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Powertrain for a utility vehicle

Abstract

A utility vehicle including a plurality of ground-engaging members, a frame supported by the ground-engaging members, and a powertrain assembly supported by the frame and including an engine supported by the frame, the engine including an exhaust side and a turbocharger operably coupled to the engine, the turbocharger having a turbine housing supporting a turbine and a compressor housing supporting a compressor, the turbocharger being positioned on the exhaust side of the engine and rearward of the engine, a space between the turbocharger and the engine being less than 9 inches.

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6333620	12/2000	Schmitz et al.	N/A	N/A
6334269	12/2001	Dilks	N/A	N/A
6338688	12/2001	Minami et al.	N/A	N/A
6352142	12/2001	Kim	N/A	N/A
6353786	12/2001	Yamada et al.	N/A	N/A
6359344	12/2001	Klein et al.	N/A	N/A
6362602	12/2001	Kozarekar	N/A	N/A
6370458	12/2001	Shal et al.	N/A	N/A
6378478	12/2001	Lagies	N/A	N/A
6394061	12/2001	Ryu et al.	N/A	N/A
6397795	12/2001	Hare	N/A	N/A
6412585	12/2001	DeAnda	N/A	N/A
D461151	12/2001	Morris	N/A	N/A
6453868	12/2001	McClure	N/A	N/A
6467787	12/2001	Marsh	N/A	N/A
D467200	12/2001	Luo et al.	N/A	N/A
6502886	12/2002	Bleau et al.	N/A	N/A
6504259	12/2002	Kuroda et al.	N/A	N/A
6507778	12/2002	Koh	N/A	N/A
6510829	12/2002	Ito et al.	N/A	N/A
6510891	12/2002	Anderson et al.	N/A	N/A
6520133	12/2002	Wenger et al.	N/A	N/A
6520878	12/2002	Leclair et al.	N/A	N/A
6523627	12/2002	Fukuda	N/A	N/A
6523634	12/2002	Gagnon et al.	N/A	N/A
RE38012	12/2002	Ochab et al.	N/A	N/A
D472193	12/2002	Sinkwitz	N/A	N/A
6528918	12/2002	Paulus-Neues et al.	N/A	N/A
6530730	12/2002	Swensen	N/A	N/A
6543523	12/2002	Hasumi	N/A	N/A
6547224	12/2002	Jensen et al.	N/A	N/A
6553761	12/2002	Beck	N/A	N/A
6557515	12/2002	Furuya et al.	N/A	N/A
6561315	12/2002	Furuya et al.	N/A	N/A
6581716	12/2002	Matsuura	N/A	N/A
6582002	12/2002	Hogan et al.	N/A	N/A
6582004	12/2002	Hamm	N/A	N/A
D476935	12/2002	Boyer	N/A	N/A
6588536	12/2002	Chiu	N/A	N/A
6591896	12/2002	Hansen	N/A	N/A
6604034	12/2002	Speck et al.	N/A	N/A
6622804	12/2002	Schmitz et al.	N/A	N/A
6622806	12/2002	Matsuura	N/A	N/A
6622968	12/2002	St. Clair et al.	N/A	N/A
6626256	12/2002	Dennison et al.	N/A	N/A
6626260	12/2002	Gagnon et al.	N/A	N/A
D480991	12/2002	Rondeau et al.	N/A	N/A
6640766	12/2002	Furuya et al.	N/A	N/A
6644709	12/2002	Inagaki et al.	N/A	N/A
6648569	12/2002	Douglass et al.	N/A	N/A
6651768	12/2002	Fournier et al.	N/A	N/A
6655717	12/2002	Wang	N/A	N/A
6659566	12/2002	Bombardier	N/A	N/A
6661108	12/2002	Yamada et al.	N/A	N/A

6675562	12/2003	Lawrence	N/A	N/A
6682118	12/2003	Ryan	N/A	N/A
6685174	12/2003	Behmenburg et al.	N/A	N/A
6691767	12/2003	Southwick et al.	N/A	N/A
6695566	12/2003	Rodriguez Navio	N/A	N/A
6702052	12/2003	Wakashiro et al.	N/A	N/A
6722463	12/2003	Reese	N/A	N/A
6725905	12/2003	Hirano et al.	N/A	N/A
6725962	12/2003	Fukuda	N/A	N/A
