In certain instances, it is desirable to fire a staple or a group of staples before firing another staple or group of staples. For example, to control bleeding and/or fluid flow within the stapled tissue, staples positioned further inboard, such as the staples adjacent to the longitudinal slot, and thus, adjacent to the cut line, may be fired before staples further outboard.
(286) In other instances, the staples aligned with the second driver **2340***b* can be fired before the staples aligned with the first driver **2340***a*. Alternatively, the first driver **2340***a* and the second driver **2340***b* can be fired simultaneously, such that the three staples supported by adjacent multi-staple and single staple drivers **2340***a*, **2340***b* pierce and capture tissue simultaneously.
(287) An arrangement of dual-staple drivers **2440** is depicted in FIG. **13**. As arranged in FIG. **13**, the dual-staple drivers **2440** are configured to fire staples from a staple cartridge that has four adjacent rows of staple cavities. For example, the driver arrangement depicted in FIG. **13** can be configured to fire staples from four rows of staple cavities on one side of a longitudinal slot in a cartridge body, and a corresponding mirror image driver arrangement can be configured to fire staples from four rows of staple cavities on the other side of the longitudinal slot.
(288) In other instances, a single row of dual-staple drivers **2440** can be positioned on a first side of the a staple cartridge, and a single row of dual-staple drivers **2440** can be positioned on a second, opposite side of the staple cartridge. In such instances, the dual-staple drivers **2440** can be arranged to fire staples from two adjacent rows of staple cavities on either side of a cut line. In other instances, rows of dual-staple drivers **2440** can be added to the arrangement shown in FIG. **13**. For example, the dual-staple drivers can be arranged to fire staples from six or more adjacent rows of staple cavities.

(289) The dual-staple drivers **2440** depicted in FIG. **13** include a pair of troughs or staple supporting cradles **2442***a*, **2442***b*. For example, each dual-staple drivers **2440** includes a first cradle **2442***a* and a second cradle **2442***b*, which are dimensioned and structured to support a staple, such as one of the staples **2012** (FIG. **7**). For example, the base of a staple can be positioned in each cradle **2442***a*, **2442***b*.
(290) The first cradle **2442***a* of one of the dual-staple drivers **2440** can be aligned with a staple in a row of staple cavities, and the second cradle **2442***b* of the same dual-staple driver **2440** can be aligned with a staple in another row of staple cavities. Additionally, the first cradle **2442***a* of another dual-staple driver **2440** can be aligned with a staple in another row of staple cavities, and the second cradle **2442***b* of that dual-staple driver **2440** can be aligned with a staple in yet another row of staple cavities.
(291) Referring still to FIG. **13**, each dual-staple driver **2440** includes steps and/or support portions **2445**, and each cradle **2442***a*, **2442***b* is defined into one of the steps **2445**. Additionally, each of the drivers **2440** includes a base or connecting flange **2448** that extends between the steps **2445** of the dual-staple driver **2440**. Because the steps **2445** are connected by the connecting flange **2448**, the cradles **2442***a*, **2442***b* are linked such that coordinated and/or synchronized staple deployment can be initiated by the dual-staple driver **2440**.
(292) The steps **2445** of the drivers **2440** can be the same height. Alternatively, in some instances, a driver **2440** can include steps of different heights. In still other instances, different drivers **2440** can have steps of different heights, for example.
(293) As disclosed in FIG. **13**, each dual-staple driver **2440** overlies a pair of firing paths. Specifically, one of the drivers **2440** overlies the first and second firing paths F.sub.1, F.sub.2, and another of the drivers **2440** overlies the third and fourth firing paths F.sub.3, F.sub.4. Multiple driving wedges **2464***a*, **2464***b*, **2464***b*, **2464***d* are also depicted in FIG. **13**. As shown in FIG. **13**, the driving wedges **2464***a*, **2464***b*, **2464***c*, **2464***d* are configured to contact the dual-staple drivers **2440** to lift the dual-staple drivers **2240** and the staples positioned thereon.
(294) Referring still to FIG. **13**, each step **2445** includes a center of mass (COM). Additionally, each of the firing paths F.sub.1, F.sub.2, F.sub.3, F.sub.4 is aligned with a center of mass of a step **2045**. As a result, each step **2445** is mass balanced relative to the corresponding firing paths F.sub.1, F.sub.2, F.sub.3, F.sub.4.
(295) In various instances, the base **2448** extending between the steps **2445** can also be mass balanced relative to the respective firing paths F.sub.1, F.sub.2, F.sub.3, F.sub.4, such that the base **2448** maintains the mass balance of the dual-staple driver **2440**. In some instances, the base **2448** can contribute an insignificant and/or negligible shift and/or variation to the mass balance of the dual-staple driver **2440**. In such instances, the mass balance of the drivers **2240** can be approximated by the mass balance of the steps **2445** thereof, for example.
(296) Referring still to FIG. **13**, the depicted driving wedges **2464***a*, **2464***b* are longitudinally staggered by a distance x. For example, the first wedge **2464***a* trails the second wedge **2464***b* by the distance x. Additionally, the center of mass (COM) of the steps **2445** of each dual-staple driver **2440** are longitudinally staggered by the distance x. In such instances, the driving wedges **2464***a*, **2464***b* can move into engagement with the driver **2440** simultaneously. Because the wedges **2464***a*, **2464***c* contact each driver **2444** simultaneously, deployment of the pair of staples supported by each driver **2440** can be synchronized, and the staples can be simultaneously driven or fired into tissue. Longitudinally staggered wedges, like the wedges **2464***a*, **2464***b*, for example, could be incorporated into other embodiments disclosed herein.
(297) In various instances, the geometry of a driving wedge can be selected, in combination with an arrangement of staples and drivers within a staple cartridge, to balance the forces exerted upon the staples and drivers during deployment. Additionally, in certain instances, the geometry of the driving wedge can be selected to coordinate the deployment of staples.
(298) For example, a driver can include staggered and/or longitudinally offset driving wedges,

which can be configured to simultaneously engage an angularly-oriented staple and/or an angularly-oriented driver within the staple cartridge. For example, staggered driving wedges can move into engagement with a first or proximal end of a driver and a second or distal end of the same driver at the same time. Because both ends of the angled driver are engaged by the staggered wedges simultaneously, the staggered driving wedges concurrently lift the driver. As a result, torqueing and/or rotation of the driver during deployment, and thus the staple supported thereon, may be prevented, limited, and/or controlled.
(299) In other driverless embodiments, further described herein, staggered driving wedges can move into engagement with a first or proximal end of an angled staple and a second or distal end of the same angled staple at the same time. Because both ends of the angled staple are engaged by the staggered wedges simultaneously, the staggered driving wedges concurrently lift the staple. As a result, torqueing and/or rotation of the staple during deployment may be prevented, limited, and/or controlled.
(300) Additionally or alternatively, the geometry of a driver can define at least one firing path that is aligned with non-angularly-oriented staples and/or drivers within the staple cartridge. For example, the firing path can be collinear with the axes of various drivers and staples that are oriented parallel to the longitudinal axis of the staple cartridge. Because the firing path is collinear with the staple and/or driver axis, the staple and/or driver can be balanced relative to the driving wedge, and torqueing and/or rotation of the driver and/or the staple can be prevented, limited, and/or controlled.
(301) An arrangement of drivers **2540**, staples **2512***a*, **2512***b*, and driving wedges **2564***a*, **2564***b*, **2564***c* of a wedge sled **2558** is depicted in FIGS. **14** and **15**. The driving wedges **2564***a*, **2564***b*, **2564***c* disclosed in FIGS. **14** and **15** are configured to move along the firing paths F.sub.1, F.sub.2, and F.sub.3 (FIG. **14**), respectively, which extend through a staple cartridge. In various instances, the arrangement of drivers **2540** can be utilized in a staple cartridge having an arrangement of staples **2512***a*, **2512***b* and staple cavities that corresponds to the depicted driver arrangement.
(302) As disclosed in FIG. **14**, the drivers **2540** and the staples **2512***a*, **2512***b* are arranged in multiple rows **2534**, **2536**. Additionally, various drivers **2540** and staples **2512***a* in each row are oriented parallel to a longitudinal axis L, and various drivers **2540** and staples **2512***b* in each row are oriented at an angle relative to the longitudinal axis L. For example, the depicted arrangement includes a pair of longitudinal rows **2534**, **2536**, and the drivers **2540** and staples **2512***a*, **2512***b* in each row **2534**, **2536** alternate between a parallel orientation and an angled orientation relative to the longitudinal axis L. For example, the drivers **2540** shown in the first row **2534** include a first driver **2540***a* angularly-oriented relative to the longitudinal axis L, a second driver **2540***b* oriented parallel to the longitudinal axis L, a third driver **2540***c* angularly-oriented relative to the longitudinal axis L, and a fourth driver **2540***d* oriented parallel to the longitudinal axis L.
(303) As disclosed in FIG. **14**, the second driver **2540***b* and the fourth driver **2540***d* of the first row **2534** are aligned with the first firing path F.sub.1. More particularly, both the proximal ends **2546** and the distal ends **2544** of the second and fourth drivers **2540***b*, **2540***d* are aligned with the first firing path F.sub.1. In such instances, the first firing path F.sub.1 extends through the center of masses (COM) of the second driver **2540***b* and the fourth driver **2540***d*. Because the first firing path F.sub.1 is aligned with the second and fourth drivers **2540***b*, **2540***d*, the second and fourth drivers **2540***b*, **2540***d* are mass balanced relative to the first firing path F.sub.1 and torqueing and/or rotation of the second and fourth drivers **2540***b*, **2540***d* shown in FIG. **14**, and thus the staples supported thereon, may be prevented, limited, and/or controlled.
(304) As disclosed in FIG. **14**, the first driver **2540***a* is aligned with an axis A, which traverses the longitudinal axis L and the firing paths F.sub.1, F.sub.2, and F.sub.3. Additionally, the third driver **2540***c* is oriented parallel to the axis A. As depicted in FIG. **14**, the first and third drivers **2540***a*, **2540***c* are oriented at an angle relative to the longitudinal axis L and overlie multiple firing paths. For example, the depicted first and third drivers **2540***a*, **2540***c* overlie the first and second firing

paths F.sub.1, F.sub.2. As depicted in FIG. **14**, the first firing path F.sub.1 extends through the proximal ends **2546** of the first and third drivers **2540***a*, **2540***c*, and the second firing path F.sub.2 extends through the distal ends **2544** of the first and third drivers **2540***a*, **2540***c*.
(305) The center of masses (COM) of the first and second drivers **2540***a*, **2540***c* are intermediate the first firing path F.sub.1 and the second firing path F.sub.2. For example, the center of masses of the first and second drivers **2540***a*, **2540***c* are equidistant from the first firing path F.sub.1 and the second firing path F.sub.2, and thus, the drivers **2540***a*, **2540***c* are mass balanced relative to the first and second firing paths F.sub.1, F.sub.2. As a result, torqueing and/or rotation of the second and fourth drivers **2540***b*, **2540***d* shown in FIG. **14**, and thus the staples supported thereon, may be prevented, limited, and/or controlled.
(306) Additionally, the driving wedges **2564***a*, **2564***c*, **2564***c* shown in FIGS. **14** and **15** are longitudinally staggered. For example, the first driving wedge **2564***a* distally trails the second driving wedge **2564***b* by a distance x and the second driving wedge **2564***b* distally trails the third driving wedge **2564***c* by the distance x. As depicted in FIG. **14**, the proximal end **2546** and the distal end **2544** of the angularly-oriented third driver **2540***c* are offset by a longitudinal distance y. In the arrangement depicted in FIGS. **14** and **15**, the longitudinal distance y between the proximal end **2546** and the distal end **2544** of third driver **2540***c* equals the longitudinal distance x between the first driving wedge **2564***a*, which is aligned with the proximal end **2546** of the third driver **2540***c*, and the second driving wedge **2564***b*, which is aligned with the distal end **2544** of the third driver **2540***c*.
(307) In the arrangement disclosed in FIGS. **14** and **15**, the first driving wedge **2564***a* and the second driving wedge **2564***b* moves into engagement with the third driver **2540***c* simultaneously. For example, the first driving wedge **2564***a* contacts the proximal end **2546** of the third staple driver **2540***c* as the second driving wedge **2564***b* contacts the distal end **2544** of the third staple driver **2540***c*. Because the driving wedges **2564***a*, **2564***b*, **2564***c* depicted in FIG. **14** are configured to engage the ends of the angled drivers, the lifting force is applied directly below the legs of the staple that is supported on the angled third driver **2540***c*. As a result, the staple legs are further stabilized, and tilting and/or tipping of the staples legs during deployment can be prevented, minimized, and/or controlled.
(308) The first and second driving wedges **2564***a*, **2564***b* shown in FIGS. **14** and **15** are configured to similarly engage additional drivers **2540** in the first row **2534**, and can sequentially deploy the staples **2512***a*, **2512***b* supported thereon. For example, the first driving wedge **2564***a* is configured to subsequently contact the proximal end **2546** of the first driver **2540***a* as the second driving wedge **2564***b* contacts the distal end **2544** of the first driver **2440***a*. Additionally, the first driving wedge **2564***a* is configured to sequentially engage and fire the parallel drivers **2540***b*, **2540***d* and staples **2512***a* in the first row **2534**.
(309) In various instances, the proximal end **2546** and the distal end **2544** of the third driver **2540***c* can be equidistant from the center of mass of the third driver **2540***c*. Because the driving wedges **2464***a* and **2464***b* disclosed in FIGS. **14** and **15** are configured to simultaneously contact the opposing ends of the angularly-oriented third staple driver **2540***c* and to exert a driving and/or lifting force on the opposing ends of the staple driver **2540***c* equidistant from the center of mass, the staple driver **2540***c* is balanced throughout its deployment. As a result, rotation and/or torqueing of the third staple driver **2540***c* may be prevented, avoided, and/or controlled.
(310) In other instances, the driving wedges **2564***a*, **2564***b* may not contact the ends **2546**, **2544** of the angled staple drivers **2540**. In such instances, however, the driving wedges **2564***a*, **2564***b* may be configured to engage the angled staple drivers **2540** at a location that is equidistant from the center of mass of the driver **2540**. Moreover, the driving wedges **2564***a*, **2564***b* can be sufficiently offset to simultaneously contact and lift the spaced locations of the driver **2540***c*.
(311) Additionally, the second and third driving wedges **2564***b*, **2564***c* shown in FIGS. **14** and **15** are configured to similarly engage the drivers **2540** in the second row **2536** and sequentially deploy

the staples **2512***a*, **2512***b* supported thereon. Referring still to the arrangement depicted in FIG. **14**, for example, the drivers **2540** in the second row **2536** are oriented at an angle such that the distance between the proximal end **2546** and the distal end **2544** of each driver is also separated by the longitudinal distance y, which equals the longitudinal distance x between the second driving wedge **2564***b* and the third driving wedge **2564***c*.

(312) In other instances, the longitudinal distance between the second driving wedge **2564***b* and the third driving wedge **2564***c* can be greater than and/or less than the longitudinal distance between the first driving wedge **2564***a* and the second driving wedge **2564***b*. Additionally or alternatively, the angled staples **2512***b* in the second row **2536** can be oriented at a different angle than the angled staples **2512***b* in the first row **2534**. Moreover, in various instances, additional rows of drivers **2540** and staples **2512***a*, **2512***b* can be added to the arrangement depicted in FIG. **14**, and additional driving wedges can be configured to engage the additional drivers **2540** to fire the additional staples **2512***a*, **2512***b*. In still other instances, the arrangement can further include a single row of drivers **2540** and staples **2512***a*, **2512***b*, for example.

(313) The arrangement of staples **2512***a*, **2512***b* depicted in FIG. **14** can also be fired from a driverless staple cartridge. For example, referring to FIG. **16**, the staples **2512***a*, **2512***b* can be arranged within a driverless cartridge, such as the staple cartridge **2620** (FIG. **37**), for example, which is further described herein. The staples **2512***a*, **2512***b* in a driverless staple cartridge can be directly engaged and/or driven by a sled and/or a firing member. For example, the staples **2512***a*, **2512***b* can include a sled-engagement surface, which is configured to be directly engaged by a staple-engagement surface of one or more of the driving wedges **2564***a*, **2564***b*, and/or **2564***c* of the wedge sled **2558**.

(314) As described herein, each staple **2512***a*, **2512***b* can be mass balanced relative to the firing path(s) F.sub.1, F.sub.2, F.sub.3 that is/are aligned with the staple **2512***a*, **2512***b*. For example, referring to FIGS. **16**, the staples **2512***a*, which are arranged parallel to the longitudinal axis L, are aligned with one of the firing paths F.sub.1, F.sub.2, F.sub.3. In the depicted arrangement, one of the driving wedges **2564***a*, **2564***b*, **2564***c* drivingly engages the parallel staples **2512***a* along the length of the base of the staple **2512***a*. Additionally, the center of mass of each parallel staple **2512***a* is aligned with one of the firing paths F.sub.1, F.sub.2, F.sub.3. Stated differently, one of the firing paths F.sub.1, F.sub.2, F.sub.3 extends through the center of mass of each parallel staple **2512***a*, and thus, the staples **2512***a* are mass balanced relative to the respective firing path F.sub.1, F.sub.2, F.sub.3 during deployment. In such an arrangement, torqueing and/or rotation of the staples **2512***a* during firing can be prevented, minimized, and/or controlled.

(315) Additionally, where the staple arrangement depicted in FIG. **14** is utilized in a driverless cartridge, a pair of offset driving wedges **2564***a*, **2564***b*, **2564***c* is configured to simultaneously move into engagement with each angularly-oriented staple **2512***b*. For example, the first and second driving wedges **2564***a*, **2564***b* are configured to simultaneously contact an angled staple **2512***b* in the first row **2534**, and the second and third driving wedges **2564***b*, **2564***c* are configured to simultaneously contact an angled staple **2512***b* in the second row **2536**. Thereafter, the wedge sled **2558** is configured to continue to translate relative to the staples **2512***a*, **2512***b*, to sequentially contact and directly drive the staples **2512***a*, **2512***b* from the driverless staple cartridge.

(316) As described herein, a driverless staple cartridge can be employed to hold and fire a staple array that includes angularly-oriented staples. An end effector assembly **2600** including the first jaw **2002**, the second jaw **2004**, the frame **2006**, the articulation joint **2009**, and a driverless staple cartridge **2620** is disclosed in FIG. **37**. The staple cartridge **2620** can be a single-use and/or disposable cartridge, which can be replaced with another staple cartridge after firing. FIG. **37** discloses a staple cartridge **2620** that includes a deck **2626**, a cartridge body **2624**, and a casing **2622**, which partially surrounds or encloses the cartridge body **2624**. Additionally, an array of staples, such as the staples **2612** (FIGS. **39**A and **39**B), for example, can be removably positioned in the cartridge body **2624**.