D490018	12/2003	Berg et al.	N/A	N/A
6732830	12/2003	Gagnon et al.	N/A	N/A
6733060	12/2003	Pavkov et al.	N/A	N/A
6745862	12/2003	Morii et al.	N/A	N/A
6752235	12/2003	Bell et al.	N/A	N/A
6752401	12/2003	Burdock	N/A	N/A
D492916	12/2003	Rondeau et al.	N/A	N/A
6761748	12/2003	Schenk et al.	N/A	N/A
6767022	12/2003	Chevalier	N/A	N/A
D493749	12/2003	Duncan	N/A	N/A
D493750	12/2003	Crepeau et al.	N/A	N/A
D494890	12/2003	Katoh	N/A	N/A
6769391	12/2003	Lee et al.	N/A	N/A
6772824	12/2003	Tsuruta	N/A	N/A
6777846	12/2003	Feldner et al.	N/A	N/A
D496308	12/2003	Wu	N/A	N/A
6786187	12/2003	Nagai et al.	N/A	N/A
6786526	12/2003	Blalock	N/A	N/A
D497324	12/2003	Chestnut et al.	N/A	N/A
D497327	12/2003	Lai	N/A	N/A
6799779	12/2003	Shibayama	N/A	N/A
6799781	12/2003	Rasidescu et al.	N/A	N/A
6809429	12/2003	Frank	N/A	N/A
D498435	12/2003	Saito et al.	N/A	N/A
6810667	12/2003	Jung et al.	N/A	N/A
6810977	12/2003	Suzuki	N/A	N/A
6820583	12/2003	Maier	N/A	N/A
6820708	12/2003	Nakamura	N/A	N/A
6822353	12/2003	Koga et al.	N/A	N/A
6825573	12/2003	Suzuki et al.	N/A	N/A
6827184	12/2003	Lin	N/A	N/A
6834736	12/2003	Kramer et al.	N/A	N/A
D500707	12/2004	Lu	N/A	N/A
D501570	12/2004	Tandrup et al.	N/A	N/A
6851679	12/2004	Downey et al.	N/A	N/A
6857498	12/2004	Vitale et al.	N/A	N/A
6860826	12/2004	Johnson	N/A	N/A
6868932	12/2004	Davis et al.	N/A	N/A
D503657	12/2004	Katoh	N/A	N/A
D503658	12/2004	Lu	N/A	N/A
D503905	12/2004	Saito et al.	N/A	N/A
6880875	12/2004	McClure et al.	N/A	N/A
6883851	12/2004	McClure et al.	N/A	N/A
D504638	12/2004	Tanaka et al.	N/A	N/A
6892842	12/2004	Bouffard et al.	N/A	N/A
6892844	12/2004	Atsuumi	N/A	N/A
6895318	12/2004	Barton et al.	N/A	N/A
6901992	12/2004	Kent et al.	N/A	N/A
6907916	12/2004	Koyama	N/A	N/A
6908108	12/2004	Scarla	N/A	N/A
6909200	12/2004	Bouchon	N/A	N/A
D507766	12/2004	McMahan et al.	N/A	N/A
6915770	12/2004	Lu	N/A	N/A
6916142	12/2004	Hansen et al.	N/A	N/A
6921077	12/2004	Pupo	N/A	N/A
D508224	12/2004	Mays et al.	N/A	N/A

6923507	12/2004	Billberg et al.	N/A	N/A
6935297	12/2004	Honda et al.	N/A	N/A
6938508	12/2004	Saagge	N/A	N/A
6942050	12/2004	Honkala et al.	N/A	N/A
6945541	12/2004	Brown	N/A	N/A
6951240	12/2004	Kolb	N/A	N/A
RE38895	12/2004	McLemore	N/A	N/A
D511317	12/2004	Tanaka et al.	N/A	N/A
D511717	12/2004	Lin	N/A	N/A
6966395	12/2004	Schuehmacher et al.	N/A	N/A
6966399	12/2004	Tanigaki et al.	N/A	N/A
6976720	12/2004	Bequette	N/A	N/A
6978857	12/2004	Korenjak	N/A	N/A
D513718	12/2005	Itaya et al.	N/A	N/A
6988759	12/2005	Fin et al.	N/A	N/A
6997239	12/2005	Kato	N/A	N/A
7000931	12/2005	Chevalier	N/A	N/A
7004134	12/2005	Higuchi	N/A	N/A
7004137	12/2005	Kunugi et al.	N/A	N/A
D516467	12/2005	Wu	N/A	N/A
D517951	12/2005	Luh	N/A	N/A
D517952	12/2005	Luh	N/A	N/A
7011174	12/2005	James	N/A	N/A
7014241	12/2005	Toyota et al.	N/A	N/A
7017542	12/2005	Wilton et al.	N/A	N/A
D518759	12/2005	Kettler et al.	N/A	N/A
D519439	12/2005	Dahl et al.	N/A	N/A
7032895	12/2005	Folchert	N/A	N/A
7035836	12/2005	Caponetto et al.	N/A	N/A
D520912	12/2005	Knight et al.	N/A	N/A