(317) In certain instances, the staple cartridge **2620** can be integrally formed with the end effector assembly **2600** and/or can be permanently fixed within one of the jaws **2002**, **2004**, for example. In such instances, the end effector assembly **2600** can be a single-use and/or disposable end effector. In other instances, the staple cartridge **2620** can be fixed to the end effector assembly **2600**, and may be reloaded with additional staples for subsequent firings, for example.
(318) Referring to the staple cartridge **2620** depicted in FIG. **37**, a longitudinal slot **2632** is defined at least partially though the cartridge body **2624**. The longitudinal slot **2632** extends along a longitudinal axis L, which extends between a proximal end **2623** and a distal end **2625** of the cartridge body **2624**. The longitudinal slot **2632** shown in FIG. **37** extends from the proximal end **2623** toward the distal end **2625** and traverses a portion of the length of the cartridge body **2624**.
(319) In some instances, the longitudinal slot **2632** can traverse the entire length of the cartridge body **2624**. In other instances, the longitudinal slot **2632** can extend from the distal end **2623** toward the proximal end **2625**, for example. In still other instances, the cartridge body **2624** may not include a predefined and/or preformed longitudinal slot. For example, a firing member and/or a cutting element can transect and/or cut the cartridge body **2624** during the firing stroke, for example.
(320) The staple cartridge **2620** disclosed in FIG. **37** is configured to fire an array of angled staples **2612** (FIGS. **38**A and **38**B), which can be oriented like the staple array **2011** shown in FIG. **7**, for example. The angled staples **2612** can be removably positioned in angled staple cavities **2628**, shown in FIG. **37**, which are defined into the cartridge body **2624**. For example, the depicted staple cavities **2628** are angularly-oriented relative to the longitudinal axis L. Additionally, the depicted arrangement of staple cavities **2628** corresponds to the arrangement of staples **2612** positioned in the cartridge **2620**. Each staple cavity **2628** shown in FIG. **37** includes an opening **2630** in the deck **2626**, and each opening **2630** includes a proximal end and a distal end. A staple axis can extend between the proximal end and the distal end, and the staple axis of the openings **2630** shown in FIG. **37** are skewed and/or angled relative to the longitudinal axis L of the cartridge body **2624**. In the staple cartridge **2620** of FIG. **37**, all the staple cavities **2628** are angularly-oriented relative to the longitudinal axis L and various staple cavities **2628** are angularly-oriented relative to other staple cavities **2628**.
(321) The staple cavities **2628** depicted in FIG. **37** are arranged in multiple rows on each side of the longitudinal slot **2632**. For example, the staple cavities **2628** are arranged in a first inside row **2633**, a first outside row **2635**, and a first intermediate row **2637** on a first side **2627** of the longitudinal slot **2632**, and staple cavities **2628** are arranged in a second inside row **2634**, a second outside row **2638**, and a second intermediate row **2636** on a second side **2629** of the longitudinal slot **2632**. Though the staple cavities **2628** do not cross or otherwise contact each other, the longitudinal rows **2633**, **2634**, **2635**, **2636**, **2637**, **2638** of staple cavities **2628** overlap. For example, a staple cavity **2628** extends laterally outboard and/or inboard past the staple cavity **2628** in an adjacent row of staple cavities **2628**, and a staple cavity **2628** extends proximally and/or distally past the staple cavity **2628** in an adjacent row of staple cavities **2628**. Because the staple cavities **2628** and the staples positioned therein are arranged in an overlapping array, bleeding and/or fluid flow in the stapled tissue can be controlled. In the staple cartridge **2620** depicted in FIG. **37**, the staple cavities **2628** and rows thereof are symmetrical relative to the longitudinal slot **2632**.
(322) In other instances, greater than or fewer than three rows of staple cavities **2628** can be positioned on each side of the longitudinal slot **2632** and, in some instances, one of the sides **2627**, **2629** of the staple cartridge **2620** can include a different number of rows of staple cavities **2628** than the other side **2627**, **2629** of the staple cartridge **2620**. In some instances, the staple cavities **2628** may not longitudinally and/or laterally overlap the staple cavities **2628** in adjacent rows. Additionally or alternatively, in certain instances, the staple cavities **2628** and/or the rows thereof can be asymmetrical relative to the longitudinal slot **2632** and/or the longitudinal axis L.
(323) Referring still to FIG. **37**, the depicted staple cavities **2628** in each longitudinal row are

parallel or substantially parallel. In other words, the staple cavities **2628** in the first inside row **2633** are parallel to each other, the staple cavities **2628** in the first outside row **2635** are parallel to each other, the staple cavities **2628** in the first intermediate row **2637** are parallel to each other, the staple cavities **2628** in the second inside row **2634** are parallel to each other, the staple cavities **2628** in the second outside row **2636** are parallel to each other, and the staple cavities **2628** in the second intermediate row **2638** are parallel to each other.

(324) As also depicted in FIG. **37**, the staple cavities **2628** in each longitudinal row are angularly-oriented relative to the staple cavities **2628** in the adjacent longitudinal row(s) on the same side of the longitudinal slot **2632**. For example, on the first side **2627** of the cartridge body **2624**, the staple cavities **2628** in the first intermediate row **2637** are angularly-oriented relative to the staple cavities **2628** in the first inner row **2633** and in the first outer row **2635**. Additionally, on the second side **2629** of the cartridge body **2624**, the staple cavities **2628** in the second intermediate row **2638** are angularly-oriented relative to the staple cavities **2628** in the second inner row **2634** and the second outer row **2636**.

(325) In other instances, only a portion of the staples cavities **2628** in each longitudinal row **2633**, **2634**, **2635**, **2636**, **2637**, **2638** may be parallel to each other and/or less than all of the longitudinal rows **2633**, **2634**, **2635**, **2636**, **2637**, **2638** can include staple cavities **2628** that are parallel to each other. Additionally or alternatively, in certain instances, at least a portion of the staple cavities **2628** can be randomly oriented. In some instances, at least one of the staple cavities **2628** in a longitudinal row **2633**, **2634**, **2635**, **2636**, **2637**, **2638** can be parallel to at least one of the staple cavities **2628** in an adjacent longitudinal row **2633**, **2634**, **2635**, **2636**, **2637**, **2638**. In certain instances, a staple cartridge **2620** can include at least one staple cavity **2628** that is parallel to the longitudinal axis L of the cartridge body **2624**. See, for example, FIG. **11**.

(326) Referring still to FIG. **37**, the depicted end effector assembly **2600** includes a firing bar **2660** movably positioned relative to the cartridge body **2624**. The firing bar **2660** is configured to traverse the cartridge body **2624** to fire the staples **2612** (FIGS. **38**A and **38**B) from the staple cavities **2628**. The depicted firing bar **2660** further includes a cutting edge **2661**, which is configured to incise tissue as the firing bar **2660** translates between the first jaw **2002** and the second jaw **2004**.

(327) The depicted firing member **2660** is dimensioned and positioned to fit within the longitudinal slot **2632**, and to drivingly engage a sled, such as a sled **2658** (FIGS. **37-38**B), a sled **2758** (FIGS. **39-39**B) or a sled **2858** (FIG. **40**) movably positioned within the driverless cartridge **2620**. As the firing bar **2660** translates through the longitudinal slot **2632**, the firing bar **2660** moves the sled **2658** (FIGS. **37-38**B), **2758** (FIGS. **39-39**B), or **2858** (FIG. **40**) through the cartridge body **2624**.

(328) The sled **2658** is disclosed in FIGS. **37-38**B. The sled **2658** is dimensioned and positioned to directly engage the staples **2612** positioned in the driverless cartridge **2620** (FIG. **37**). The depicted sled **2658** includes a central portion **2659** and driving wedges or driving rails **2664**. The driving wedges **2664** include a staple-engagement or staple-contacting surface **2666**, which are inclined and/or ramped surfaces extending from a distal end to a proximal end of the sled **2658**. As depicted in FIGS. **37-38**B, the inclined surfaces **2666** of the wedges **2664** have equal, or substantially equal, incline degrees or angles.

(329) Each staple-contacting surface **2666** shown in FIGS. **37-38**B is positioned to directly contact the staples **2612** (FIGS. **38**A and **38**B) positioned in the staple cartridge **2620**. More particularly, the staple-contacting surfaces **2666** of the driving wedges **2664** are configured to contact the base **2614** (FIG. **38**B) of each staple **2612**, and to lift the base **2614** of the staple **2612** upward to eject the staple **2612** from the staple cavity **2628**. For example, to lift the staples **2612** from lowered and/or unfired positions to lifted and/or fired positions, the distal end **2667** of each inclined surface **2666** engages the base **2614** of the staple **2612**, and the inclined surface **2666** moves distally across the base **2614** of the staple **2612**.

(330) In the depicted arrangement, the firing bar **2660** and the cutting edge **2661** thereof are

configured to slide and/or translate within the longitudinal slot **2632**. Additionally, the driving wedges **2664** depicted in FIGS. **37-38**B, which are shown laterally outboard of the firing bar **2660** and the cutting edge **2661**, and configured to contact the staples **2612** (FIGS. **38**A and **38**B) positioned in the staple cavities **2628** (FIG. **37**). Multiple driving wedges **2664** are positioned on either side of the central portion **2659** of the wedge sled **2658**. For example, in the depicted sled **2658**, four driving wedges **2664***a*, **2664***b*, **2664***c*, **2664***d* are positioned on each side of the central portion **2659**.
(331) Moreover, in the arrangement disclosed in FIGS. **37-38**B, multiple driving wedges **2664***a*, **2664***b*, **2664***c*, **2664***d* are configured to engage a single angled staple **2612**. For example, the first and second wedges **2664***a*, **2664***b* are configured to engage staples **6212** positioned in the first outer row **2633** of staple cavities **2628**, the second and third wedges **2664***b*, **2664***c* are configured to engage staples **2612** positioned in the first intermediate row **2637**, and the third and fourth wedges **2664***c*, **2664***d* are configured to engage staples **2612** positioned in the first outer row **2635**.
(332) In various circumstances, it is desirable to support and drive staples **2612** in the staple cartridge **2620** disclosed in FIG. **37** from multiple positions along the base **2614** (FIG. **38**B) of the staple **2612**. For example, staples **2612** that are longitudinally aligned with a firing path of a driving wedge **2664** are supported along the entire length of the base **2614** of the staple **2612**. For example, when staples **2612** are angled relative to the firing paths of the sled **2658**, as depicted in FIGS. **37-38**B, the staples **2612** can be supported at multiple locations along the base by utilizing multiple driving wedges **2664**. Because the angled staples **2612** are drivingly supported at multiple locations along the base **2614** thereof, the staples **2612** can be balanced and/or stabilized such that rotation and/or torqueing of the staples **2612** during deployment may be prevented, reduced, and/or controlled. Direct drive staples that are mass balanced relative to multiple sled-engagement surfaces, like the staples **2612**, for example, could be incorporated into other embodiments disclosed herein.
(333) The inclined surfaces **2666** disclosed in FIGS. **37-38**B are staggered. For example, the depicted inclined surfaces **2666** are longitudinally staggered such that at least one inclined surface **2666** longitudinally leads at least one other inclined surface **2666**. The inclined surfaces **2666** of the second and fourth driving wedges **2664***b*, **2664***d* longitudinally lead the inclined surfaces **2666** of the first and third driving wedges **2664***a*, **2664***c*. The inclined surfaces **2666** of the second and fourth driving wedges **2664***b*, **2664***d* are taller than the inclined surfaces **2666** of the first and third driving edges **2664***a*, **2664***c* at the aligned distal ends **2667**. For example, as shown in FIGS. **38** and **38**B, the first and third driving wedges **2664***a*, **2664***c* have a distal height y and the second and fourth driving wedges **2664***b*, **2664***d* have a distal height x, which is less than the height y.
(334) The longitudinally staggered inclined surfaces **2666** are configured to move into engagement with the angled staples **2612** simultaneously. For example, the staple-engagement surfaces **2666** of the first and second wedges **2664***a*, **2664***b* are configured to simultaneously engage angled staples **2612** in the first outer row **2633** (FIG. **37**) of staple cavities **2628**. Additionally, the staple-engagement surfaces **2666** of the second and third wedges **2664***b*, **2664***c* are configured to simultaneously engage angled staples **2612** in the first intermediate row **2637** (FIG. **37**). Moreover, the staple-engagement surfaces **2666** of the third and fourth wedges **2664***c*, **2664***d* are configured to simultaneously engage staples **2612** positioned in the first outer row **2635** (FIG. **37**).
(335) The deployment or firing of a staple **2612** is depicted in FIGS. **38**A and **38**B, in which the third and fourth wedges **2664***c*, **2664***d* of the driver **2658** are in driving engagement with the staple **2612**. The third wedge **2664***c* can initially contact the staple **2612** at point A and the fourth wedge **2664***d* can initially contact the staple **2612** at point B. The third and fourth wedges **2664***c*, **2664***d* are configured to engage the staple **2612** simultaneously such that the staple **2612** contacts points A and B concurrently or nearly concurrently. Because of the height difference between the staple-engagement surfaces **2666** of the third and fourth wedges **2664***c*, **2664***d*, points A and B can be longitudinally offset such that points A and B are at the same, or essentially the same, elevation.

(336) Referring still to FIGS. **38**A and **38**B, as the driver **2658** continues to move distally in the staple cartridge **2620**, the staple **2612** can slide up the staple-engagement surfaces **2666** of the third and fourth wedges **2664***c*, **2664***d* to points A′ and B′ on the third and fourth wedges **2664***c*, **2664***d*, respectively. As shown in FIG. **38**B, the staple **2612** maintains a vertically upright orientation during deployment. Thereafter, the staple **2612** can continue to slide up the staple-engagement surfaces **2666** of the third and fourth wedges **2664***c*, **2664***d* to points A″ and B″ on the third and fourth wedges **2664***c*, **2664***d*, respectively. As shown in FIG. **38**B, the staple **2612** continues to maintain a vertically upright orientation. In other words, the pair of staple-engagement surfaces **2666** stabilize and/or balance the staple **2612** during deployment, such that rotation or torqueing of the staples **2612** may be prevented, minimized and/or controlled.
(337) In other instances, the driving wedges or rails of a wedge sled can all decline to a height of zero, or essentially zero. For example, referring now to FIGS. **39-39**B, the wedge sled **2758** is depicted. The wedge sled **2758** can be employed in the staple cartridge **2620** and the end effector **2600** (FIG. **37**) to fire staples **2612** from the staple cartridge **2620** (FIG. **39**A).
(338) Similar to the sled **2658**, the wedge sled **2758** disclosed in FIGS. **39-39**B includes four driving wedges **2764** on either side of a central portion **2759**. Each driving wedge **2764** includes an inclined, staple-engagement surface **2766**, which is configured to directly engage and drive the staples **2612** from the staple cavities **2628**. Also similar to the sled **2658**, the staple-engagement surfaces **2766** of the driving wedges **2764** depicted in FIGS. **39-39**B are longitudinally staggered, such that the first and third driving wedges **2764***a*, **2764***c* longitudinally trail the second and fourth driving wedges **2764***b*, **2764***d*.
(339) The longitudinally staggered inclined surfaces **2766** of the driving wedges **2764***a*, **2764***b*, **2764***c*, **2764***d* disclosed in FIGS. **39-39**B are configured to move into engagement with angled staples **2612** simultaneously. For example, the staple-engagement surfaces **2766** of the first and second wedges **2764***a*, **2764***b* are configured to simultaneously engage angled staples **2612** positioned in the first outer row **2635** (FIG. **37**). Additionally, the staple-engagement surfaces **2766** of the second and third wedges **2764***b*, **2764***c* are configured to simultaneously engage angled staples **2612** positioned in the first intermediate row **2637** (FIG. **37**). Moreover, the staple-engagement surfaces **2766** of the third and fourth wedges **2764***c*, **2764***d* are configured to simultaneously engage angled staples **2612** positioned in the first inner row **2633** (FIG. **37**).
(340) Additionally, the longitudinally staggered inclined surfaces **2666** of the driving wedges **2764***a*, **2764***b*, **2764***c*, **2764***d* disclosed in FIGS. **39-39**B are configured to drive the angled staples **2612** simultaneously. For example, the staple-engagement surfaces **2766** of the first and second wedges **2764***a*, **2764***b* are configured to simultaneously drive angled staples **2612** in the first outer row **2635** of staple cavities **2628** (FIG. **37**). Additionally, the staple-engagement surfaces **2766** of the second and third wedges **2764***b*, **2764***c* are configured to simultaneously drive angled staples **2612** positioned in the first intermediate row **2637** (FIG. **37**). Moreover, the staple-engagement surfaces **2766** of the third and fourth wedges **2764***c*, **2764***d* are configured to simultaneously drive angled staples **2612** positioned in the first inner row **2633** (FIG. **37**).
(341) Referring primarily to FIG. **39**A, the second wedge **2764***b* and the third wedge **2764***c* on the first side **2627** of the cartridge body **2624** are configured to move into engagement with the second staple **2612***b*, which is the proximal most staple and is aligned with the firing paths of the second wedge **2764***b* and the third wedge **2764***c*. Additionally, the second wedge **2764***b* and the third wedge **2764***c* can be equidistant from the center of mass (COM) of the second staple **2612***b*. As the sled **2758** continues to translate distally, the second wedge **2764***b* and the third wedge **2764***c* are configured to drivingly engage the second staple **2612***b* to lift and fire the staple **2612***b*.
(342) In the arrangement disclosed in FIG. **39**A, as the second wedge **2764***b* and the third wedge **2764***c* lift the second staple **2612***b*, the first wedge **2764***a* and the second wedge **2764***b* on the first side **2627** of the cartridge body **2624** are configured to move into engagement with the first staple **2612***a* and the third wedge **2764***c* and the fourth wedge **2764***d* on the first side **2627** are configured