D520914	12/2005	Luh	N/A	N/A
D521413	12/2005	Katoh	N/A	N/A
7040260	12/2005	Yoshimatsu et al.	N/A	N/A
7040437	12/2005	Fredrickson et al.	N/A	N/A
7044203	12/2005	Yagi et al.	N/A	N/A
7051824	12/2005	Jones et al.	N/A	N/A
D522924	12/2005	Yokoyama et al.	N/A	N/A
D523782	12/2005	Lin	N/A	N/A
7055454	12/2005	Whiting et al.	N/A	N/A
7070527	12/2005	Saagge	N/A	N/A
7073482	12/2005	Kirchberger	N/A	N/A
7076351	12/2005	Hamilton et al.	N/A	N/A
7077233	12/2005	Hasegawa	N/A	N/A
7089737	12/2005	Claus	N/A	N/A
7096988	12/2005	Moriyama	N/A	N/A
7097166	12/2005	Folchert	N/A	N/A
7100562	12/2005	Terada et al.	N/A	N/A
7104242	12/2005	Nishi et al.	N/A	N/A
D529414	12/2005	Wu et al.	N/A	N/A
D531088	12/2005	Lin	N/A	N/A
7114585	12/2005	Man et al.	N/A	N/A
7117927	12/2005	Kent et al.	N/A	N/A
7118151	12/2005	Bejin et al.	N/A	N/A
7124853	12/2005	Kole, Jr.	N/A	N/A
7125134	12/2005	Hedlund et al.	N/A	N/A
D532339	12/2005	Hishiki	N/A	N/A
7136729	12/2005	Salman et al.	N/A	N/A
7137764	12/2005	Johnson	N/A	N/A
7140619	12/2005	Hrovat et al.	N/A	N/A
7143861	12/2005	Chu	N/A	N/A
7147075	12/2005	Tanaka et al.	N/A	N/A
7152706	12/2005	Pichler et al.	N/A	N/A
D535215	12/2006	Turner et al.	N/A	N/A
7156439	12/2006	Bejin et al.	N/A	N/A
7159557	12/2006	Yasuda et al.	N/A	N/A

7165522	12/2006	Malek et al.	N/A	N/A
7168516	12/2006	Nozaki et al.	N/A	N/A
7168709	12/2006	Niwa et al.	N/A	N/A
7172232	12/2006	Chiku et al.	N/A	N/A
7182169	12/2006	Suzuki	N/A	N/A
7185732	12/2006	Saito et al.	N/A	N/A
D539705	12/2006	Ichikawa et al.	N/A	N/A
7204219	12/2006	Sakurai	N/A	N/A
7208847	12/2006	Taniguchi	N/A	N/A
D542186	12/2006	Lai et al.	N/A	N/A
D542188	12/2006	Miwa et al.	N/A	N/A
7213669	12/2006	Fecteau et al.	N/A	N/A
7216733	12/2006	Iwami et al.	N/A	N/A
7224132	12/2006	Cho et al.	N/A	N/A
7234707	12/2006	Green et al.	N/A	N/A
D546246	12/2006	Crepeau et al.	N/A	N/A
7237789	12/2006	Herman	N/A	N/A
7239032	12/2006	Wilson et al.	N/A	N/A
7243564	12/2006	Chonan et al.	N/A	N/A
7243632	12/2006	Hu	N/A	N/A
D548662	12/2006	Markefka	N/A	N/A
D549133	12/2006	LePage	N/A	N/A
7258355	12/2006	Amano	N/A	N/A
7270335	12/2006	Hio et al.	N/A	N/A
7275512	12/2006	Deiss et al.	N/A	N/A
7281753	12/2006	Curtis et al.	N/A	N/A
7286919	12/2006	Nordgren et al.	N/A	N/A
7287508	12/2006	Kurihara	N/A	N/A
7287619	12/2006	Tanaka et al.	N/A	N/A
D555036	12/2006	Eck	N/A	N/A
D561064	12/2007	Crepeau	N/A	N/A
D562189	12/2007	Miwa et al.	N/A	N/A
7325526	12/2007	Kawamoto	N/A	N/A
D563274	12/2007	Ramos	N/A	N/A
7347296	12/2007	Nakamura et al.	N/A	N/A
7357207	12/2007	Vaeisaenen	N/A	N/A
7357211	12/2007	Inui	N/A	N/A
7359787	12/2007	Ono et al.	N/A	N/A
7363961	12/2007	Mori et al.	N/A	N/A
7367247	12/2007	Horiuchi et al.	N/A	N/A
7367417	12/2007	Inui et al.	N/A	N/A
7370724	12/2007	Saito et al.	N/A	N/A
7374012	12/2007	Inui et al.	N/A	N/A
7377351	12/2007	Smith et al.	N/A	N/A
7380622	12/2007	Shimizu	N/A	N/A
7380805	12/2007	Turner	N/A	N/A
7386378	12/2007	Lauwerys et al.	N/A	N/A
7387180	12/2007	Konno et al.	N/A	N/A
7395804	12/2007	Takemoto et al.	N/A	N/A