to move into engagement with the third staple **2612***c*. Additionally, as depicted in FIG. **39**A, the first wedge **2764***a* and the second wedge **2764***b* are equidistant from the center of mass (COM) of the first staple **2612***a*, and the third wedge **2764***c* and the fourth wedge **2764***d* are equidistant from the center of mass (COM) of the third staple **2612***c*. As the sled **2758** continues to translate distally, the first wedge **2764***a* and the second wedge **2764***b* drivingly engage the first staple **2612***a* to lift and fire the staple **2612***b*, and the third wedge **2764***c* and the fourth wedge **2764***d* drivingly engage the third staple **2612***c* to lift and fire the staple **2612***c*.
(343) The paired driving wedge arrangement described above and depicted in FIG. **39**A is configured to continue simultaneously engaging and lifting the staples **2612** in the staple cartridge **2620** as the sled **2758** continues to translate distally. Because the sled **2758** supports each staple **2612** at multiple locations along the base thereof, the staples **2612** are stabilized and/or balanced during deployment. Additionally, because the staple-engagement surfaces **2766** of the sled **2758** are equidistant from the center of mass (COM) of each contacted staple **2612**, rotation and/or torqueing of the staples **2612** may be further prevented, minimized, or controlled. Moreover, because the driving wedges **2764***a*, **2764***b*, **2764***c*, **2764** are longitudinally staggered, the engagement of the multiple driving wedges **2764***a*, **2764***b*, **2764***c*, **2764** with each staple **2612** is timed and/or synchronized to balance the driving forces exerted on each staple **2612** throughout its deployment.
(344) The driving sled **2858** is depicted in FIG. **40**. The wedge sled **2758** can be employed in the staple cartridge **2620** and the end effector **2600** (FIG. **37**) to fire staples **2612** from the staple cavities **2620** (FIG. **39**A). Similar to the sleds **2658** and **2758**, the driving sled **2858** includes multiple driving wedges **2864** on either side of a central portion **2859**. Each driving wedge **2864** includes an inclined, staple-engagement surface **2866**, which is configured to directly engage and drive the staples **2612** from the staple cavities **2628**. Moreover, the inclined, staple-engagement surfaces **2866** are angled or sloped laterally. Because the staple-engagement surfaces **2866** are laterally and longitudinally sloped, each surface **2866** includes longitudinally offset support portions, which drivingly engage the angled staples **2612** throughout the deployment and firing thereof.
(345) For example, the sloped staple-engagement surfaces **2866** disclosed in FIG. **40** are configured to drivingly engage the staples **2612** along a portion of the base of each staple **2612**. In the arrangement depicted in FIG. **40**, the driving force exerted on the staple **2612** is distributed over a larger surface area. For example, a staple-engagement surface **2866** can contact at least 50% of the length of the base of the staple **2612**. In other instances, the staple engagement-surface can contact at least 75% of the length of the base of the staple **2612**. In still other instances, the staple engagement-surface can contact less than 50% or more than 75% the length of the base of the staple **2612**. Moreover, the driving force from the sled **2858** is balanced relative to center of mass of each staple **2612** to further stabilize and balance the staple **2612** during deployment. As a result, rotation and/or torqueing of the staple **2612** may be prevented, minimized, or controlled.
(346) As described herein, a staple array that includes staples angularly-oriented relative to the longitudinal axis of the staple cartridge and/or the firing path of the firing member provides various benefits. For example, such a staple array can provide improved flexibility and/or stretchability within stapled tissue. As a result, incidences of tissue tearing can be reduced. In certain instances, a staple array can also include staples with different length bases. The variable length bases within a staple array can promote increased flexibility and/or stretchability in stapled tissue. Additionally, in certain arrangements, staples having shorter bases can nest within the staple array. For example, the staples having shorter bases can be positioned in narrower spaces between staples having longer bases. Such an arrangement can densify the staple line, which can improve control of bleeding and/or fluid flow in the stapled tissue.
(347) A staple array **3011** is depicted in FIG. **41**. The array **3011** includes long staples **3012** and short staples **3013**. As shown in FIG. **41**, the long staples **3012** have a base length of l.sub.1, and the short staples **3013** have a base length of l.sub.2, which is less than l.sub.1. In the depicted array

3011, a first long staple **3012***a* is aligned with an axis A.sub.a, and a first short staple **3013** is aligned with an axis A.sub.b, which is parallel to the axis A.sub.a. Additional long and short staples **3012**, **3013**, such as staples **3012***e*, **3013***b*, **3013***c*, and **3013***d*, for example, are parallel to the axes A.sub.a and A.sub.b. As further disclosed in the array **3011** shown in FIG. **41**, a second long staple **3012** is aligned with an axis A.sub.c, which traverses the axes A.sub.a and A.sub.b. Additional long staples **3012**, such as staples **3012***c*, **3012***d*, and **3012***f*, for example, are parallel to the axis A.sub.c.
(348) In other arrangements, additional short staples **3012** can also be parallel to the axis A.sub.c. In some instances, various staples can be arranged along axes that are non-parallel to axes A.sub.a, A.sub.b and A.sub.c. For example, the staple array **3011** can include staples that are oriented parallel to the longitudinal axis of the staple cartridge and/or to the firing path of a driving sled. Additionally, in various instances, the staple array **3011** can include staples having base lengths that are different than l.sub.2 and l.sub.1. In some instances, the staple array **3011** can include additional and/or fewer longitudinal rows of staples **3012**, **3013**. For example, the row of long staples **3012** aligned with the first long staple **3012***a* can be removed, and/or the row of long staples **3012** aligned with the second long staple **3012***b* can be removed, and/or the row of short staples aligned with first short staple **3013***a* can be removed, and/or the row of long staples **3012** aligned with the third long staple **3012***c* can be removed, and/or the row of short staples **3013** aligned with the second short staple **3013***b* can be removed, and/or the row of long staples **3013** aligned with the fourth long staple **3012***d* can be removed.
(349) Referring again to FIG. **41**, a short staple **3013** is embedded in the staple array **3011** intermediate two long staples **3012**. For example, two long staples **3012** in the array **3011**, such as the third long staple **3012***c* and the sixth long staple **3012***f* shown in FIG. **41**, are parallel and laterally aligned. In such an arrangement, a space is defined between the third and sixth long staples **3012***c* and **3012***f*, and the space is configured to accommodate the third short staple **3013***c*. Accordingly, the third short staple **3013***c* in the depicted array **3011** is nestled between the third long staple **3012***c* and the sixth long staple **3012***f*. In such an arrangement, the third short staple **3013***c*, and similarly placed shorts staples **3013** in the array **3011**, can densify the staple line by filling the spaces between the long staples **3012**. In various instances, bleeding and/or fluid flow control is improved because the staple line is densified in the array **3011**. Densified staple lines, like the staple array **3011**, for example, could be incorporated into other embodiments disclosed herein.
(350) In other instances, the long staples **3012** defining a space therebetween for accommodating a short staple can be non-parallel to each other. For example, the third and sixth long staples **3012***c*, **3012***f* can be skewed and/or otherwise non-parallel to each other. Additionally or alternatively, the long staples **3012** defining the space therebetween for accommodating a short staple **3013** can only partially laterally overlap. For example, in certain instances, the third long staple **3012***c* can be laterally outboard or laterally inboard relative to the sixth long staple **3012***f*, such that only a portion of the third and sixth staples **3012***c*, **3012***f* are laterally aligned.
(351) An array of staples, such as the array **3011**, for example, can be positioned in a driverless staple cartridge, such as the driverless staple cartridge **2620** (FIG. **37**), for example, and can be directly engaged and driven from the staple cartridge by a driving sled. In such instances, the staples **3012**, **3013** in the array **3011** can be mass balanced relative to the driving wedges of a sled that contacts and drives the staples **3012**, **3013**. For example, the driving wedges can apply the firing force at the ends of the staple bases equidistant from the center of mass of each staple **3012**, **3013**. In other instances, the firing force can be applied at various spaced locations along the base of a staple **3012**, **3013**, and the cumulative firing force can be balanced relative to the staple **3012**, **3013**. In instances where a staple does not overlie a firing path and/or is not balanced relative to the firing path, a staple driver may be employed. For example, a multi-staple driver, as further described herein, can simultaneously lift multiple staples from a staple cartridge.
(352) A staple array **3111** is depicted in FIG. **42**. The array **3111** includes long staples **3112** and

short staples **3113**. As shown in FIG. **42**, the long staples **3112** have a base length of l.sub.1, and the short staples **3113** have a base length of l.sub.2, which is less than l.sub.1. In the depicted array **3111**, a first short staple **3113***a* is aligned with an axis A.sub.a, and a first long staple **3112***a* is aligned with an axis A.sub.b, which traverses the axis A.sub.a. Additional short staples **3113** are oriented parallel to the axis A.sub.a and additional long staples **3112** are parallel to the axis A.sub.b.
(353) In other arrangements, at least one short staple **3113** can be oriented parallel to the axis A.sub.b and/or at least one long staple **3112** can be oriented parallel to the axis A.sub.a. In some instances, various staples **3112**, **3113** can be arranged along axes that are non-parallel to axes A.sub.a and A.sub.b. For example, the staple array **3111** may include staples that are oriented parallel to the longitudinal axis of the staple cartridge and/or to the firing path of the driving wedges **3064**, which are also depicted in FIG. **42**. Additionally, in various instances, the staple array **3111** can include staples having base lengths that are different than l.sub.2 and l.sub.1, and/or the staple array **3111** can include additional and/or fewer longitudinal rows of staples **3112**, **3113**.
(354) Referring still to FIG. **42**, a short staple **3113** can be embedded in the staple array **3111** intermediate at least two laterally overlapping long staples **3112**. In such an arrangement, the nested short staple **3113** in the array **3111** can densify the staple line by filling the spaces between the adjacent long staples **3112**. Because the staple line is densified in the array **3111**, bleeding and/or fluid flow control can be improved. Densified staple lines, like the staple array **3111**, for example, could be incorporated into other embodiments disclosed herein.
(355) In other instances, the long staples **3112** defining a space therebetween for accommodating a short staple can be non-parallel to each other. Additionally or alternatively, the long staples **3112** defining the space therebetween for accommodating a short staple **3113** may only partially overlap.
(356) An array of staples, such as the array **3111**, for example, can be positioned in a driverless staple cartridge, such as the driverless staple cartridge **2620** (FIG. **37**), for example, and can be directly engaged and driven from the staple cartridge by a driving sled, such as the sled **2058** (FIG. **37**). In such instances, the staples **3112**, **3113** in the array **3111** can be mass balanced relative to the driving wedges **3064** of the sled that contact and drive the staples **3112**, **3113**. For example, the driving wedges **3064** can apply the firing force at the ends of the staple bases equidistant from the center of mass of the staples **3112**, **3113**.
(357) In other instances, the firing force can be applied at various spaced locations along the base of the staples **3112**, **3113**, and the cumulative firing force can be balanced relative to the staples **3112**, **3113**. In instances where a staple **3112**, **3113** does not overlie a firing path and/or is not balanced relative to the firing path, a staple driver can be employed. For example, a multi-staple driver, as further described herein, can simultaneously lift multiple staples from a staple cartridge.
(358) In various instances, where a sled is configured to directly drive a staple, the staple can include a sled-engagement surface and the sled can include a staple-engagement surface. The staples can be generally “V-shaped” staples having a base and non-parallelly extending legs. For example, referring again to the staple **2612** depicted in FIGS. **39**B and **40**, for example, the staple **2612** includes a base **2614**, a first leg **2616** extending from a first end of the base **2614**, and a second leg **2618** extending from a second end of the base **2614**. The staple **2612** can be formed from a wire, such as a wire having a circular cross-section, and thus, the outer perimeter of the staple **2612** can consist of rounded surfaces. As a result, the sled-engagement surface of the staple **2612** can include a rounded and/or contoured surface.
(359) In other instances, the staple **2612** can be formed from a wire having a polygonal cross-section, and thus, the outer perimeter of the staple **2612** can include edges and flat or planar surfaces. In such an embodiment, the sled-engagement surface of the staple **2612** can include at least one flat and/or planar surfaces, for example. In still other instances, the outer perimeter of the staple **2612** can include both contoured and planar surfaces. For example, the staple **2612** can be formed from a wire having a circular cross-section, which can be flattened and/or otherwise deformed to form a flat sled-engagement surface.

(360) In certain instances, a staple can be formed from a piece of material. For example, a staple can be stamped, cut, and/or molded from a sheet of material. Various stamped staples are described in U.S. patent application Ser. No. 14/138,481, entitled SURGICAL STAPLES AND METHODS FOR MAKING THE SAME, filed Dec. 23, 2013, now U.S. Pat. No. 9,968,354, which is hereby incorporated by reference herein in its entirety. In various instances, a staple can be stamped or otherwise formed from a single piece of material, for example, and can remain a single and/or unitary piece of material, for example. In various instances, the sled-engagement surface of a staple, such as a stamped staple, can include a flat or planar surface of the stamped or otherwise formed piece. Additionally, in certain instances, the sled-engagement surface can include a groove and/or cutout, which can be configured to receive a driving wedge of a wedge sled. When a staple is angularly-oriented relative to the firing path of the driving wedge, the groove can traverse the base of the staple at an angle.
(361) A stamped staple **2912** is depicted in FIGS. **26-28**. The staple **2912** includes a base **2914**, a first leg **2916**, and a second leg **2918**. As shown in FIGS. **26-28**, the outer perimeter of the staple **2912** includes flat and contoured surfaces. Moreover, the staple **2912** includes a groove or track **2915** (FIGS. **27** and **28**), which has been cut into the base **2914**. The groove **2915** is configured to receive a driving wedge **2964** of a drive sled **2958**.
(362) In various instances, the width of the groove **2915** can be slightly larger than the width of the driving wedge **2964** received therein. For example, the width of the groove **2915** can be dimensioned to receive the driving wedge **2964** and prevent lateral shifting of the staple **2915** relative to the wedge **2964**.
(363) The staple **2912** depicted in FIGS. **26-28** is angularly-oriented relative to the firing path F (FIG. **28**) of the driving wedge **2964**. For example, the staple **2912** extends along an axis A (FIG. **27**), which traverses the firing path F. As a result, the depicted groove **2915** is angularly-oriented across the base **2914** of the staple **2912**. For example, the axis A can be oriented at an angle θ relative to the firing path F. The angle θ depicted in FIG. **28** is 45°.
(364) The base **2914** has an extended length l. For example, the length l of the base **2914** is greater than the length of the staple legs **2916**, **2918**. Because the base **2914** is elongated, the groove **2915** includes an elongated guide surface or track for the driving wedge **2964**, which promotes stability of the staple **2912** during deployment. Staples having an elongated guide or track for receiving a driving wedge, like the staples **2912**, for example, could be incorporated into other embodiments disclosed herein.
(365) Referring primarily to FIG. **28**, the staple **2912** has a center of mass (COM), which coincides with the firing path F. For example, the firing path F extends through the center of mass (COM) of the staple **2912**, such that the staple **2912** is balanced relative to the driving wedge **2964**. As a result, the driving force exerted on the staple **2912** can lift the staple legs **2916**, **2918** simultaneously and torqueing or rotation of the staple **2912** can be prevented, minimized, and/or controlled.
(366) In various instances, a groove or track similar to the groove **2915** can be defined into an unstamped staple. For example, a wire staple can be cut, stamped, and/or ground to create a track for slidably receiving a driving wedge. In such instances, the staple base may have the same length as the staple legs or, in other instances, the staple base can be flattened to increase or elongate the length thereof. Additionally, in certain instances, as further described herein, multiple driving wedges can drivingly engage a staple. In such instances, the staple can include multiple grooves or tracks, which can each be configured to receive a driving wedge. Moreover, in certain instances, a staple having a guide track, similar to the groove **2915**, for example, can be oriented parallel to the longitudinal axis of a staple cartridge. For example, a parallel staple can be longitudinally aligned with a firing path of a driving wedge. In such instances, the guide track defined into the base of the staple can extend along the base of the staple parallel thereto.
(367) As described herein, angularly-oriented staples can provided increased flexibility and/or

stretchability to stapled tissue. For example, the angled staples in an array of fired staples can pivot and/or rotate toward alignment with the cut line and/or the longitudinal axis of the staple line to facilitate lengthening and/or longitudinal deformation of the stapled tissue. Because the angled staples can pivot and/or rotate in the array of stapled tissue, tearing and/or stretching of the tissue can be reduced and/or prevented. Moreover, stresses in the tissue and/or trauma to the stapled tissue can be minimized.

(368) In addition to the longitudinal flexibility afforded by a longitudinally stretchable array of fired staples, it can be desirable to provide lateral customizations to the tissue treated by the array of staples. For example, the compressive force exerted on the tissue can be optimized and/or tailored based on the relative lateral position of the tissue relative to the staple line. In certain instances, it can be desirable to customize the compressive force on the tissue prior to stapling and/or during stapling. In other instances, it can be desirable to customize the compressive force on the stapled tissue. Moreover, in still other instances, it can be desirable to customize the compressive force on tissue prior to staling, during stapling, and after stapling, for example.

(369) The combination of lateral tissue compression customization and longitudinal tissue flexibility can provide synergistic tissue effects. For example, when compressive forces exerted on the tissue during and/or after stapling generate less stress in the compressed tissue and/or affect reduced tissue trauma, the compressed tissue may accommodate increased elastic deformation. In other words, as optimally compressed tissue is stretched and/or elongated, the optimally compressed tissue may better accommodate the rotating and/or pivoting of staples therein. Moreover, when stapled tissue readily accommodates staple pivoting and/or shifting, stresses in the stapled tissue may be reduced and trauma to the stapled tissue may be minimized. Accordingly, as staples pivot and/or shift to accommodate for tissue elongation or longitudinal stretch, stress and/or trauma to the optimally compressed tissue can be further minimized.

(370) A staple cartridge **3420** is depicted in FIGS. **43-45**. The depicted staple cartridge **3420** includes a cartridge body **3424** and a deck **3422**. Multiple staple cavities **3428** are defined into the body **3424** of the depicted staple cartridge **3420**, and each staple cavity **3428** forms an opening **3430** in the deck **3422**. Additionally, the staple cavities **3428** shown in FIGS. **43-45** are angularly-oriented relative to the longitudinal axis L (FIG. **44**) of the staple cartridge **3420**. In the depicted staple cartridge **3420**, a longitudinal slot **3432** is defined partially through the cartridge body **3424**, and three rows of staple cavities **3428** are positioned on either side of the longitudinal slot **3432**. The arrangement of staple cavities **3428** shown in FIGS. **43-45** is configured to receive an array of angled staples. For example, multiple staples, such as the staples **3412** (FIG. **45**) are removably positioned in the staple cavities **3428**.

(371) In the depicted staple cartridge **3420**, the staple cavities **3428** in an outside row on a first side of the longitudinal slot **3432** are oriented at a first angle relative to the longitudinal axis L (FIG. **44**), the staple cavities **3428** in an intermediate row on the first side of the longitudinal slot **3432** are oriented at a second angle relative to the longitudinal axis L, and the staple cavities **3428** in an inner row on the first side of the longitudinal slot **3432** are oriented at a third angle relative to the longitudinal axis L. In the depicted staple cartridge **3420**, the third angle is the same, or generally the same, as the first angle, and the second angle is 90 degrees, or approximately 90 degrees, offset from the first angle and from the third angle.