7401794	12/2007	Laurent et al.	N/A	N/A
7401797	12/2007	Cho	N/A	N/A
7407190	12/2007	Berg et al.	N/A	N/A
7412310	12/2007	Brigham et al.	N/A	N/A
7416234	12/2007	Bequette	N/A	N/A
7421954	12/2007	Bose	N/A	N/A
7427072	12/2007	Brown	N/A	N/A
7427248	12/2007	Chonan	N/A	N/A
D578433	12/2007	Kawaguchi et al.	N/A	N/A
D578934	12/2007	Tanaka et al.	N/A	N/A
7431024	12/2007	Buchwitz et al.	N/A	N/A
7438147	12/2007	Kato et al.	N/A	N/A
7438153	12/2007	Kalsnes et al.	N/A	N/A
7441789	12/2007	Geiger et al.	N/A	N/A
7449793	12/2007	Cho et al.	N/A	N/A
7451808	12/2007	Busse et al.	N/A	N/A

7455134	12/2007	Severinsky et al.	N/A	N/A
7458593	12/2007	Saito et al.	N/A	N/A
D584661	12/2008	Tanaka et al.	N/A	N/A
7481287	12/2008	Madson et al.	N/A	N/A
7481293	12/2008	Ogawa et al.	N/A	N/A
7483775	12/2008	Karaba et al.	N/A	N/A
D585792	12/2008	Chao et al.	N/A	N/A
D586694	12/2008	Huang et al.	N/A	N/A
7490694	12/2008	Berg et al.	N/A	N/A
7497299	12/2008	Kobayashi	N/A	N/A
7497471	12/2008	Kobayashi	N/A	N/A
7497472	12/2008	Cymbal et al.	N/A	N/A
7503610	12/2008	Karagitz et al.	N/A	N/A
7506712	12/2008	Kato et al.	N/A	N/A
7506714	12/2008	Davis et al.	N/A	N/A
7510060	12/2008	Izawa et al.	N/A	N/A
7510199	12/2008	Nash et al.	N/A	N/A
D592556	12/2008	Mehra	N/A	N/A
D592557	12/2008	Mehra	N/A	N/A
D592998	12/2008	Woodard et al.	N/A	N/A
7530420	12/2008	Davis et al.	N/A	N/A
7537070	12/2008	Maslov et al.	N/A	N/A
D593454	12/2008	Sanschagrin et al.	N/A	N/A
D595188	12/2008	Tandrup	N/A	N/A
7540511	12/2008	Saito et al.	N/A	N/A
7546892	12/2008	Lan et al.	N/A	N/A
D595613	12/2008	Lai et al.	N/A	N/A
D596080	12/2008	Lai et al.	N/A	N/A
7559308	12/2008	Matsuda et al.	N/A	N/A
7565944	12/2008	Sakamoto et al.	N/A	N/A
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D597890	12/2008	Lai et al.	N/A	N/A
7571039	12/2008	Chen et al.	N/A	N/A
7575088	12/2008	Mir et al.	N/A	N/A
7575211	12/2008	Andritter	N/A	N/A
D599250	12/2008	Hirano	N/A	N/A
D599251	12/2008	Yin et al.	N/A	N/A
7588010	12/2008	Mochizuki et al.	N/A	N/A
7591472	12/2008	Kinjyo et al.	N/A	N/A
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7600603	12/2008	Okada et al.	N/A	N/A
7600762	12/2008	Yasui et al.	N/A	N/A
7600769	12/2008	Bessho et al.	N/A	N/A
7604084	12/2008	Okada et al.	N/A	N/A
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7610132	12/2008	Yanai et al.	N/A	N/A
D604201	12/2008	Kawaguchi et al.	N/A	N/A
7611154	12/2008	Delaney	N/A	N/A
7617803	12/2008	Fujimoto et al.	N/A	N/A
7621262	12/2008	Zubeck	N/A	N/A
7623327	12/2008	Ogawa	N/A	N/A
D605555	12/2008	Tanaka et al.	N/A	N/A
D606900	12/2008	Flores	N/A	N/A
D606905	12/2008	Yao	N/A	N/A
7625048	12/2008	Rouhana et al.	N/A	N/A
7630807	12/2008	Yoshimura et al.	N/A	N/A
D607377	12/2009	Shimomura et al.	N/A	N/A
7641208	12/2009	Barron et al.	N/A	N/A
7644791	12/2009	Davis et al.	N/A	N/A
7644934	12/2009	Mizuta	N/A	N/A
7645452	12/2009	Thompson et al.	N/A	N/A
7650959	12/2009	Kato et al.	N/A	N/A
D609136	12/2009	Renchuan	N/A	N/A
D610514	12/2009	Eck	N/A	N/A
7658258	12/2009	Denney	N/A	N/A

7677646	12/2009	Nakamura	N/A	N/A
7682115	12/2009	Jay et al.	N/A	N/A
7684911	12/2009	Seifert et al.	N/A	N/A
7694769	12/2009	McGuire	N/A	N/A
7703566	12/2009	Wilson et al.	N/A	N/A
7703730	12/2009	Best et al.	N/A	N/A
7703826	12/2009	German	N/A	N/A
7708103	12/2009	Okuyama et al.	N/A	N/A
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7712562	12/2009	Nozaki	N/A	N/A
7717495	12/2009	Leonard et al.	N/A	N/A
7728212	12/2009	Fujishima et al.	N/A	N/A
7740092	12/2009	Bender	N/A	N/A
7740103	12/2009	Sasajima	N/A	N/A
7740256	12/2009	Davis	N/A	N/A
7742851	12/2009	Hisada et al.	N/A	N/A
D620399	12/2009	Wu et al.	N/A	N/A
7751959	12/2009	Boon et al.	N/A	N/A
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D621423	12/2009	Nakanishi et al.	N/A	N/A
D622631	12/2009	Lai et al.	N/A	N/A
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7778741	12/2009	Rao et al.	N/A	N/A
7786886	12/2009	Maruyama et al.	N/A	N/A
7788212	12/2009	Beckmann et al.	N/A	N/A
7795602	12/2009	Leonard et al.	N/A	N/A
7802816	12/2009	McGuire	N/A	N/A
D625662	12/2009	Li	N/A	N/A
7810818	12/2009	Bushko	N/A	N/A
7819220	12/2009	Sunsdahl et al.	N/A	N/A
7828098	12/2009	Yamamoto et al.	N/A	N/A
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D628520	12/2009	Lin	N/A	N/A
7845452	12/2009	Bennett et al.	N/A	N/A
7857334	12/2009	Seki	N/A	N/A
D631395	12/2010	Tandrup et al.	N/A	N/A
7862061	12/2010	Jung	N/A	N/A
7874391	12/2010	Dahl et al.	N/A	N/A
D631792	12/2010	Sanschagrin	N/A	N/A
D633006	12/2010	Sanschagrin et al.	N/A	N/A
7882912	12/2010	Nozaki et al.	N/A	N/A
7884574	12/2010	Fukumura et al.	N/A	N/A
7885750	12/2010	Lu	N/A	N/A
7891684	12/2010	Luttinen et al.	N/A	N/A
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7912610	12/2010	Saito et al.	N/A	N/A
7913505	12/2010	Nakamura	N/A	N/A
7913782	12/2010	Foss et al.	N/A	N/A
D636295	12/2010	Eck et al.	N/A	N/A
D636704	12/2010	Yoo et al.	N/A	N/A
D636787	12/2010	Luxon et al.	N/A	N/A
D636788	12/2010	Luxon et al.	N/A	N/A
7926822	12/2010	Ohletz et al.	N/A	N/A
7931106	12/2010	Suzuki et al.	N/A	N/A
D637623	12/2010	Luxon et al.	N/A	N/A
D638446	12/2010	Luxon et al.	N/A	N/A
D638755	12/2010	Bracy et al.	N/A	N/A
7942427	12/2010	Lloyd	N/A	N/A
7942447	12/2010	Davis et al.	N/A	N/A
7950486	12/2010	Van et al.	N/A	N/A
D640171	12/2010	Danisi	N/A	N/A
D640598	12/2010	Zhang	N/A	N/A
D640604	12/2010	Lai et al.	N/A	N/A
D640605	12/2010	Lai et al.	N/A	N/A
7954679	12/2010	Edwards	N/A	N/A

7954853	12/2010	Davis et al.	N/A	N/A
7959163	12/2010	Beno et al.	N/A	N/A
7962261	12/2010	Bushko et al.	N/A	N/A
7963529	12/2010	Oteman et al.	N/A	N/A
7967100	12/2010	Cover et al.	N/A	N/A
7970512	12/2010	Lu et al.	N/A	N/A
D641288	12/2010	Sun	N/A	N/A
7984780	12/2010	Hirukawa	N/A	N/A
7984915	12/2010	Post et al.	N/A	N/A
D642493	12/2010	Goebert et al.	N/A	N/A
D643781	12/2010	Nagao et al.	N/A	N/A
8002061	12/2010	Yamamura et al.	N/A	N/A
8005596	12/2010	Lu et al.	N/A	N/A
8011342	12/2010	Bluhm	N/A	N/A
8011420	12/2010	Mazzocco et al.	N/A	N/A
8027775	12/2010	Takenaka et al.	N/A	N/A
8029021	12/2010	Leonard	180/21	B62D 55/04