(372) As further depicted in FIGS. **43-45**, the staple cavities **3428** in an outside row on a second side of the longitudinal slot **3432** are oriented at a fourth angle relative to the longitudinal axis L (FIG. **44**), the staple cavities **3428** in an intermediate row on the second side of the longitudinal slot **3432** are oriented at a fifth angle relative to the longitudinal axis L, and the staple cavities **3428** in an inside row on the second side of the longitudinal slot **3432** are oriented at a sixth angle relative to the longitudinal axis L. In the depicted staple cartridge **3420**, the sixth angle is the same, or generally the same, as the fourth angle, and the fifth angle is 90 degrees, or approximately 90 degrees, offset from the fourth angle and from the sixth angle. Additionally, in the arrangement

depicted in FIGS. **43-45**, the second angle is the same, or generally the same, as the fourth angle and the sixth angle, and the first angle is the same, or generally the same, as the third angle and the fifth angle.

(373) In other instances, the staple cartridge **3420** may include additional and/or fewer rows of staple cavities. Additionally or alternatively, the angular orientation of the staples **3412** in each row may be adjusted and/or modified to accommodate a different array. For example, in certain instances, at least one staple cavity can be parallel to the longitudinal axis L.

(374) In various instances, the staple cartridge **3420** depicted in FIGS. **43-45** can be used with the end effector **2000** depicted in FIG. **7**. For example, the staple cartridge **3420** can be loaded into the elongate channel of the second jaw **2004**. Additionally, in certain instances, the staple cartridge **3420** can be fired with single-staple drivers, multi-staple drivers, and/or a combination thereof. For example, a single-staple driver **3440** (FIG. **45**) can be positioned in each staple cavity **3428**, and can drivingly engage the staple **3412** supported thereon. The drivers **3440** shown in FIG. **45** can be positioned within the cartridge body **3424** such that the cradle of each driver **3440** is aligned with one of the staples **3412** positioned in one of the staple cavities **3428**.

(375) In certain instances, the staple cartridge **3420** can include multi-staple drivers. For example, a multi-staple driver can be configured to fire the staples **3412** (FIG. **45**) from a first group of staple cavities **3428**, and another multi-staple driver can be configured to fire staples **3412** from a second group of staple cavities **3428**. In other instances, the staple cartridge **3420** may not include drivers. For example, a firing member and/or sled, such as the firing member **2660** and the sled **2658** (FIG. **37**), for example, can be configured to directly contact, engage, and/or drive the staples **3412**. In various instances, the drivers **3440** and/or the staples **3412** can be mass balanced relative to the firing path(s) of a sled, such as the sled **2058** (FIG. **7**) and/or sled **2658** (FIG. **37**), for example, during deployment.

(376) The deck **3422** depicted in FIGS. **43-45** includes multiple longitudinally extending portions. For example, the deck **3422** includes a first longitudinal portion **3422***a*, a second longitudinal portion **3422***b*, and a third longitudinal portion **3422***c* on one side of the longitudinal slot **3432**, and a fourth longitudinal portion **3422***d*, a fifth longitudinal portion **3422***e*, and a sixth longitudinal portion **3422***f* on the other side of the longitudinal slot **3432**. As shown in FIGS. **43-45**, a longitudinal row of staple cavities **3428** is aligned with each longitudinally extending portion **3422***a*, **3422***b*, **3422***c*, **3422***d*, **3422***e*, **3422***f*. For example, the outside row of staple cavities **3428** on the first side of the longitudinal slot **3432** is aligned with the first longitudinal portion **3422***a*, the intermediate row of staple cavities **3428** on the first side of the longitudinal slot **3432** is aligned with the second longitudinal portion **3422***b*, and the inside row of staple cavities **3428** on the first side of the longitudinal slot **3432** is aligned with the third longitudinal portion **3422***c*. Additionally, the outside row of staple cavities **3428** on the second side of the longitudinal slot **3432** is aligned with the fourth longitudinal portion **3422***d*, the intermediate row of staple cavities **3428** on the second side of the longitudinal slot **3432** is aligned with the fifth longitudinal portion **3422***e*, and the inside row of staple cavities **3428** on the second side of the longitudinal slot **3432** is aligned with the sixth longitudinal portion **3422***f*.

(377) In other instances, the staple cartridge **3420** may include additional and/or fewer longitudinally extending portions. For example, the longitudinal portions can be adjusted and/or modified to correspond to a different arrangement of staple cavities and staples. In certain embodiments, more than one longitudinal row of staple cavities can coincide with at least one longitudinal portion. Additionally or alternatively, at least one longitudinal portion may not include a staple cavity and/or a row of staples, for example.

(378) In the depicted staple cartridge **3420**, the adjacent longitudinal portions **3422***a*, **3422***b*, **3422***c*, **3422***d*, **3422***e*, and **3422***f* are vertically offset from each other by a ridge **3423**. For example, a ridge **3423** extends between the first portion **3422***a* and the second portion **3422***b*, and another ridge **3423** extends between the second portion **3422***b* and the third portion **3422***c*. Additionally, in the

depicted arrangement, a ridge **3423** extends between the fourth portion **3422***d* and the fifth portion **3422***e*, and another ridge **3423** extends between the fifth portion **3422***e* and the sixth portion **3422***f*. As shown in FIGS. **43-45**, the longitudinal slot **3432** extends between the third portion **3422***c* and the fourth portion **3422***d*.

(379) The ridges **3423** disclosed in FIGS. **43-45** define an elevation change in the deck **3422**. For example, the ridge **3423** between the first portion **3422***a* and the second portion **3422***b* defines a step upward, such that the second portion **3422***b* has a higher elevation than the first portion **3422**. In various instances, the ridges **3423** adjust the height of the deck **3422** laterally. For example, the ridges **3423** increase the height of the deck **3422** inwardly and decrease the height of the deck **3422** outwardly, such that the largest height is adjacent to the longitudinal slot **3432** and the laterally flanking portions have the shortest height.

(380) The gap between the deck **3422** and the staple forming surface of the anvil controls the degree of tissue compression when the jaws of an end effector, such as the first jaw **2002** and the second jaw **2004** of the end effector **2000** (FIG. **7**) are clamped. Accordingly, the height of the deck **3422** can affect the degree of tissue compression between the clamped jaws. For example, in regions where the deck **3422** is taller, the adjacent tissue can be relatively more compressed between the clamped jaws, and in regions where the deck **3422** is shorter, the adjacent tissue can be relatively less compressed between the clamped jaws. Accordingly, the ridges **3423** disclosed in FIGS. **43-45** can affect a lateral variation in tissue compression. As further described herein, the degrees of tissue compression can be selected and/or optimized to reduce stress and/or trauma to the compressed tissue. Moreover, because the staple cartridge **3420** is configured to fire a longitudinally flexible array of staples **3412**, the integrity of the stapled tissue can be further preserved.

(381) The ridges **3423** disclosed in FIGS. **43-45** affect abrupt and/or steep steps between the adjacent longitudinal portions **3422***a*, **3422***b*, **3422***c*, **3422***d*, **3422***e*, and **3422***f*. FIGS. **43-45** further disclose that the ridges **3423** curve around the staple cavities **3428** in the adjacent rows of staple cavities **3428**. For example, the ridges **3423** generally extend along a path that corresponds to and/or matches the angular orientation of the staple cavity or cavities **3428** adjacent thereto. As a result, the ridges **3423** include multiple contours and/or bends. Additionally, the ridges **3423** include multiple straight, or generally straight portions, intermediate the contours.

(382) In other instances, a ridge **3423** may define a less steep elevation change. For example, at least one ridge **3423** and/or a portion thereof can gradually slope and/or incrementally step to a different elevation. Additionally, in certain instances, the height of a longitudinal portion **3422***a*, **3422***b*, **3422***c*, **3422***d*, **3422***e*, **3422***f* can vary. For example, the height of each longitudinal portion **3422***a*, **3422***b*, **3422***c*, **3422***d*, **3422***e*, **3422***f* can vary laterally and/or longitudinally. In such instances, the deck may define sloped and/or angled surfaces intermediate the ridges **3423**, for example.

(383) In other staple cartridges, ridges can extend along a different path between the rows of staples and staple cavities. For example, the staple cartridge **3520**, which is shown in FIGS. **46-48**, is similar to the staple cartridge **3420** (FIGS. **43-45**) and like reference characters refer to similar elements. For example, the staple cartridge **3520** includes a cartridge body **3524** and a deck **3522**. Multiple staple cavities **3528** are defined into the body **3524** of the depicted staple cartridge **3520**, and each staple cavity **3528** forms an opening **3530** in the deck **3422**. Additionally, the staple cavities **3528** shown in FIGS. **46-48** match the array of staple cavities **3428** depicted in FIGS. **43-45**. For example, in the depicted staple cartridge **3520**, a longitudinal slot **3532** is defined partially through the cartridge body **3524**, and three rows of staple cavities **3528** are positioned on either side of the longitudinal slot **3532**. The arrangement of staple cavities **3528** shown in FIGS. **46-48** is configured to receive an array of angled staples. For example, multiple staples, such as the staples **3412** (FIG. **45**) can be removably positioned in the staple cavities **3528**.

(384) The deck **3522** disclosed in FIGS. **46-48** includes multiple longitudinally extending portions.

For example, the depicted deck **3522** includes a first longitudinal portion **3522***a*, a second longitudinal portion **3522***b*, and a third longitudinal portion **3522***c* on one side of the longitudinal slot **3532**, and a fourth longitudinal portion **3522***d*, a fifth longitudinal portion **3522***e*, and a sixth longitudinal portion **3522***f* on the other side of the longitudinal slot **3432**. As shown in FIGS. **46-48**, a longitudinal row of staple cavities **3528** is aligned with each longitudinally extending portion **3522***a*, **3522***b*, **3522***c*, **3522***d*, **3522***e*, **3522***f*. Additionally, in the depicted staple cartridge **3520**, the adjacent longitudinal portions **3522***a*, **3522***b*, **3522***c*, **3522***d*, **3522***e*, and **3522***f* are vertically offset from each other by a ridge **3523**.

(385) The ridges **3523** disclosed in FIGS. **46-48** extend along different paths than the ridges **3423** of the deck **3422** (FIGS. **43-45**). For example, the ridges **3423** include multiple cut-ins, such as cut-ins **3523***a*, **3523***b*, **3523***c*, and **3523***d* (FIG. **47**), for example, where the ridges **3523** do not extend along and/or adjacent to a staple cavity **3528**. The geometry of the cut-ins **3523***a*, **3523***b*, **3523***c*, and **3523***d* can be selected to adjust the tissue compression. For example, a cut-in can enlarge a region of reduced pressure and reduce an adjacent region of increased pressure. In various instances, it may be desirable to provide the cut-ins **3523***a*, **3523***b*, **3523***c*, and **3523***d* towards the knife slot **3532** to provide regions of reduced tissue compression, for example.

(386) As further described herein, the ridges **3523** disclosed in FIGS. **46-48** can affect a lateral variation in tissue compression. For example, the degrees of tissue compression can be selected and/or optimized to reduce stress and/or trauma to the compressed tissue. Moreover, because the staple cartridge **3520** is configured to fire a longitudinally flexible array of staples **3512**, the integrity of the stapled tissue can be further preserved.

(387) In other instances, the ridges on a cartridge deck can be straight or generally straight. For example, the staple cartridge **3620**, which is shown in FIGS. **49-51**, is similar to the staple cartridge **3420** (FIGS. **43-45**) and like reference characters refer to similar elements. For example, the staple cartridge **3620** includes a cartridge body **3624** and a deck **3622**. Multiple staple cavities **3628** are defined into the body **3624** of the depicted staple cartridge **3620**, and each staple cavity **3628** forms an opening **3630** in the deck **3622**. Additionally, the staple cavities **3628** shown in FIGS. **49-51** match the arrangement of staple cavities **3528** depicted in FIGS. **46-48**. For example, in the depicted staple cartridge **3620**, a longitudinal slot **3632** is defined partially through the cartridge body **3624**, and three rows of staple cavities **3628** are positioned on either side of the longitudinal slot **3632**. The arrangement of staple cavities **3628** shown in FIGS. **46-48** is configured to receive an array of angled staples. For example, multiple staples, such as staples **3612** (FIG. **51**) are removably positioned in the staple cavities **3628**.

(388) The deck **3622** disclosed in FIGS. **49-51** includes multiple longitudinally extending portions. For example, the depicted deck **3622** includes a first longitudinal portion **3622***a*, a second longitudinal portion **3622***b*, and a third longitudinal portion **3622***c* on one side of the longitudinal slot **3632**, and a fourth longitudinal portion **3622***d*, a fifth longitudinal portion **3622***e*, and a sixth longitudinal portion **3622***f* on the other side of the longitudinal slot **3632**. As shown in FIGS. **49-51**, a longitudinal row of staple cavities **3628** is aligned with each longitudinally extending portion **3622***a*, **3622***b*, **3622***c*, **3622***d*, **3622***e*, **3622***f*. Additionally, in the depicted staple cartridge **3620**, the adjacent longitudinal portions **3622***a*, **3622***b*, **3622***c*, **3622***d*, **3622***e*, and **3622***f* are vertically offset from each other by a ridge **3623**.

(389) The ridges **3623** disclosed in FIGS. **49-51** extend along different paths than the ridges **3423** of the deck **3422** (FIGS. **43-45**) and the ridges **3523** of the deck **3522** (FIGS. **46-48**). For example, the ridges **3623** extend along straight paths, which extend parallel to the longitudinal slot **3632**. Moreover, a portion of the longitudinal ridges **3523** extend through staple cavities **3628** in the staple cartridge **3620**. As a result, one end or side of a staple cavity **3628** is positioned in one of the longitudinal deck portions **3622***a*, **3622***b*, **3622***c*, **3622***d*, **3622***e*, or **3622***f*, and the other end or side of the same staple cavity **3628** is positioned in another of the longitudinal deck portions **3622***a*, **3622***b*, **3622***c*, **3622***d*, **3622***e*, or **3622***f*.

(390) As further described herein, the ridges **3623** disclosed in FIGS. **49-51** can affect a lateral variation in tissue compression. For example, the degrees of tissue compression can be selected and/or optimized to reduce stress and/or trauma to the compressed tissue. Moreover, because the staple cartridge **3620** is configured to fire a longitudinally flexible array of staples **3612**, the integrity of the stapled tissue can be further preserved.
(391) In certain instances, the staple cartridge **3620** includes multi-staple drivers, such as the multi-staple drivers **3640** disclosed in FIG. **51**. Each multi-staple driver **3640** is configured to fire the staples **3612** from a group of staple cavities **3628**. For example, similar to the multi-staple drivers **2040***a*, **2040***b* (FIGS. **7-9**), the multi-staple drivers **3640** include three steps **3645**, and a trough or cradle **3642** is defined into each step **3645**. Additionally, the steps **3645** of the multi-staple drivers **3640** are connected by a connecting flange **3648**. Each multi-staple driver **3640** shown in FIG. **51** supports staples **3612** across multiple rows of staple cavities **3628**, and is configured to fire staples **3612** from staples cavities **3628** in multiple rows. In FIG. **51**, the height of each step **3645** and the depth of each cradle **3642** defined therein is the same, such that the staples **3612** formed between the steps **3645** and a staple forming surface on the anvil have the same formed height.
(392) As further described herein, it may be desirable to customize and/or optimize the formed staple height to affect varied tissue compression within formed staples. Accordingly, at least one of the multi-staple drivers **3640** can be modified to form staples **3612** of different formed heights. For example, the steps **3645** and/or the cradles **3642** of a staple multi-staple driver **3640** can be modified to have different dimensions, such that at least two of the staples **3612** formed by the modified multi-staple driver **3640** have different formed heights. In other instances, the steps **3645** and/or the cradles **3642** of different staple drivers **3640** can be modified, such that a first driver **3640** is configured to form staples **3612** having a first formed height and a second driver **3640** is configured to form staples having a second, different formed height **3612**.
(393) In still other instances, the staple cartridge **3620** may include single-staple drivers. Alternatively, the staple cartridge **3620** may not include drivers. For example, a firing member and/or sled, such as the firing member **2660** and/or the sled **2658** (FIG. **37**), for example, can be configured to directly contact, engage, and/or drive the staples **3612**. In various instances, the drivers **3640** and/or the staples **3612** can be mass balanced relative to the firing path(s) of a sled, such as sled **2058** (FIG. **7**) and/or sled **2658** (FIG. **37**), for example.
(394) As described herein, to customize and/or optimize the tissue compression within a formed staple, staples in a staple array can be formed to different formed heights. For example, in various instances, it is desirable to vary tissue compression, and thus the formed staple dimensions, laterally. In such circumstances, tissue closer to the cut line can be compressed more than tissue farther from the cut line, for example. Various staple arrays having different unformed heights and/or different formed heights are described in U.S. Pat. No. 7,866,528, entitled STAPLE DRIVE ASSEMBLY, which issued on Jan. 1, 2011; U.S. Pat. No. 7,726,537, entitled SURGICAL STAPLER WITH UNIVERSAL ARTICULATION AND TISSUE PRE-CLAMP, which issued on Jun. 1, 2010; U.S. Pat. No. 7,641,091, entitled STAPLE DRIVE ASSEMBLY, which issued on Jan. 5, 2010; U.S. Pat. No. 7,635,074, entitled STAPLE DRIVE ASSEMBLY, which issued on Dec. 22, 2009; and U.S. Pat. No. 7,997,469, entitled STAPLE DRIVE ASSEMBLY, which issued on Aug. 16, 2011, which are hereby incorporated by reference herein in their respective entireties.
(395) Referring again to FIGS. **49-51**, in various instances, the staple cartridge **3620** can be employed with an end effector that is configured to deform the staples **3612** to different formed heights. The angled staple cavities **3628** in the staple cartridge **3620** are arranged in a plurality of rows. For example, angled the staple cavities **3628** are arranged in a first outer row, a first intermediate row, and a first inner row on a first side of the staple cartridge **3620**, and the angled staple cavities **3628** are arranged in a second outer row, a second intermediate row, and a second inner row on a second side of the staple cartridge **3620**. In various instances, the staples **3612** fired from the staple cavities **3628** in the first outer row can assume a taller formed height than the

staples **2612** fired from the staple cavities **3628** in the first intermediate row, and/or the staples **3612** fired from the staple cavities **3628** in the first intermediate row can assume a taller formed height than the staples **2612** fired from the staple cavities **3628** in the first inner row. Additionally or alternatively, the staples **3612** fired from the staple cavities **3628** in the second outer row can assume a taller formed height than the staples **2612** fired from the staple cavities **3628** in the second intermediate row, and/or the staples **3612** fired from the staple cavities **3628** in the second intermediate row can assume a taller formed height than the staples **2612** fired from the staple cavities **3628** in the second inner row.

(396) In certain instances, the staples **3612** fired from the staple cartridge **3620** can have different unformed heights. For example, the staples **3612** fired from the staple cavities **3628** in the first outer row can have a greater unformed height than the staples **2612** fired from the staple cavities **3628** in the first intermediate row, and/or the staples **3612** fired from the staple cavities **3628** in the first intermediate row can have a greater unformed height than the staples **2612** fired from the staple cavities **3628** in the first inner row. Additionally or alternatively, the staples **3612** fired from the staple cavities **3628** in the second outer row can have a greater unformed height than the staples **2612** fired from the staple cavities **3628** in the second intermediate row, and/or the staples **3612** fired from the staple cavities **3628** in the second intermediate row can have a greater unformed height than the staples **2612** fired from the staple cavities **3628** in the second inner row.

(397) In various instances, staple arrays having different unformed heights and/or different formed heights can be incorporated into various staple cartridges described herein. For example, the staple cartridge **3420** (FIGS. **43-45**) and/or the staple cartridge **3520** (**46-48**) can include staples having different unformed heights and/or can be configured to fire staples to different formed heights. In such instances, the stepped cartridge decks **3422** (FIGS. **43-45**), **3522** (FIGS. **46-48**), and **3622** (FIGS. **49-51**) can affect variable pre-firing tissue compression, for example, and the different formed staple heights can affect variable post-firing tissue compression, for example.

(398) As described herein, angled staple arrays provide improved flexibility to the stapled tissue. A staple that is angled relative to the cut line and/or the longitudinal axis of staple cartridge can have one staple leg closer to the cut line than another staple leg. In such an arrangement, to customize and/or optimize the tissue compression laterally, the staple can be formed to different formed heights. For example, one end of a staple can be formed to a first height, and the other end of the staple can be formed to a second, different height. In such instances, tissue treated by the same row of staples could be subjected to different compressive forces.

(399) A staple cartridge **3720** and an anvil **3703** are depicted in FIG. **79**. The staple cartridge **3720** is similar to the staple cartridge **3620** (FIGS. **49-51**) and like reference characters refer to similar elements. For example, the staple cartridge **3720** includes a cartridge body **3724** and a deck **3722**. The deck **3722** includes multiple longitudinally extending portions **3722***a*, **3722***b*, **3722***c*, and adjacent longitudinal portions **3722***a*, **3722***b*, **3722***c* are separated by a ridge **3723**. The ridges **3723** extend longitudinally along at least a portion of the length of the cartridge body **3722**. An angled staple cavity **3728** is defined into the cartridge body **3724**, and a ridge **3723** extends through the staple cavity **3728**. As a result, the first end of the depicted staple cavity **3728** is positioned in the first longitudinal portion **3722***a* and the second end of the depicted staple cartridge **3728** is positioned in the second longitudinal portion **3722***b*. Additionally, a longitudinal slot **3732** is defined partially through the depicted cartridge body **3724**.

(400) In various instances, the staple cartridge **3720** can include multiple staple cavities **3728**, which are configured to receive an array of angled staples **3712**. For example, the staple cartridge **3720** can include an arrangement of staple cavities **3728** that corresponds to the arrangement of staple cavities **3628** depicted in FIGS. **49-51**. In certain instances, three rows of staple cavities **3728** can be positioned on both sides of the longitudinal slot **3732**, for example.

(401) An unformed staple **3712** and a deformed staple **3712′** are depicted in FIG. **79**. The staple **3712** includes a base **3714**, a first leg **3716** extending from the base **3714**, and a second leg **3718**

extending from the base **3714**. A driver **3740** is also depicted in FIG. **79**. The driver **3740** includes a trough or cradle **3742**, which is configured to support the base **3714** of the staple **3712**. The driver **3740** and the cradle **3742** defined therein have a variable height between a first end **3741** and a second end **3743** of the driver **3740**. For example, the first end **3741** of the driver **3740** defines a first height and the second end **3743** of the driver **3740** defines a second height, which is less than the first height.

(402) As the driver **3740** is fired and lifted within the staple cavity **3728**, the staple **3712** rides upward on the lifting driver **3740** and is deformed by the staple forming pockets **3705** of the anvil **3703**. The formed staple **3712**′ is also depicted in FIG. **79**. The formed height of the staple **3712**′ is a function of the distance or gap between the lifted driver **3740** and the staple forming pockets **3705** of the anvil **3703**. Because the distance between the staple-supporting surface **3742** of the lifted driver **3740** and the staple forming pockets **3705** varies in the staple cartridge **3720** disclosed in FIG. **79**, the formed staple **3712**′ has a variable height. For example, the height of formed staple **3712**′ is greater between the first leg **3716**′ and the base **3714**′ than between the second leg **3718**′ and the base **3714**′. In various instances, the angular orientation of the staple **3712**′ can place the first leg **3716**′ farther from the longitudinal slot **3732** than the second leg **3718**′. In such instances, the first leg **3716**′ can be an outer leg of the staple **3712**′ and the second leg **3718**′ can be an inner leg of the staple **3712**′. In such an arrangement, the tissue compression can be greater between the inner leg **3718**′ and the base **3714**′ than between the outer leg **3716**′ and the base **3714**′.

(403) Staple cartridge and anvil arrangements that are configured to deform angled staples to different formed heights, like the staple cartridge **3720** and the anvil **3705**, for example, could be incorporated into other embodiments disclosed herein. For example, drivers having a variable height staple-supporting cradle, like the drivers **2740**, for example, could be incorporated into other staple cartridge and/or end effector assemblies disclosed herein.

(404) The unformed staple **3712** depicted in FIG. **79** also has a variable height. For example, the staple **3712** defines a first height at the first leg **3716** and a second height at the second leg **3718**, which is less than the first height. Additionally, the base **3714** of the staple **3712** defines a bend or step **3715**, which lifts the second leg **3718** relative to the first leg **3716**.

(405) In other instances, the unformed staple **3712** may have a uniform height. Additionally or alternatively, the base **3714** of the unformed staple **3712** may be straight, or generally straight, between the first leg **3716** and the second leg **3718**. In such instances, the staple **3712** may still assume a variable formed height when the distance between the staple-supporting surface **3742** of the lifted driver **3740** and the staple forming pockets **3705** is variable. For example, one of the staple legs **3716**, **3718** can be more deformed and/or compacted than the other staple leg **3716**, **3718** to accommodate for the additional leg length. Additionally, because the distance between the staple-supporting surface **3742** and the staple forming pockets **3705** varies, the base **3714** can be bent and/or otherwise deformed during firing to accommodate for the height difference.

(406) A staple cartridge **3820** and an anvil **3803** are depicted in FIG. **80**. The staple cartridge **3820** is similar to the staple cartridge **3620** (FIGS. **49-51**) and like reference characters refer to similar elements. For example, the staple cartridge **3820** includes a cartridge body **3824** and a deck **3822**. Unlike the deck **3622** (FIGS. **49-51**), the deck **3822** has a flat, or generally flat, unstepped surface. An angled staple cavity **3828** is defined into the cartridge body **3824**. Additionally, a longitudinal slot **3832** is defined partially through the depicted cartridge body **3824**.

(407) In various instances, the staple cartridge **3820** can include multiple staple cavities **3828**, which are configured to receive an array of angled staples. For example, the staple cartridge **3820** can include an arrangement of staple cavities that corresponds to the arrangement of staple cavities **3628** depicted in FIGS. **49-51**. In certain instances, three rows of staple cavities **3828** can be positioned on either side of the longitudinal slot **3832**, for example.

(408) An unformed staple **3812** is depicted in FIG. **80**. The staple **3812** includes a base **3814**, a first leg **3816** extending from the base **3814**, and a second leg **3818** extending from the base **3814**. A

driver **3840** is also depicted in FIG. **80**. The driver **3840** includes a trough or cradle **3842**, which is configured to support the base **3814** of the staple **3812**.

(409) The anvil **3803** includes a laterally stepped, cartridge-facing surface **3801**. A first staple forming pocket **3805***a* and a second staple forming pocket **3805***b* are defined into the stepped surface **3801**. As depicted in FIG. **80**, the first staple forming pocket **3805***a* is in a first step **3801***a* of the stepped surface **3801** and the second staple forming pocket **3805***b* is in a second step **3801***b* of the stepped surface **3801**.

(410) As the driver **3840** is fired and lifted within the staple cavity **3828**, the staple **3812** rides upward on the lifting driver **3840** and is deformed by the staple forming pockets **3805***a*, **3805***b* of the anvil **3803**. The formed staple **3812**′ is also depicted in FIG. **80**. The formed height of the staple **3812**′ is a function of the distance or gap between the lifted driver **3840** and the staple forming pockets **3805***a*, **3805***b* of the anvil **3803**. Because the distance between the staple-supporting surface **3842** of the lifted driver **3840** and each staple forming pockets **3805***a*, **3805***b* is different in the staple cartridge **3720** depicted in FIG. **79**, the formed staple **3812**′ assumes a variable height. For example, the height of formed staple **3812**′ is greater between the first leg **3816**′ and the base **3814**′ than between the second leg **3818**′ and the base **3814**′. In various instances, the angular orientation of the staple **3812**′ can place the first leg **3816**′ farther from the longitudinal slot **3832** than the second leg **3818**′. In such instances, the first leg **3816**′ can be an outer leg of the staple **3812**′ and the second leg **3818**′ can be an inner leg of the staple **3812**′. In such an arrangement, the tissue compression can be greater between the inner leg **3818**′ and the base **3814**′ than between the outer leg **3816**′ and the base **3814**′.

(411) In other instances, the staple **3812**′ can be deformed to a smaller height at the outer leg **3816**′. As a result, the tissue compression could be greater between the outer leg **3816**′ and the base **3814**′ than between the inner leg **3818**′ and the base **3814**′.

(412) Staple cartridge and anvil arrangements that are configured to deform angled staples to different formed heights, like the staple cartridge **3820** and the anvil **3805***a*, **3805***b*, for example, could be incorporated into other embodiments disclosed herein. For example, variable depth pockets, like pockets **3805***a*, **3805***b*, for example, could be incorporated into other embodiments disclosed herein.

(413) The unformed staple **3812** depicted in FIG. **80** has a variable height. For example, the staple **3812** defines a first height at the first leg **3816** and a second height at the second leg **3818**, which is less than the first height.

(414) In other instances, the unformed staple **3812** may have a uniform height. In such instances, the staple **3812** may still assume a variable formed height when the distance between the staple-supporting surface **3842** of the lifted driver **3840** and the staple forming pockets **3805** is variable. For example, one of the staple legs **3816**, **3818** can be more deformed and/or compacted than the other staple leg **3816**, **3818** to accommodate for the additional length.

(415) In certain types of surgical procedures, the use of surgical staples or surgical fasteners has become the preferred method of joining tissue, and, specially configured surgical staplers or circular surgical fastening devices have been developed for these applications. For example, intra-luminal or circular staplers have been developed for use in surgical procedures used to form an "anastomosis". Circular staplers useful to perform an anastomosis are disclosed, for example, in U.S. Pat. No. 5,104,025, entitled INTRALUMINAL ANASTOMOTIC SURGICAL STAPLER WITH DETACHED ANVIL, U.S. Pat. No. 5,309,927, entitled CIRCULAR STAPLER TISSUE RETENTION SPRING METHOD, U.S. Pat. No. 7,665,647, entitled SURGICAL CUTTING AND STAPLING DEVICE WITH CLOSURE APPARATUS FOR LIMITING MAXIMUM TISSUE COMPRESSION FORCE, U.S. Pat. No. 8,668,130, entitled SURGICAL STAPLING SYSTEMS AND STAPLE CARTRIDGES FOR DEPLOYING SURGICAL STAPLES WITH TISSUE COMPRESSION FEATURES, the entire disclosures of each being hereby incorporated by reference herein.

(416) One form of an "anastomosis" comprises a surgical procedure wherein sections of intestine are joined together after a connecting section (usually a diseased section) has been excised. The procedure requires joining the ends of two tubular sections together to form a continuous tubular pathway. Previously, this surgical procedure was a laborious and time consuming operation. The surgeon had to precisely cut and align the ends of the intestine and maintain the alignment while joining the ends with numerous suture stitches. The development of circular fastening devices has greatly simplified the anastomosis procedure and has also decreased the time required to perform an anastomosis.
(417) In general, a conventional circular stapler or fastening device consists of an elongated shaft that includes a proximal actuating mechanism and a distal stapling mechanism that is mounted to the shaft. The distal stapling mechanism typically consists of a fixed stapling cartridge that contains a plurality of staples that are arranged in a concentric circular array. A round cutting knife is also concentrically mounted in the cartridge such that it is interior to the staples. The knife is axially moveable in a distal direction. Extending axially from the center of the cartridge is a trocar shaft. The trocar shaft is also axially moveable within the elongated shaft. The trocar shaft is configured to be removably attached to an anvil member. The anvil member includes a staple-forming undersurface that is arranged to confront the staple cartridge for forming the ends of the staples as they are advanced into contact with it. The distance between the distal face of the staple cartridge and the staple forming undersurface of the anvil is controlled by an adjustment mechanism that is mounted to the proximal end of the stapler shaft. Tissue that is contained between the staple cartridge and the staple anvil is simultaneously stapled and cut when the actuating mechanism is actuated by the surgeon.
(418) When performing an anastomosis using a circular stapler, the intestine is typically initially stapled using a conventional surgical stapler with double rows of staples being emplaced on either side of a target section (i.e., the diseased section or specimen) of intestine. The target section is typically simultaneously cut as the section is stapled. Next, after removing the specimen, the surgeon typically inserts the anvil into the proximal end of the lumen (i.e., intestine), proximal of the staple line. This is done by inserting the anvil head into an entry port cut into the proximal lumen (intestine) by the surgeon. On occasion, the anvil can be placed transanally, by placing the anvil head on the distal end of the stapler and inserting the instrument through the rectum. The proximal end of the intestine is then sutured to the anvil shaft using a suture or other conventional tying device. Next, the surgeon cuts excess tissue adjacent to the tie and the surgeon attaches the anvil to the trocar shaft of the stapler. The surgeon then closes the gap between the anvil and cartridge by drawing the anvil towards the staple cartridge. As the anvil moves toward the cartridge, the proximal and distal ends of the intestine are clamped therebetween. The stapler is then actuated causing the rows of staples to be driven through both ends of the intestine into forming contact with the anvil. Simultaneously, as the staples are driven and formed, the circular blade is driven through the intestinal tissue ends, cutting the ends adjacent to the inner row of staples. The surgeon then withdraws the stapler from the intestine and the anastomosis is complete.
(419) The effective healing of a colorectal anastomosis can be challenged by several factors and conditions. For example, healing can be effected by the presence of bacterial contaminates in the area of the anastomosis. In general practice, the success rate of the anastomosis tends to improve with the patient's return to mobility. It is desirable for the patient to return to contents passing as soon as possible. One inhibitor to contents passing is the risk of "stricture". If the colon contents are unable to pass the staple line or if they dramatically stress the staple line, a tear, rupture or leak can occur. A linear expandable line of staples was developed for highly expanding organs like the lungs. However, such staple configurations do not lend themselves to use in connection with a circular stapler.
(420) FIG. **29** illustrates one form of circular stapler or stapling device generally designated as **5000**. A variety of circular stapling devices are well known and employed for installing surgical

staples or fasteners. Thus, various details concerning the construction and operation of circular stapling devices will not be discussed in detail herein beyond what may be necessary to understand the innovations and arrangements disclosed herein and depicted in the appended Figures. More details regarding circular fastener and stapling devices may be found in U.S. Pat. No. 7,665,647, entitled SURGICAL CUTTING AND STAPLING DEVICE WITH CLOSURE APPARATUS FOR LIMITING MAXIMUM TISSUE COMPRESSION FORCE, which has been incorporated herein in its entirety as well as other U.S. Patents incorporated by reference herein. In general, the circular stapling device **5000** shown in FIG. **29** includes a head **5002**, an anvil **5004**, an adjustment knob assembly **5006** and a handle **5010** that supports a trigger **5008** thereon. The handle assembly **5010** is coupled to the head **5002** by an arcuate shaft assembly **5012**. In the illustrated arrangement, the trigger **5008** is pivotally supported by handle assembly **5010** and is used to operate the stapler **5000** when a safety mechanism (not illustrated) is released. When trigger **5008** is activated, a firing mechanism is movably advanced within the shaft assembly **5012** so that staples or fasteners are expelled, or deployed, from the head **5002** into forming contact with an anvil forming undersurface **5005** of the anvil **5004**.

(421) Simultaneously, a circular knife (not viewable in FIG. **29**) that is operably supported within head **5002** is advanced distally toward the anvil **5004** and serves to cut the tissue that has been clamped between the head **5002** and anvil **5004** in a known manner. Stapling device **5000** is then removed from the surgical site leaving the stapled tissue in place.

(422) As can also be seen in FIG. **29**, the anvil **5004** includes circular body portion **5014** that has an anvil shaft **5016** protruding therefrom. The anvil shaft **5016** is configured to be removably attached to a trocar shaft **5050** operably supported within the shaft assembly **5012**. See FIG. **29**A. As is known, the trocar shaft **5050** is movably supported with the shaft assembly **5012** and operably interfaces with the adjustment knob assembly **5006** that is rotatably supported on the handle assembly **5010**. The anvil shaft **5016** may be removably attached to the trocar shaft **5050** by retention clips **5052** or other releasable fastening arrangements may also be employed to removably affix the anvil shaft **5016** to the trocar shaft **5050**. Once the anvil shaft **5016** has been attached to the trocar shaft **5050**, the clinician can move the anvil **5004** toward and away form the head **5002** by rotating the adjustment knob **5006** in the appropriate rotary direction.