8032281	12/2010	Bujak et al.	N/A	N/A
8037959	12/2010	Yamamura et al.	N/A	N/A
D648745	12/2010	Luxon et al.	N/A	N/A
D649162	12/2010	Luxon et al.	N/A	N/A
8047324	12/2010	Yao et al.	N/A	N/A
8047451	12/2010	McNaughton	N/A	N/A
8050818	12/2010	Mizuta	N/A	N/A
8050851	12/2010	Aoki et al.	N/A	N/A
8050857	12/2010	Lu et al.	N/A	N/A
8051842	12/2010	Hagelstein et al.	N/A	N/A
8052202	12/2010	Nakamura	N/A	N/A
8056392	12/2010	Ryan et al.	N/A	N/A
8056912	12/2010	Kawabe et al.	N/A	N/A
8065054	12/2010	Tarasinski et al.	N/A	N/A
D650311	12/2010	Bracy	N/A	N/A
8074753	12/2010	Tahara et al.	N/A	N/A
8075002	12/2010	Pionke et al.	N/A	N/A
8079602	12/2010	Kinsman et al.	N/A	N/A
8086371	12/2010	Furuichi et al.	N/A	N/A
8087676	12/2011	McIntyre	N/A	N/A
8095268	12/2011	Parison et al.	N/A	N/A
8100434	12/2011	Miura	N/A	N/A
8104524	12/2011	Manesh et al.	N/A	N/A
8108104	12/2011	Hrovat et al.	N/A	N/A
8116938	12/2011	Itagaki et al.	N/A	N/A
8121757	12/2011	Song et al.	N/A	N/A
8122988	12/2011	Obayashi et al.	N/A	N/A
D657720	12/2011	Eck et al.	N/A	N/A
D657721	12/2011	Miyanishi	N/A	N/A
8152880	12/2011	Matschl et al.	N/A	N/A
8157039	12/2011	Melvin et al.	N/A	N/A
8162086	12/2011	Robinson	N/A	N/A
D660746	12/2011	Bracy	N/A	N/A
8167325	12/2011	Lee et al.	N/A	N/A
8170749	12/2011	Mizuta	N/A	N/A
8176957	12/2011	Manesh et al.	N/A	N/A
8186333	12/2011	Sakuyama	N/A	N/A
8191930	12/2011	Davis et al.	N/A	N/A
8205910	12/2011	Leonard et al.	N/A	N/A
8209087	12/2011	Haegglund et al.	N/A	N/A
D662855	12/2011	Wang	N/A	N/A
8214106	12/2011	Ghoneim et al.	N/A	N/A
8215427	12/2011	Rouaud et al.	N/A	N/A
8215694	12/2011	Smith et al.	N/A	N/A
8219262	12/2011	Stiller	N/A	N/A
8229642	12/2011	Post et al.	N/A	N/A
8231164	12/2011	Schubring et al.	N/A	N/A
D665309	12/2011	Lepine et al.	N/A	N/A

D665705	12/2011	Lepine et al.	N/A	N/A
8235155	12/2011	Seegert et al.	N/A	N/A
8260496	12/2011	Gagliano	N/A	N/A
8269457	12/2011	Wenger et al.	N/A	N/A
8271175	12/2011	Takenaka et al.	N/A	N/A
8272685	12/2011	Lucas et al.	N/A	N/A
D668184	12/2011	Tashiro	N/A	N/A
8281891	12/2011	Sugiura	N/A	N/A
8296010	12/2011	Hirao et al.	N/A	N/A
D670198	12/2011	Li et al.	N/A	N/A
D671037	12/2011	Wu et al.	N/A	N/A
8302711	12/2011	Kinsman et al.	N/A	N/A
8308170	12/2011	Van et al.	N/A	N/A
8315764	12/2011	Chen et al.	N/A	N/A
8321088	12/2011	Brown et al.	N/A	N/A
8322497	12/2011	Marjoram et al.	N/A	N/A
8323147	12/2011	Wenger et al.	N/A	N/A
8328235	12/2011	Schneider et al.	N/A	N/A
D674728	12/2012	Matsumura	N/A	N/A
8352143	12/2012	Lu et al.	N/A	N/A
8353265	12/2012	Pursifull	N/A	N/A
8355840	12/2012	Ammon et al.	N/A	N/A
8356472	12/2012	Hiranuma et al.	N/A	N/A
8374748	12/2012	Jolly	N/A	N/A
8376373	12/2012	Conradie	N/A	N/A
8376441	12/2012	Nakamura et al.	N/A	N/A
8381855	12/2012	Suzuki et al.	N/A	N/A
8382125	12/2012	Sunsdahl et al.	N/A	N/A
8386109	12/2012	Nicholls	N/A	N/A
8387594	12/2012	Wenger et al.	N/A	N/A
8396627	12/2012	Jung et al.	N/A	N/A
D679627	12/2012	Li et al.	N/A	N/A
D680468	12/2012	Li et al.	N/A	N/A
D680469	12/2012	Li et al.	N/A	N/A