(423) FIG. **29**A illustrates a head **5002** that has a unique and novel fastener cartridge assembly **5020** operably mounted therein. As can be seen in that Figure, the fastener cartridge assembly **5020** includes a cartridge body **5022** that includes a circular deck **5030**. The circular deck **5030** may form a planar surface **5032** that is arranged to confront the staple forming undersurface **5005** of the anvil **5004** when the anvil shaft **5016** is attached to the trocar shaft **5050**. A plurality of fastener cavities **5040** are provided in the circular deck **5030** and are configured to receive at least one surgical staple or surgical fastener therein (not shown) that is operably supported on a driver assembly **5060** movably supported in the body **5022** of the fastener cartridge assembly **5020**. The driver assembly **5060** is operably coupled to a corresponding movable portion of the shaft assembly **5012** that operably interfaces with the trigger **5008**. Activation of the trigger **5008**, for example, will result in the axial movement of the driver assembly **5060** in the distal direction “DD”. Movement of the driver assembly **5060** in the distal direction “DD” will result in the movement or expulsion of the surgical staple(s) or fastener(s) supported in each fastener cavity **5040** into forming contact with the staple forming undersurface **5005** on the anvil **5004**.

(424) Still referring to FIG. **29**A, for example, each fastener cavity **5040** includes two cavity ends **5042**, **5044**. In the illustrated arrangement, each cavity end **5042**, which may also be referred to herein as a “first cavity end” is positioned on a first circular axis “FCA” that has a first radius “FR”. The first radius “FR” may be measured from the instrument shaft axis “SA”. Also in the illustrated arrangement, each cavity end **5044**, which may also be referred to herein as a “second cavity end” is positioned on a second circular axis “SCA” that has a second radius “SR” that is different from the first radius “FR”. In the illustrated example, the second radius “SR”, which is

also measured from the shaft axis "SA", is greater than the first radius "FR". Also in the illustrated embodiment, each fastener cavity **5040** includes a cavity axis "CA". In the illustrated embodiment, each fastener cavity **5040** is arranged in the circular deck **5030** relative to the first circular axis "FCA" and the second circular axis "SCA" such that each the cavity axis "CA" forms an acute angle with the first circular axis "FCA" and the second circular axis "SCA". Stated another way, the cavity ends **5042** of adjacent fastener cavities **5040** are adjacent to each other and the ends **5044** of the same fastener cavities **5040** are spaced form each other. Such arrangement may be referred to herein as a "zigzag" orientation. In other arrangements, however, the cavity axis "CA" may be perpendicular to the first and second circular axes "FCA" and "SCA".
(425) In the arrangement illustrated in FIG. **29**A, each cavity end **5042**, **5044** may be V-shaped such that they generally terminate in a point. For example, each cavity end **5042** may generally terminate in a point **5043** and each end **5044** may terminate in a point **5045**. Points **5043** may be positioned on or intersect with the first circular axis "FCA" and points **5045** may be positioned on or intersect with the second circular axis "SCA". Such cavity arrangements result in the application of the surgical staples or fasteners in a similar pattern with the tissue. In the illustrated arrangement, the fastener cavities **5040** each support one surgical staple or surgical fastener therein. In other arrangements, however, more than one staple or fastener may be supported in each cavity. The fastener cartridge assembly **5020** employs like-sized staples in each fastener cavity **5040**. In other arrangements, different sizes of surgical staples or fasteners may be employed in the fastener cartridge assembly. The surgical staples that may be employed, for example, include two staple legs that extend from a central body portion or crown. The legs maybe received in the V-shaped ends **5042**, **5044** of the fastener cavity **5040** such that when they are ejected out of the cavity **5040**, the legs extend through the first or second circular axes, which ever the case may be. These staple orientations may address some of the concerns associated with staple stricture discussed above. In particular, the staple configuration formed when employing the fastener cartridge assembly **5020** may allow the staple line to expand and flex more like the original colon than a common staple line. For example, the staples or fasteners may twist as they are pulled radially allowing them to minimize the stress on the healing zones and maximize the flexibility and strength.
(426) Another area of concern associated with colorectal anastomosis procedures relates to radial leakage through the attachment areas. The above-described fastener cartridge assembly **5020** may also address this area of concern. Another fastener cartridge assembly **5120** is shown in FIG. **30** and may also address the various problems and concerns described above. As can be seen in that Figure, the fastener cavities are arrangement in an "asymmetric pattern" wherein the staples applied through the inner ring or inner circular array of cavities function differently from those staples or fasteners applied through the outer ring or outer circular array of cavities.
(427) More specifically and with reference to FIG. **30**, the fastener cartridge assembly **5120** includes a cartridge body **5122** that includes a circular deck **5130**. The circular deck **5130** may form a planar surface **5132** that is arranged to confront the staple forming undersurface **5005** of the anvil **5004** when the anvil shaft **5016** is attached to the trocar shaft **5050**. A first ring **5036** of first cavities **5040** are provided in the circular deck **5130** and a second ring **5160** of second cavities **5170** are provided through the cartridge deck **5130** as shown. Each of the first and second cavities **5040**, **5170** are configured to receive at least one surgical staple or surgical fastener therein (not shown) that is operably supported on a driver assembly **5060** movably supported in the body **5122** of the fastener cartridge assembly **5120**.
(428) Each fastener cavity **5040** includes two cavity ends **5042**, **5044**. Each cavity end **5042** is positioned on a first circular axis "FCA" that has a first radius "FR". The first radius "FR" may be measured from the instrument shaft axis "SA". Each cavity end **5044** is positioned on a second circular axis "SCA" that has a second radius "SR" that is different from the first radius "FR". In the illustrated example, the second radius "SR", which is also measured from the shaft axis "SA", is greater than the first radius "FR". Each fastener cavity **5040** includes a cavity axis "CA". In the

illustrated embodiment, each fastener cavity **5040** is arranged in the circular deck **5130** relative to the first circular axis "FCA" and the second circular axis "SCA" such that each the cavity axis "CA" forms an acute angle with the first circular axis "FCA" and the second circular axis "SCA". Stated another way, the cavity ends **5042** of adjacent fastener cavities **5040** are adjacent to each other and the ends **5044** of the same fastener cavities **5040** are spaced form each other. Such arrangement may be referred to herein as a "zigzag" orientation. In other arrangements, however, the cavity axis "CA" may be perpendicular to the first and second circular axes "FCA", "SCA".
(429) Also in the arrangement illustrated in FIG. **30**, each cavity end **5042**, **5044** may be V-shaped such that they generally terminate in a point. For example, each cavity end **5042** may generally terminate in a point **5043** and each end **5044** may generally terminate in a point **5045**. Points **5043** may be positioned on or intersect with the first circular axis "FCA" and points **5045** may be positioned on or intersect with the second circular axis "SCA". Such cavity arrangements result in the application of the surgical staples or fasteners in a similar pattern with the tissue. Also in the illustrated arrangement, the second ring **5160** includes a plurality of second fastener cavities **5170** that are aligned on a third circular axis "TCA" that is arranged at a third radius "TR" from the shaft axis "SA". In the illustrated arrangement, the third radius "TR" is less that the first and second radiuses. In other arrangements, however, the third radius "TR" is greater than the first radius. In further arrangements, however, the third radius "TR" is greater than the first and second radiuses.
(430) The unique and novel fastener cartridge assembly **5120** serves to orient the staples or fasteners in the tissue such that they would be "tunable" relative to the amount of expansion applied to the staple line. The surgical staples that may be employed, for example, include two staple legs that extend from a central body portion or crown. The legs maybe received in the V-shaped ends of the fastener cavity such that when they are ejected out of the cavity, the legs extend through the first circular axis "FCA", the second circular axis "SCA" or the third circular axis "TCA", whichever the case may be. These staple orientations may result in an improvement to the issues associated with staple stricture discussed above. For example, one ring of staples or fasteners (e.g., the second ring **5160**) provides the standard sealing features and the first ring **5036** may be more aligned to the radial and flexibility aspects of the staple line. Such arrangement therefore, may also provide the same or similar advantages discussed above with respect to fastener cartridge assembly **5020**.
(431) FIG. **31** depicts another unique and novel fastener cartridge assembly **5220** that may also address the various problems and concerns described above. As can be seen in that Figure, the fastener cavities are arrangement in an "asymmetric pattern" wherein the staples applied through the inner ring of cavities function differently from those staples or fasteners applied through the outer ring of cavities.
(432) More specifically and with reference to FIG. **31**, the fastener cartridge assembly **5220** includes a cartridge body **5222** that includes a circular deck **5230**. The circular deck **5230** may form a planar surface **5232** that is arranged to confront the staple forming undersurface **5005** of the anvil **5004** when the anvil shaft **5016** is attached to the trocar shaft **5050**. A first ring **5236** of first cavities **5240** are provided in the circular deck **5230** and a second ring **5260** of second cavities **5270** are provided through the cartridge deck **5230** as shown. Each of the first and second cavities **5240**, **5270** are configured to receive at least one surgical staple or surgical fastener therein (not shown) that is operably supported on a driver assembly **5060** that is movably supported in the body **5222** of the fastener cartridge assembly **5220**.
(433) Each fastener cavity **5240** includes two cavity ends **5242**, **5244**. Each cavity end **5242** is positioned on a first circular axis "FCA" that has a first radius "FR". The first radius "FR" may be measured from the instrument shaft axis "SA". Each cavity end **5244** is positioned on a second circular axis "SCA" that has a second radius "SR" that is different from the first radius "FR". In the illustrated example, the second radius "SR", which is also measured from the shaft axis "SA", is greater than the first radius "FR". Each fastener cavity **5240** includes a cavity axis "CA". In the

illustrated embodiment, each fastener cavity **5240** is arranged in the circular deck **5230** relative to the first circular axis "FCA" and the second circular axis "SCA" such that each the cavity axis "CA" forms an acute angle with the first circular axis "FCA" and the second circular axis "SCA".

(434) Also in the arrangement illustrated in FIG. **31**, each cavity end **5242**, **5244** may be V-shaped such that they generally terminate in a point. For example, each cavity end **5242** may generally terminate in a point **5243** and each end **5244** may generally terminate in a point **5245**. Points **5243** may be positioned on or intersect with the first circular axis "FCA" and points **5245** may be positioned on or intersect with the second circular axis "SCA". Such cavity arrangements result in the application of the surgical staples or fasteners in a similar pattern with the tissue. Also in the illustrated arrangement, the second ring **5260** includes a plurality of second fastener cavities **5270** that are aligned on a third circular axis "TCA" that is arranged at a third radius "TR" from the shaft axis "SA". In the illustrated arrangement, the third radius "TR" is less that the first and second radiuses. In other arrangements, however, the third radius "TR" is greater than the first radius. In further arrangements, however, the third radius "TR" is greater than the first and second radiuses. These staple orientations may result in an improvement to the issues associated with staple structure discussed above. In particular, the staple configuration formed when employing the fastener cartridge assembly **5220** may allow the staple line to expand and flex more like the original colon than a common staple line. For example, the staples or fasteners may twist as they are pulled radially allowing them to minimize the stress on the healing zones and maximize the flexibility and strength.

(435) Adjunct films/buttress materials have been shown to improve hemostasis and pneumostasis by sealing around the staple tips. In many applications, buttress material is employed to stiffen and/or strengthen soft tissue. A variety of buttress material arrangements have been developed and configured for arrangement on the surgical staple cartridge or the anvil of the surgical stapling device. Attaching the buttress member to the cartridge or anvil and then releasing the buttress material therefrom can be challenging. FIG. **58** illustrates a surgical end effector **5300** and portions of a surgical cutting and fastening instrument **5400**. The end effector **5300** employs a unique and novel arrangement for attaching a buttress member **5500** to the surgical staple cartridge **5320** and releasing it therefrom. Examples of surgical cutting and fastening instruments of the type depicted in FIG. **58** are disclosed in U.S. patent application Ser. No. 14/318,991, entitled SURGICAL FASTENER CARTRIDGES WITH DRIVER STABILIZING ARRANGEMENTS, filed on Jun. 30, 2014, now U.S. Pat. No. 9,833,241, the entire disclosure of which is hereby incorporated by reference herein. Further details beyond those which are required to understand the construction and use of the end effector **5300** may be gleaned from reference to that document as well as the numerous other documents incorporated by reference therein.

(436) As can be seen in FIG. **58**, the end effector **5300** depicted therein includes an elongate staple channel **5302** that is configured to operably support a staple cartridge **5320** therein. The elongate staple channel **5302** is coupled to a spine portion **5404** that is operably supported within an elongate shaft assembly **5402** of the surgical stapling instrument **5400**. The staple cartridge **5320** includes a cartridge body **5322** that may be fabricated from a polymer material. In the illustrated embodiment, a metal bottom tray **5324** is attached to the cartridge body **5322**. The cartridge body **5322** includes a deck **5330** that has a plurality of staple cavities **5332** defined therein. Each staple cavity **5332** is configured to removably store a staple therein. The cartridge body **5322** further includes a longitudinal slot that is configured to removably receive a firing member **5410** therein. The cartridge body **5320** can further comprise a distal end **5326**, a proximal end **5328**, and opposing longitudinal sides **5329** extending between the distal end **5326** and the proximal end **5328**. In various instances, each longitudinal side **5329** can comprise a contiguous or continuous edge without interruptions defined therein.

(437) Located within each staple cavity **5332** is a staple **5342** that is supported on a corresponding staple driver **5340** that is movably supported within the cartridge body **5322**. The staple drivers

5340 are lifted upwardly when the firing member **5410** is driven distally through the staple cartridge **5320**. As discussed in further detail in U.S. patent application Ser. No. 14/318,991, now U.S. Pat. No. 9,833,341, the firing member **5410** is configured to advance a staple sled **5350** distally to lift the staple drivers **5340** and the staples **5342** upward and out of the staple cavity **5332**. The end effector **5300** further includes an anvil **5360** that is mounted to the elongate staple channel **5302**. In the illustrated embodiment, the anvil **5360** includes a pair of trunnions **5362** that are movably received in trunnion slots **5304** in the elongate staple channel **5302**. As can be further seen in FIG. **58**, the anvil **5360** includes an anvil tab **5364** that interacts with a closure tube segment **5420**. Movement of the closure tube segment **5420** in the distal direction "DD" can move the anvil **5360** in a direction toward the staple cartridge **5320**. Movement of the closure tube **5420** in the proximal direction "PD" causes the anvil to move away from the staple cartridge **5320**. Other embodiments may employ a cartridge and anvil arrangement wherein the anvil is stationary (e.g., non-movably affixed to the elongate shaft of the surgical device) and the elongate channel and/or the staple cartridge are movable toward and away from the anvil.

(438) As can be seen in FIGS. **58** and **59**, a buttress member **5500** is configured to be received between the surgical staple cartridge **5320** and the anvil **5360**. Stated more precisely, the buttress member **5500** is configured to be received between the staple-forming undersurface **5366** of the anvil **5360** and the deck **5330** of the staple cartridge **5320**. In the illustrated embodiment, the buttress member **5500** is configured to be mounted in tension on the deck **5330** of the staple cartridge **5320**. The buttress material comprising the buttress member **5500** may comprise Gore SeamGuard material, Synovis Peri-Strips material, and/or polyurethane, for example. Other suitable buttress or adjunct materials are disclosed in U.S. patent application Ser. No. 14/318,991, entitled SURGICAL FASTENER CARTRIDGES WITH DRIVER STABILIZING ARRANGEMENTS, filed on Jun. 30, 2014, now U.S. Pat. No. 9,833,241, the entire disclosure of which was previously incorporated by reference herein. Various other suitable buttress and adjunct materials are also disclosed in U.S. patent application Ser. No. 13/763,095, entitled LAYER ARRANGEMENTS FOR SURGICAL STAPLE CARTRIDGES, filed on Feb. 28, 2013, now U.S. Pat. No. 9,770,245, the entire disclosure of which is hereby incorporated by reference herein. The entire disclosures of U.S. patent application Ser. No. 13/531,619, entitled TISSUE STAPLER HAVING A THICKNESS COMPENSATOR COMPRISING INCORPORATING A HEMOSTATIC AGENT, filed on Jun. 25, 2012, now U.S. Pat. No. 9,345,477, U.S. patent application Ser. No. 13/531,623, entitled TISSUE STAPLER HAVING A THICKNESS COMPENSATOR INCORPORATING AN OXYGEN GENERATING AGENT, filed on Jun. 25, 2012, now U.S. Pat. No. 9,320,518, U.S. patent application Ser. No. 13/531,627, entitled TISSUE STAPLER HAVING A THICKNESS COMPENSATOR INCORPORATING AN ANTI-MICROBIAL AGENT, filed on Jun. 25, 2012, now U.S. Pat. No. 9,307,965, and U.S. patent application Ser. No. 13/531,630, entitled TISSUE STAPLER HAVING A THICKNESS COMPENSATOR INCORPORATING AN ANTI-INFLAMMATORY AGENT, filed on Jun. 25, 2012, now U.S. Pat. No. 9,314,246, are also incorporated by reference herein.

(439) In the illustrated embodiment, the staple cartridge **5320** includes projections **5336** that extend upward from the deck **5330** adjacent each staple cavity **5332** in the various manners and arrangements that are described in detail in U.S. patent application Ser. No. 14/318,991, now U.S. Pat. No. 9,833,241. In other embodiments, the staple cartridge does not have such projections. In the illustrated embodiment, the buttress member **5500** includes holes **5502** therein that correspond to the projections **5336**. See, e.g., FIGS. **61** and **62**. As can be seen in those Figures, however, the holes **5502** only accommodate the projections **5336** such that the buttress material spans the areas that correspond to at least portions of the crowns of the staples supported in the cavities. Those portions of buttress material that correspond to the staple crown portions are generally identified as **5504** in FIGS. **61** and **62**.

(440) The buttress member **5500** includes means for releasably affixing the buttress member **5500**

to the cartridge body **5322** such that the buttress member **5500** is retained thereon in tension prior to the actuation of the surgical instrument and then is released from the cartridge body **5322** when the surgical instrument is actuated or "fired". For example, as can be seen in FIG. **58**, the buttress member **5500** includes a distal end **5503** that has at least one distal retention feature **5506** therein. In the illustrated arrangement, two distal holes **5506** are provided in the distal end **5503** and are configured to receive corresponding retention members **5338** protruding from the distal end **5326** of the cartridge body **5322**. As shown in FIGS. **59** and **60**, the retention members **5338** are configured to be received within the distal holes **5506** in the distal end portion **5503** of the buttress member **5500** to releasably retain the distal end of the buttress member **5500** on the distal end portion **5326** of the cartridge **5320**. Other forms of releasable retention members (shapes, numbers, sizes, configurations) and arrangements may also be employed to releasably retain the buttress member **5500** on the staple cartridge **5320** when a tension force is applied to the buttress member **5500** in the proximal and/or distal directions.

(441) Turning to FIGS. **63-65**, the buttress member **5500** includes a proximal end portion **5510** that has a proximal retention feature **5511** thereon. In the illustrated embodiment, the proximal retention feature **5511** comprises at least one retaining tab **5512** that protrudes proximally therefrom. The retaining tab **5512** is located such that when the holes **5506** are inserted over the retention members **5338** on the cartridge body **5322** and the buttress member **5500** is received on the cartridge deck **5330**, the retaining tab **5512** is aligned with the elongate slot **5334** in the cartridge body **5322**. See FIG. **64**. The retaining tab **5512** is folded over the proximal end of the cartridge body and retained within the elongate slot **5334** by the staple sled **5350** when the staple sled **5350** is in its proximal starting position within the cartridge **5320**. The staple sled **5350** may be of the type and construction disclosed in U.S. patent Ser. No. 14/318,991, now U.S. Pat. No. 9,833,241, which includes a stabilizing member **5352** that extends distally to stabilize the sled **5350** and prevent and/or inhibit the rocking or rotation of the staple sled **5350**. As can be seen in FIG. **65**, the retaining tab **5512** is held within the elongate slot **5534** by the stabilizing member **5352** and/or other portions of the staple sled **5350**. Such arrangement serves to retain the buttress member **5500** in tension on the staple deck **5330**. Stated another way, the buttress member **5500** may be stretched between the retention members **5338** and the proximal end **5328** of the staple cartridge **5320**. When the clinician actuates the surgical instrument to commence the firing process, the firing member **5410** is advanced distally in the distal direction "DD". The firing member **5410** interfaces with the staple sled **5350** and, as discussed in U.S. patent application Ser. No. 14/318,991, now U.S. Pat. No. 9,833,241, the firing member **5410** moves the staple sled **5350** distally through the staple cartridge **5320** to drive the staple drivers **5340** upward such that the staples **5342** supported thereon are driven into forming contact with the underside **5366** of the anvil **5360** and the tissue clamped between the anvil **5360** and the staple cartridge **5320** is severed by the cutting member **5410**. Once the staple sled **5350** has moved out of retaining engagement with the retention tab **5512**, the retention tab **5512** is released enabling the buttress material **5500** to be removed from the staple cartridge **5320** with the stapled tissue. Such arrangement serves to release the tension in the buttress material **5500** at the beginning of the firing process. In addition, such buttress arrangement requires no additional releasing parts or configurations.

(442) Existing stapling technology is not particularly well-suited for use on tissues that experience stretching during the healing process. For example, in thoracic parenchymal stapling, the staple lines are fired on lungs in a collapsed configuration. After the procedure is complete, the lung is inflated which often results in the doubling of the surface area of the lung. Existing stapling technology generally does not have the capacity to stretch to the same extent as the lung tissue. This may result in a dramatic strain gradient in the immediate vicinity of the staple line which can lead to high stresses within the staple line, particularly in the row of staples furthest from the cut edge. Thus, there is a need for technologies that allow the staple line to stretch and/or increase in length in an effort to relieve the strain gradient and the associated stress to eliminate or at least

reduce the potential source of air leaks.

(443) Adjunct films/buttress materials have been shown to improve hemostasis and pneumostasis by sealing around the staple tips. In many applications, buttress material is employed to stiffen and/or strengthen soft tissue. However, existing buttress materials may not be sufficiently elastic so as not to impede the compliance of the elastic staple line. FIGS. **66-68** illustrate one form of buttress material **6100** that may address such issues. As can be seen in those Figures, the buttress material **6100** includes a buttress body **6102** that is sized to be operably received on a deck **6004** of a surgical staple cartridge **6000**. In the illustrated example, the surgical staple cartridge **6000** includes a cartridge body **6002** that defines the deck **6004**. The cartridge body **6002** includes a centrally disposed, elongate slot **6006** that is configured to receive a tissue cutting member (not shown) therethrough. A plurality of staple pockets or staple cavities is provided in the deck **6004** on each side of the elongate slot **6006**. As shown, first rows **6010** of first cavities **6012** are provided on each side of the elongate slot **6006**. The first cavities **6012** in each first row **6010** are parallel to each other. Each of the first cavities **6012** is arranged at an angle relative to the elongate slot **6006** and is adjacent thereto. The illustrated cartridge body **6002** further includes two rows **6020** of second staple cavities **6022** that are arranged at angles relative to the first staple cavities **6012**. Two rows **6030** of third staple cavities **6032** are also provided in the cartridge body **6002** as shown. In at least one form, the third staple cavities **6032** are parallel with corresponding first staple cavities **6012**. Other staple or fastener cavity arrangements could be employed, however. In addition, the staple cartridge body **6002** may have lateral ledges **6008** protruding laterally therefrom. As can also be seen in FIG. **66**, the proximal end **6003** of the cartridge body **6002** is narrower than the remaining portion of the cartridge body **6002**.

(444) In the illustrated embodiment, the buttress body **6102** includes four edges **6110**, **6140**, **6150**, **6160** and a central portion **6152**. At least two of the edges **6110**, **6140**, **6150**, **6160** include various edge notch configurations. In the illustrated embodiment, edges **6110**, **6160** include edge notches therein. More specifically as can be seen in FIG. **67**, a first plurality of first edge notches **6114** are formed in a first portion **6112** of the first edge **6110**. In the illustrated embodiment, the first edge notches **6114** extend inward from the first edge portion **6112** at a first acute angle **6115** (“notch angle”) and are parallel to each other. As can be further seen in FIGS. **66** and **67**, second edge notches **6118** extend inward from a second portion **6116** of the first edge portion **6112**. In one arrangement, for example, the second edge notches **6118** extend perpendicularly inward (“notch angle”) from the second portion **6116**. As can be further seen in FIGS. **66** and **67**, third edge notches **6122** extend inward from a third portion **6120** of the first edge portion **6110**. In one arrangement, for example, the third edge notches **6122** extend perpendicularly inward (“notch angle”) from the third portion **6120**. As can be further seen in FIGS. **66** and **67**, fourth edge notches **6126** extend inward from a fourth portion **6124** of the first edge portion **6110**. In one arrangement, for example, the fourth edge notches **6126** extend inward at an acute angle (“notch angle”) from the fourth portion **6124**. As can be further seen in FIGS. **66** and **67**, fifth edge notches **6130** extend inward from a fifth portion **6128** of the first edge portion **6110**. In one arrangement, for example, the fifth edge notches **6130** extend inward at an acute angle (“notch angle”) from the fifth portion **6128**.

(445) Still referring to FIGS. **66** and **67**, a series of primary edge notches **6164** extend inward from a primary portion **6162** of the second edge portion **6160**. In the illustrated arrangement, the primary edge notches **6164** extend perpendicularly inward (“notch angle”) from primary edge portion **6162**. As can be further seen in FIGS. **66** and **67**, secondary edge notches **6168** extend inward from a secondary portion **6166** of the second edge **6160**. In one arrangement, for example, the secondary edge notches **6168** extend inward at an acute angle (“notch angle”) from the secondary edge portion **6166**. As can be further seen in FIGS. **66** and **67**, tertiary edge notches **6172** extend inward from a tertiary portion **6170** of the second edge **6160**. In one arrangement, for example, the tertiary edge notches **6172** extend inward at an acute angle (“notch angle”) from the tertiary portion **6170**.

As can be further seen in FIGS. **66** and **67**, quaternary edge notches **6176** extend inward from a quaternary portion **6174** of the second edge **6160**. In one arrangement, for example, the quaternary edge notches **6176** extend perpendicularly inward ("notch angle") from the quaternary portion **6174**. As can be further seen in FIGS. **66** and **67**, quinary edge notches **6180** extend inward from a quinary portion **6178** of the second edge portion **6160**. In one arrangement, for example, the quinary edge notches **6180** extend perpendicularly inward ("notch angle") from the quinary portion **6178**.
(446) The buttress material **6100** illustrated in FIGS. **66** and **67** also has five different widths, W**1**, W**2**, W**3**, W**4**, W**5** along the total length of the buttress **6100**. W**1** corresponds to edge portions **6112**, **6162**. W**2** corresponds to edge portions **6116**, **6166**. W**3** corresponds to edge portions **6120**, **6170**. W**4** corresponds to edge portions **6124**, **6174**. W**5** corresponds to edge portions **6128**, **6178**. Other buttress material embodiments may have a constant width or different numbers of widths that facilitate operational support on the staple cartridge and/or anvil of the surgical stapling instrument. In addition, the numbers, shapes, sizes and arrangements of edge notches may vary depending upon the embodiment.
(447) In the embodiment shown in FIGS. **66** and **67**, the buttress material **6100** includes a plurality of cutout openings therein. As can be seen in those Figures, the cutouts are arranged in parallel rows. In particular, the cutouts **6204** in rows **6200** comprise slits that are arranged at an angle relative to the edge portions such that the cutouts **6204** in each row **6200** are parallel to each other. The cutouts **6204** may or may not extend completely through the buttress material **6100**. Similarly, the cutouts **6206** in rows **6202** comprise slits that are perpendicularly transverse to the edge portions of the buttress material **6100**. The cutouts **6206** may or may not extend completely through the buttress material **6100**. In other embodiments, the number, shape, size, orientation, spacing, depth and location of such cutouts may vary.
(448) FIG. **68** illustrates one cutout arrangement wherein the staple cavity positions **6012**, **6022**, and **6032** are shown in broken lines. As can be seen in that Figure, no portion of any cutouts **6204**, **6206** is positioned over any one of the staple cavities, **6012**, **6022**, **6032** when the buttress material **6100** is positioned in registration on the deck **6004** of the surgical staple cartridge **6000**. FIG. **69** illustrates a similar buttress material arrangement wherein the staple cavities **6012**, **6022**, and **6032** are shown in broken lines. The portions **6103** of the buttress material **6100′** wherein the staple/fastener legs will ultimately penetrate through are also shown in broken lines. Portions **6103** may also be referred to herein as "staple penetration zones". As can be seen in that Figure, no portion of any of the cutouts **6208**, **6209** is located over any or the staple penetration zones **6103**. The cutouts **6208** and **6209** are arranged in longitudinal rows in the buttress material **6100′**. The cutouts **6208** in each row are approximately parallel to each other and are arranged at an acute angle relative to the edges of the buttress material **6100′**. Similarly, the cutouts **6209** in each row are approximately parallel to each other and are arranged such that they are perpendicular to the cutouts **6208** in adjacent rows. The cutouts **6208** may or may not extend completely through the buttress material **6100′**. As can also be seen in FIG. **69** one entire row of cutouts **6208** is located between the locations of fastener cavities **6032** and the edge of the buttress material **6100′** to facilitate further flexibility of the buttress material **6100′**. As with the other embodiments, the number, shape, size, orientation, spacing, depth and location of such cutouts may vary.
(449) FIG. **70** illustrates another buttress member embodiment **6100″**. In this embodiment, the buttress material includes a plurality of edge notches **6300** that comprise undulating wave-like curves which form serpentine edges. Such edge notches/serpentine edges allow for rotation of staples while reducing material stress during expansion.
(450) FIGS. **71** and **72** illustrates another buttress member **6400** that is fabricated out of a woven material that may be bioabsorbable or may not be bioabsorbable. Further, the buttress material may comprise any of the buttress materials described herein and include the unique and novel attributes described below. For example, the buttress member **6400** may include a hole or opening **6402**

therethrough for cooperating with a correspondingly-shaped portion of the surgical staple cartridge or anvil (e.g., a post, protrusion, etc.) to support the buttress member **6400** in a desired orientation/registration relative to the staples/fasteners in the staple cartridge. In the illustrated arrangement, the buttress member **6400** includes a plurality of staple zones **6404**, **6406**, **6408** that are located therein for registration with corresponding **6012**, **6022**, **6032** fastener cavities in the surgical staple cartridge when the buttress member **6400** is supported on the cartridge deck. The staple zones may be formed by compressing the material and applying heat thereto to cause the material to permanently assume the compressed state. As can be seen in FIG. **72**, the compressed staple areas (generally represented as **6410**) have a smaller cross-sectional thickness than the adjacent non-compressed portions (generally represented as **6412**) of the buttress member **6400**. In addition, the buttress member **6400** may have linear edges **6420**, **6422**, **6424** and/or serpentine edge(s) **6426**. The buttress member may have a shape that corresponds to the shape of the surgical staple cartridge and/or anvil of the surgical instrument.

(451) All of the foregoing buttress member embodiments may be employed on the deck of the surgical staple cartridge or used in connection with an anvil of a surgical stapling device. All of the buttress members may have a shape that corresponds to the shape of the surgical staple cartridge and/or anvil and may have straight or linear edges or edge portions and/or wavy, jagged and or serpentine edges or a combination of such edge configurations. The buttress members may have a constant width or they may have a plurality of widths. The cutouts through the buttress material remove excess material to facilitate or allow for more deformation of the buttress, twisting, etc. with less stress throughout the buttress material during longitudinal expansion. Stated another way, the cutouts enable the buttress to “accordion” in the same manner as the staples themselves are moving. Serpentine or irregular edges allow for rotation of staples while reducing material stress during expansion. The buttress configurations described above comprise “softened structures” that allow for increased extensibility, while still sealing relevant regions. In addition, the buttress members described above not only don't inhibit staple twisting, but also allow the staples and adjunct (buttress) to move in the same manner when stretched. Such buttress member arrangements comprise buttress members that essentially comprise regions of various mechanical behaviors which allow for optimal performance of the staple lines.

(452) FIGS. **73-78** illustrate another staple cartridge **6500** that is similar in construction to staple cartridge **6000** discussed above, except that staple cartridge **6500** additional includes a plurality of projections. In the illustrated example, the surgical staple cartridge **6500** includes a cartridge body **6502** that defines the deck **6504**. The cartridge body **6502** is mounted within a bottom tray **6524** and includes a centrally disposed elongate slot **6506** that is configured to receive a tissue cutting member (not shown) therethrough. A plurality of staple pockets or staple cavities is provided in the deck **6504** on each side of the elongate slot **6506**. As shown, first rows **6510** of first cavities **6512** are provided on each side of the elongate slot **6506**. The first cavities **6512** in each first row **6510** are parallel to each other. Each of the first cavities **6512** is arranged at an angle relative to the elongate slot **6506** and is adjacent thereto. The illustrated cartridge body **6502** further includes two rows **6520** of second staple cavities **6522** that are arranged at angles relative to the first staple cavities **6512**. Two rows **6530** of third staple cavities **6532** are also provided in the cartridge body as shown. In at least one form, the third staple cavities **6532** are parallel with corresponding first staple cavities **6512**. The cartridge body **6502** further has two longitudinal sides **6508**.

(453) The cartridge body **6502** can further comprise a plurality of projections **6550** that extend from the deck surface **6504**. Projections **6550** can be configured to engage tissue positioned intermediate the anvil **5360** and the cartridge **6500** and control the movement of the tissue relative to the cartridge **6500**. Tissue can move relative to the cartridge **6500** in various instances. In at least one instance, tissue can flow relative to the cartridge **6500** when the anvil is moved between an open position and a closed position in which the tissue is squeezed between the anvil and the cartridge **6500**. In such instances, the tissue may flow laterally toward the longitudinal sides **6508**,

distally toward the distal end **6503**, and/or proximally toward the proximal end **6505**. In at least one other instance, tissue can flow relative to the cartridge **6500** when the cutting member is advanced distally through the tissue captured between the anvil and the cartridge **6500**. In such instances, tissue may flow laterally, distally, and/or proximally, but it primarily flows distally due to the distal movement of the cutting edge. In various instances, projections **6550** can be configured to limit or prevent the flow of the tissue relative to the staple cartridge. Projections **6550** can be positioned at the proximal end and/or the distal end of the staple cavities **6512**, **6522**, **6532**. In various instances, each projection **6550** can comprise a cuff extending around an end of a corresponding staple cavity **6512**, **6522** and **6532**. In certain instances, each projection **6550** can comprise an arcuate ridge that extends around an end of a corresponding staple cavity **6512**, **6522** and **6532**.

(454) FIGS. **76-78** illustrate a cartridge arrangement that includes projections **6550**. The cartridge arrangement depicted in FIGS. **73-75** is similar to the cartridge of FIGS. **76-78**, but also includes rows of projection posts **6560** that are formed on the deck surface **6504**. In the arrangement of FIGS. **73-75**, for example, a projection post **6560** is provided between each staple cavity **6512**, **6522** and **6532** in each row of staple cavities. The projection posts **6560** serve to further control the flow of tissue during the clamping and firing process.

(455) Referring primarily to FIG. **73**, the cartridge body **6502** includes a sloped transition **6570** extending between the distal tip of the cartridge body **6502** and the deck surface **6504**. The sloped transition **6570** facilitates the movement of the cartridge **6500** relative to the tissue when positioning the cartridge **6500** and the anvil within a surgical site. In such instances, the tissue can slide over the sloped surface **6570**. In other arrangements, the sloped surface **6570** comprises a radiused surface. In the illustrated arrangement, the sloped surface **6570** comprises an angled surface. In still other arrangements, the sloped surface **6570** comprises a concave surface and/or a convex surface.

(456) The staple cavities **6512**, **6522**, and **6532** defined in the cartridge body **6502** are arranged in longitudinal rows on each side of the longitudinal slot **6506**. Each projection **6550** can be configured to support at least a portion of a staple **6542** removably stored in a staple cavity **6512**, **6522** and **6532**. In various instances, each projection **6550** can extend an endwall **6513**, **6515** of the staple cavity **6512**, **6522**, and **6532** above the deck **6504**. In certain instances, referring generally to FIG. **78**, a staple **6542** positioned within the staple cavity **6512**, **6522**, **6532** includes a base **6543**, a first leg **6545** extending from the base **6543** at a first angle, and a second leg **6547** extending from the base **6543** at a second angle. The first leg **6545** can be in contact with a first endwall **6513** of a staple cavity **6532** and the second leg **6547** can be in contact with a second endwall **6515** of the staple cavity **6512**, **6522**, **6532**. In certain instances, the distance, or spread, between the first leg **6545** and the second leg **6547** of the staple **6542** can be wider than the distance between the endwalls **6513**, **6515** such that, when the staple **6542** is positioned within the staple cavity **6512**, **6522**, **6532**, the legs **6545**, **6547** are biased inwardly by the endwalls **6513**, **6515**. When the staple **6542** is stored within the staple cavity **6512**, **6522**, **6532** in its unfired, or unlifted, position, the tips of the staple legs **6545**, **6547** may be positioned within the projections **6550**. In such instances, the projections **6550** can support and protect the tips of the staple legs **6545**, **6547** above the deck **6504**. In some instances, the tips of the staple legs **6545**, **6547** may be positioned below the projections **6550** when the staple **6542** is in its unfired position and, thus, the projections **6550** may not support the staple legs **6545**, **6547** when the staple **6542** is in its unfired position. When such a staple **6542** is fired, or lifted out of the staple cavity **6512**, **6522**, **6532**, the staple legs **6545**, **6547** may then come into contact with and be supported by the projections **6550**. In any event, the projections **6550** can continue to support the staple legs **6545**, **6547** as the staple **6542** is deployed until the staple **6542** has been sufficiently fired and/or lifted out of the staple cavity **6512**, **6522**, **6532** such that the staple legs **6545**, **6547** are no longer in contact with the projections **6550**.