8417417	12/2012	Chen et al.	N/A	N/A
8424832	12/2012	Robbins et al.	N/A	N/A
D682737	12/2012	Li et al.	N/A	N/A
D682739	12/2012	Patterson et al.	N/A	N/A
8434774	12/2012	Leclerc et al.	N/A	N/A
8439019	12/2012	Carlson et al.	N/A	N/A
8442720	12/2012	Lu et al.	N/A	N/A
8444161	12/2012	Leclerc et al.	N/A	N/A
8447489	12/2012	Murata et al.	N/A	N/A
8457841	12/2012	Knoll et al.	N/A	N/A
8464824	12/2012	Reisenberger	N/A	N/A
8465050	12/2012	Spindler et al.	N/A	N/A
8473157	12/2012	Savaresi et al.	N/A	N/A
8479854	12/2012	Gagnon	N/A	N/A
8485303	12/2012	Yamamoto et al.	N/A	N/A
8496079	12/2012	Wenger et al.	N/A	N/A
8517136	12/2012	Hurd et al.	N/A	N/A
8517395	12/2012	Knox et al.	N/A	N/A
D689396	12/2012	Wang	N/A	N/A
8522911	12/2012	Hurd et al.	N/A	N/A
8538628	12/2012	Backman	N/A	N/A
D691519	12/2012	Fisher	N/A	N/A
D691924	12/2012	Smith	N/A	N/A
8548678	12/2012	Ummethala et al.	N/A	N/A
8548710	12/2012	Reisenberger	N/A	N/A
8550221	12/2012	Paulides et al.	N/A	N/A
8555851	12/2012	Wenger et al.	N/A	N/A
8556015	12/2012	Itoo et al.	N/A	N/A
8561403	12/2012	Vandyne et al.	N/A	N/A
8567541	12/2012	Wenger et al.	N/A	N/A
8567847	12/2012	King et al.	N/A	N/A

D693370	12/2012	Randhawa	N/A	N/A
8573348	12/2012	Cantemir et al.	N/A	N/A
8573605	12/2012	Di Maria	N/A	N/A
8579060	12/2012	George et al.	N/A	N/A
8590651	12/2012	Shigematsu et al.	N/A	N/A
D694668	12/2012	Li et al.	N/A	N/A
D694671	12/2012	Lai et al.	N/A	N/A
8596398	12/2012	Bennett	N/A	N/A
8596405	12/2012	Sunsdahl et al.	N/A	N/A
8613335	12/2012	Deckard et al.	N/A	N/A
8613336	12/2012	Deckard et al.	N/A	N/A
8613337	12/2012	Kinsman et al.	N/A	N/A
8626388	12/2013	Oikawa	N/A	N/A
8626389	12/2013	Sidlosky	N/A	N/A
D699627	12/2013	Tang	N/A	N/A
8640814	12/2013	Deckard et al.	N/A	N/A
8641052	12/2013	Kondo et al.	N/A	N/A
8645024	12/2013	Daniels	N/A	N/A
8646555	12/2013	Reed	N/A	N/A
8651557	12/2013	Suzuki	N/A	N/A
8657050	12/2013	Yamaguchi	N/A	N/A
D700869	12/2013	Sato et al.	N/A	N/A
D701143	12/2013	Shan	N/A	N/A
D701469	12/2013	Lai et al.	N/A	N/A
8668623	12/2013	Vuksa et al.	N/A	N/A
8671919	12/2013	Nakasugi et al.	N/A	N/A
8672106	12/2013	Laird et al.	N/A	N/A
8672337	12/2013	Van et al.	N/A	N/A
D703102	12/2013	Eck et al.	N/A	N/A
8689925	12/2013	Ajisaka	N/A	N/A
8700260	12/2013	Jolly et al.	N/A	N/A
8708359	12/2013	Murray	N/A	N/A
8712599	12/2013	Westpfahl	N/A	N/A
8712639	12/2013	Lu et al.	N/A	N/A
D705127	12/2013	Patterson et al.	N/A	N/A
8718872	12/2013	Hirao et al.	N/A	N/A
8725351	12/2013	Selden et al.	N/A	N/A
8731774	12/2013	Yang	N/A	N/A
8746719	12/2013	Safranski et al.	N/A	N/A
8763739	12/2013	Belzile et al.	N/A	N/A
8781705	12/2013	Reisenberger	N/A	N/A
8783396	12/2013	Bowman	N/A	N/A
8783400	12/2013	Hirukawa	N/A	N/A
D711778	12/2013	Chun et al.	N/A	N/A
D712311	12/2013	Morgan et al.	N/A	N/A
8827019	12/2013	Deckard et al.	N/A	N/A
8827020	12/2013	Deckard et al.	N/A	N/A
8827025	12/2013	Hapka	N/A	N/A
8827028	12/2013	Sunsdahl et al.	N/A	N/A
8827856	12/2013	Younggren et al.	N/A	N/A
8834307	12/2013	Itoo et al.	N/A	N/A