(457) A layer, such as buttress material, for example, may be made from any biocompatible material. Buttress material may be formed from a natural material and/or a synthetic material.

Buttress material may be bioabsorbable and/or non-bioabsorbable. It should be understood that any combination of natural, synthetic, bioabsorbable and non-bioabsorbable materials may be used to form buttress material. Some non-limiting examples of materials from which the buttress material may be made include, but are not limited to, poly(lactic acid), poly(glycolic acid), poly(hydroxybutyrate), poly(phosphazine), polyesters, polyethylene glycols, polyethylene oxides, polyacrylamides, polyhydroxyethylmethylacrylate, polyvinylpyrrolidone, polyvinyl alcohols, polyacrylic acid, polyacetate, polycaprolactone, polypropylene, aliphatic polyesters, glycerols, poly(amino acids), copoly(ether-esters), polyalkylene oxalates, polyamides, poly(iminocarbonates), polyalkylene oxalates, polyoxaesters, polyorthoesters, polyphosphazenes and copolymers, block copolymers, homopolymers, blends and/or combinations thereof, for example.

(458) Natural biological polymers can be used in forming the buttress material. Suitable natural biological polymers include, but are not limited to, collagen, gelatin, fibrin, fibrinogen, elastin, keratin, albumin, hydroxyethyl cellulose, cellulose, oxidized cellulose, hydroxypropyl cellulose, carboxyethyl cellulose, carboxymethyl cellulose, chitan, chitosan, and/or combinations thereof, for example. Natural biological polymers may be combined with any of the other polymeric materials described herein to produce the buttress material. Collagen of human and/or animal origin, e.g., type I porcine or bovine collagen, type I human collagen or type III human collagen may be used to form the buttress material. The buttress material may be made from denatured collagen or collagen which has at least partially lost its helical structure through heating or any other method, consisting mainly of non-hydrated a chains, of molecular weight close to 100 kDa, for example. The term “denatured collagen” means collagen which has lost its helical structure. The collagen used for the porous layer as described herein may be native collagen or atellocollagen, notably as obtained through pepsin digestion and/or after moderate heating as defined previously, for example. The collagen may have been previously chemically modified by oxidation, methylation, succinylation, ethylation and/or any other known process.

(459) Where the buttress material is fibrous, the fibers may be filaments or threads suitable for knitting or weaving or may be staple fibers, such as those frequently used for preparing non-woven materials. The fibers may be made from any biocompatible material. The fibers may be formed from a natural material or a synthetic material. The material from which the fibers are formed may be bioabsorbable or non-bioabsorbable. It should be understood that any combination of natural, synthetic, bioabsorbable and non-bioabsorbable materials may be used to form the fibers. Some non-limiting examples of materials from which the fibers may be made include, but are not limited to, poly(lactic acid), poly(glycolic acid), poly(hydroxybutyrate), poly(phosphazine), polyesters, polyethylene glycols, polyethylene oxides, polyacrylamides, polyhydroxyethylmethylacrylate, polyvinylpyrrolidone, polyvinyl alcohols, polyacrylic acid, polyacetate, polycaprolactone, polypropylene, aliphatic polyesters, glycerols, poly(amino acids), copoly(ether-esters), polyalkylene oxalates, polyamides, poly(iminocarbonates), polyalkylene oxalates, polyoxaesters, polyorthoesters, polyphosphazenes and copolymers, block copolymers, homopolymers, blends and/or combinations thereof. Where the buttress material is fibrous, the buttress material may be formed using any method suitable to forming fibrous structures including, but not limited to, knitting, weaving, non-woven techniques and the like, for example. Where the buttress material is a foam, the porous layer may be formed using any method suitable to forming a foam or sponge including, but not limited to the lyophilization or freeze-drying of a composition, for example.

(460) The buttress material may possesses haemostatic properties. Illustrative examples of materials which may be used in providing the buttress material with the capacity to assist in stopping bleeding or hemorrhage include, but are not limited to, poly(lactic acid), poly(glycolic acid), poly(hydroxybutyrate), poly(caprolactone), poly(dioxanone), polyalkyleneoxides, copoly(ether-esters), collagen, gelatin, thrombin, fibrin, fibrinogen, fibronectin, elastin, albumin, hemoglobin, ovalbumin, polysaccharides, hyaluronic acid, chondroitin sulfate, hydroxyethyl starch, hydroxyethyl cellulose, cellulose, oxidized cellulose, hydroxypropyl cellulose, carboxyethyl

cellulose, carboxymethyl cellulose, chitan, chitosan, agarose, maltose, maltodextrin, alginate, clotting factors, methacrylate, polyurethanes, cyanoacrylates, platelet agonists, vasoconstrictors, alum, calcium, RGD peptides, proteins, protamine sulfate, epsilon amino caproic acid, ferric sulfate, ferric subsulfates, ferric chloride, zinc, zinc chloride, aluminum chloride, aluminum sulfates, aluminum acetates, permanganates, tannins, bone wax, polyethylene glycols, fucans and/or combinations thereof, for example. The use of natural biological polymers, and in particular proteins, may be useful in forming buttress material having haemostatic properties. Suitable natural biological polymers include, but are not limited to, collagen, gelatin, fibrin, fibrinogen, elastin, keratin, albumin and/or combinations thereof, for example. Natural biological polymers may be combined with any other haemostatic agent to produce the porous layer of the buttress. The entire disclosure of U.S. Pat. No. 8,496,683, entitled BUTTRESS AND SURGICAL STAPLING APPARATUS, which issued on Jul. 30, 2013, is incorporated by reference herein.
(461) The entire disclosures of:
(462) U.S. Pat. No. 5,403,312, entitled ELECTROSURGICAL HEMOSTATIC DEVICE, which issued on Apr. 4, 1995;
(463) U.S. Pat. No. 7,000,818, entitled SURGICAL STAPLING INSTRUMENT HAVING SEPARATE DISTINCT CLOSING AND FIRING SYSTEMS, which issued on Feb. 21, 2006;
(464) U.S. Pat. No. 7,422,139, entitled MOTOR-DRIVEN SURGICAL CUTTING AND FASTENING INSTRUMENT WITH TACTILE POSITION FEEDBACK, which issued on Sep. 9, 2008;
(465) U.S. Pat. No. 7,464,849, entitled ELECTRO-MECHANICAL SURGICAL INSTRUMENT WITH CLOSURE SYSTEM AND ANVIL ALIGNMENT COMPONENTS, which issued on Dec. 16, 2008;
(466) U.S. Pat. No. 7,670,334, entitled SURGICAL INSTRUMENT HAVING AN ARTICULATING END EFFECTOR, which issued on Mar. 2, 2010;
(467) U.S. Pat. No. 7,753,245, entitled SURGICAL STAPLING INSTRUMENTS, which issued on Jul. 13, 2010;
(468) U.S. Pat. No. 8,393,514, entitled SELECTIVELY ORIENTABLE IMPLANTABLE FASTENER CARTRIDGE, which issued on Mar. 12, 2013;
(469) U.S. patent application Ser. No. 11/343,803, entitled SURGICAL INSTRUMENT HAVING RECORDING CAPABILITIES, now U.S. Pat. No. 7,845,537;
(470) U.S. patent application Ser. No. 12/031,573, entitled SURGICAL CUTTING AND FASTENING INSTRUMENT HAVING RF ELECTRODES, filed Feb. 14, 2008;
(471) U.S. patent application Ser. No. 12/031,873, entitled END EFFECTORS FOR A SURGICAL CUTTING AND STAPLING INSTRUMENT, filed Feb. 15, 2008, now U.S. Pat. No. 7,980,443;
(472) U.S. patent application Ser. No. 12/235,782, entitled MOTOR-DRIVEN SURGICAL CUTTING INSTRUMENT, now U.S. Pat. No. 8,210,411;
(473) U.S. patent application Ser. No. 12/249,117, entitled POWERED SURGICAL CUTTING AND STAPLING APPARATUS WITH MANUALLY RETRACTABLE FIRING SYSTEM, now U.S. Pat. No. 8,608,045;
(474) U.S. patent application Ser. No. 12/647,100, entitled MOTOR-DRIVEN SURGICAL CUTTING INSTRUMENT WITH ELECTRIC ACTUATOR DIRECTIONAL CONTROL ASSEMBLY, filed Dec. 24, 2009, now U.S. Pat. No. 8,220,688;
(475) U.S. patent application Ser. No. 12/893,461, entitled STAPLE CARTRIDGE, filed Sep. 29, 2012, now U.S. Pat. No. 8,733,613;
(476) U.S. patent application Ser. No. 13/036,647, entitled SURGICAL STAPLING INSTRUMENT, filed Feb. 28, 2011, now U.S. Pat. No. 8,561,870;
(477) U.S. patent application Ser. No. 13/118,241, entitled SURGICAL STAPLING INSTRUMENTS WITH ROTATABLE STAPLE DEPLOYMENT ARRANGEMENTS, now U.S. Pat. No. 9,072,535;

(478) U.S. patent application Ser. No. 13/524,049, entitled ARTICULATABLE SURGICAL INSTRUMENT COMPRISING A FIRING DRIVE, filed on Jun. 15, 2012, now U.S. Pat. No. 9,101,358;
(479) U.S. patent application Ser. No. 13/800,025, entitled STAPLE CARTRIDGE TISSUE THICKNESS SENSOR SYSTEM, filed on Mar. 13, 2013, now U.S. Pat. No. 9,345,481;
(480) U.S. patent application Ser. No. 13/800,067, entitled STAPLE CARTRIDGE TISSUE THICKNESS SENSOR SYSTEM, filed on Mar. 13, 2013, now U.S. Patent Application Publication No. 2014/0263552;
(481) U.S. Patent Application Publication No. 2007/0175955, entitled SURGICAL CUTTING AND FASTENING INSTRUMENT WITH CLOSURE TRIGGER LOCKING MECHANISM, filed Jan. 31, 2006; and
(482) U.S. Patent Application Publication No. 2010/0264194, entitled SURGICAL STAPLING INSTRUMENT WITH AN ARTICULATABLE END EFFECTOR, filed Apr. 22, 2010, now U.S. Pat. No. 8,308,040, are hereby incorporated by reference herein.
(483) Although the various embodiments of the devices have been described herein in connection with certain disclosed embodiments, many modifications and variations to those embodiments may be implemented. Also, where materials are disclosed for certain components, other materials may be used. Furthermore, according to various embodiments, a single component may be replaced by multiple components, and multiple components may be replaced by a single component, to perform a given function or functions. The foregoing description and following claims are intended to cover all such modification and variations.
(484) The devices disclosed herein can be designed to be disposed of after a single use, or they can be designed to be used multiple times. In either case, however, the device can be reconditioned for reuse after at least one use. Reconditioning can include any combination of the steps of disassembly of the device, followed by cleaning or replacement of particular pieces, and subsequent reassembly. In particular, the device can be disassembled, and any number of the particular pieces or parts of the device can be selectively replaced or removed in any combination. Upon cleaning and/or replacement of particular parts, the device can be reassembled for subsequent use either at a reconditioning facility, or by a surgical team immediately prior to a surgical procedure. Those skilled in the art will appreciate that reconditioning of a device can utilize a variety of techniques for disassembly, cleaning/replacement, and reassembly. Use of such techniques, and the resulting reconditioned device, are all within the scope of the present application.
(485) Preferably, the invention described herein will be processed before surgery. First, a new or used instrument is obtained and if necessary cleaned. The instrument can then be sterilized. In one sterilization technique, the instrument is placed in a closed and sealed container, such as a plastic or TYVEK bag. The container and instrument are then placed in a field of radiation that can penetrate the container, such as gamma radiation, x-rays, or high-energy electrons. The radiation kills bacteria on the instrument and in the container. The sterilized instrument can then be stored in the sterile container. The sealed container keeps the instrument sterile until it is opened in the medical facility.
(486) While this invention has been described as having exemplary designs, the present invention may be further modified within the spirit and scope of the disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.
(487) Any patent, publication, or other disclosure material, in whole or in part, that is said to be incorporated by reference herein is incorporated herein only to the extent that the incorporated materials does not conflict with existing definitions, statements, or other disclosure material set forth in this disclosure. As such, and to the extent necessary, the disclosure as explicitly set forth

herein supersedes any conflicting material incorporated herein by reference. Any material, or portion thereof, that is said to be incorporated by reference herein, but which conflicts with existing definitions, statements, or other disclosure material set forth herein will only be incorporated to the extent that no conflict arises between that incorporated material and the existing disclosure material.

Claims

1. A staple cartridge for use with a surgical stapling instrument, the staple cartridge comprising: a cartridge body, comprising: a proximal end; a distal end; a deck configured to support patient tissue, wherein the deck extends between the proximal end and the distal end; a longitudinal slot extending from the proximal end toward the distal end, wherein the longitudinal slot defines a longitudinal cartridge axis, wherein a first deck side of the deck is on a first lateral side of the longitudinal slot and a second deck side of the deck is on a second lateral side of the longitudinal slot; a longitudinal row of first staple cavities defined in the first deck side extending along a first longitudinal row axis, wherein each first staple cavity comprises a first proximal end and a first distal end positioned along the first longitudinal axis; a longitudinal row of second staple cavities defined in the first deck side, wherein the longitudinal row of first staple cavities is positioned intermediate the longitudinal slot and the longitudinal row of second staple cavities, and wherein each second staple cavity comprises: a second proximal end; a second distal end; and a second cavity axis extending between the second proximal end and the second distal end, wherein the second cavity axis extends at a transverse angle relative to the longitudinal cartridge axis and at a transverse angle relative to the first longitudinal row axis; first staples removably stored in the first staple cavities; second staples removably stored in the second staple cavities; staple drivers movably positioned within the cartridge body; and a sled movable from a proximal unfired position to a distal fired position during a staple firing stroke, wherein the sled engages the staple drivers during the staple firing stroke to lift the first staples and the second staples toward the deck.
2. The staple cartridge of claim 1, wherein the first deck side comprises: a first step, wherein the longitudinal row of first staple cavities is defined in the first step; a second step, wherein the second step is lower than the first step, and wherein the longitudinal row of second staple cavities is defined in the second step; and a third step, wherein the third step is lower than the second step, and wherein a longitudinal row of third staple cavities is defined in the third step.
3. The staple cartridge of claim 1, wherein the first deck side comprises: a first longitudinal surface, wherein the longitudinal row of first staple cavities is defined in the first longitudinal surface; a second longitudinal surface, wherein the second longitudinal surface is lower than the first longitudinal surface, and wherein the longitudinal row of second staple cavities is defined in the second longitudinal surface; and a third longitudinal surface, wherein the third longitudinal surface is lower than the second longitudinal surface, and wherein a longitudinal row of third staple cavities is defined in the third longitudinal surface.
4. The staple cartridge of claim 1, wherein the first deck side defines a deck surface, wherein the longitudinal row of first staple cavities are defined in the deck surface, and wherein the cartridge body further comprises integral projections extending from the deck surface within the longitudinal row of first staple cavities.
5. The staple cartridge of claim 1, wherein the proximal end of each second staple cavity is closer to the longitudinal slot than the distal end.
6. The staple cartridge of claim 1, wherein the distal end of each second staple cavity is closer to the longitudinal slot than the proximal end.
7. The staple cartridge of claim 1, further comprising buttress material releasably attached to the cartridge body.
8. A stapling assembly, comprising: an anvil jaw; and a staple cartridge, comprising: a cartridge

body, comprising: a proximal end; a distal end; a deck configured to support patient tissue, wherein the deck extends between the proximal end and the distal end; a longitudinal slot extending from the proximal end toward the distal end, wherein the longitudinal slot defines a longitudinal cartridge axis, wherein a first deck side of the deck is on a first lateral side of the longitudinal slot and a second deck side of the deck is on a second lateral side of the longitudinal slot; a straight longitudinal row of first staple cavities defined in the first deck side extending along a first longitudinal row axis; a longitudinal row of second staple cavities defined in the first deck side, wherein the straight longitudinal row of first staple cavities is positioned intermediate the longitudinal slot and the longitudinal row of second staple cavities, and wherein each second staple cavity comprises: a second proximal end; a second distal end; and a second cavity axis extending between the second proximal end and the second distal end, wherein the second cavity axis extends at a transverse angle relative to the longitudinal cartridge axis and at a transverse angle relative to the first longitudinal row axis; first staples removably stored in the first staple cavities; second staples removably stored in the second staple cavities; staple drivers movably positioned within the cartridge body; and a sled movable from a proximal unfired position to a distal fired position during a staple firing stroke, wherein the sled engages the staple drivers during the staple firing stroke to lift the first staples and the second staples toward the anvil jaw.
9. The stapling assembly of claim 8, wherein the first deck side comprises: a first step, wherein the straight longitudinal row of first staple cavities is defined in the first step; a second step, wherein the second step is lower than the first step, and wherein the longitudinal row of second staple cavities is defined in the second step; and a third step, wherein the third step is lower than the second step, and wherein a longitudinal row of third staple cavities is defined in the third step.
10. The stapling assembly of claim 8, wherein the first deck side comprises: a first longitudinal surface, wherein the straight longitudinal row of first staple cavities is defined in the first longitudinal surface; a second longitudinal surface, wherein the second longitudinal surface is lower than the first longitudinal surface, and wherein the longitudinal row of second staple cavities is defined in the second longitudinal surface; and a third longitudinal surface, wherein the third longitudinal surface is lower than the second longitudinal surface, and wherein a longitudinal row of third staple cavities is defined in the third longitudinal surface.
11. The stapling assembly of claim 8, wherein the first deck side defines a deck surface, wherein the straight longitudinal row of first staple cavities are defined in the deck surface, and wherein the cartridge body further comprises integral projections extending from the deck surface within the straight longitudinal row of first staple cavities.
12. The stapling assembly of claim 8, wherein the proximal end of each second staple cavity is closer to the longitudinal slot than the distal end.
13. The stapling assembly of claim 8, wherein the distal end of each second staple cavity is closer to the longitudinal slot than the proximal end.
14. The stapling assembly of claim 8, further comprising buttress material releasably attached to the cartridge body.