8840076	12/2013	Zuber et al.	N/A	N/A
8864174	12/2013	Minami et al.	N/A	N/A
8869525	12/2013	Lingenauber et al.	N/A	N/A
D717695	12/2013	Matsumura	N/A	N/A
D719061	12/2013	Tandrup et al.	N/A	N/A
D721300	12/2014	Li et al.	N/A	N/A
D722538	12/2014	Song et al.	N/A	N/A
8944449	12/2014	Hurd et al.	N/A	N/A
8960347	12/2014	Bennett	N/A	N/A
8960348	12/2014	Shomura et al.	N/A	N/A
8973693	12/2014	Kinsman et al.	N/A	N/A
D727794	12/2014	Tandrup et al.	N/A	N/A
8997908	12/2014	Kinsman et al.	N/A	N/A
8998253	12/2014	Novotny et al.	N/A	N/A

9010768	12/2014	Kinsman et al.	N/A	N/A
9016760	12/2014	Kuroda et al.	N/A	N/A
D730239	12/2014	Gonzalez	N/A	N/A
9027937	12/2014	Ryan et al.	N/A	N/A
9061711	12/2014	Kuroda et al.	N/A	N/A
D734689	12/2014	Hashimoto	N/A	N/A
D735077	12/2014	Sato et al.	N/A	N/A
9091468	12/2014	Colpan et al.	N/A	N/A
D735615	12/2014	Itaya et al.	N/A	N/A
9102205	12/2014	Kvien et al.	N/A	N/A
D737724	12/2014	Schroeder et al.	N/A	N/A
D739304	12/2014	Brown	N/A	N/A
9133730	12/2014	Joergl et al.	N/A	N/A
9146061	12/2014	Farlow et al.	N/A	N/A
9162561	12/2014	Marois et al.	N/A	N/A
9186952	12/2014	Yleva	N/A	N/A
9187083	12/2014	Wenger et al.	N/A	N/A
9194278	12/2014	Fronk et al.	N/A	N/A
9194282	12/2014	Serres et al.	N/A	N/A
9211924	12/2014	Safranski et al.	N/A	N/A
9217501	12/2014	Deckard et al.	N/A	N/A
9221508	12/2014	De Haan	N/A	N/A
9228644	12/2015	Tsukamoto et al.	N/A	N/A
9266417	12/2015	Nadeau et al.	N/A	N/A
D751467	12/2015	Lai et al.	N/A	N/A
D756845	12/2015	Flores	N/A	N/A
9327587	12/2015	Spindler et al.	N/A	N/A
9328652	12/2015	Bruss et al.	N/A	N/A
D758281	12/2015	Galloway	N/A	N/A
9365251	12/2015	Safranski et al.	N/A	N/A
D761698	12/2015	Umemoto	N/A	N/A
9381803	12/2015	Galsworthy et al.	N/A	N/A
9382832	12/2015	Bowers	N/A	N/A
9393894	12/2015	Steinmetz et al.	N/A	N/A
D762522	12/2015	Kinoshita	N/A	N/A
D763732	12/2015	Okuyama et al.	N/A	N/A
D764973	12/2015	Mikhailov et al.	N/A	N/A
9421860	12/2015	Schuhmacher et al.	N/A	N/A
9428031	12/2015	Kuwabara et al.	N/A	N/A
9434244	12/2015	Sunsdahl et al.	N/A	N/A
9440671	12/2015	Schlangen et al.	N/A	N/A
9469329	12/2015	Leanza	N/A	N/A
D772755	12/2015	Tandrup et al.	N/A	N/A
9499044	12/2015	Osaki	N/A	N/A
9500264	12/2015	Aitcin et al.	N/A	N/A
D774955	12/2015	Lai et al.	N/A	N/A
D774957	12/2015	Umemoto	N/A	N/A
9512809	12/2015	Tsumiyama et al.	N/A	N/A
9540052	12/2016	Burt, II et al.	N/A	N/A
9566858	12/2016	Hicke et al.	N/A	N/A
9573561	12/2016	Muto et al.	N/A	N/A
9592713	12/2016	Kinsman et al.	N/A	N/A
D784199	12/2016	Dunshee et al.	N/A	N/A
9623912	12/2016	Schlangen	N/A	N/A
D785502	12/2016	Dunshee et al.	N/A	N/A
D787985	12/2016	Wilcox et al.	N/A	N/A
9638070	12/2016	Kaeser	N/A	N/A
9644717	12/2016	Aitcin	N/A	N/A
9649928	12/2016	Danielson et al.	N/A	N/A
9650078	12/2016	Kinsman et al.	N/A	N/A
9713976	12/2016	Miller et al.	N/A	N/A
9718351	12/2016	Ripley et al.	N/A	N/A
9719463	12/2016	Oltmans et al.	N/A	N/A
9725023	12/2016	Miller et al.	N/A	N/A
9752489	12/2016	Chu	N/A	N/A

9776481	12/2016	Deckard et al.	N/A	N/A
9789909	12/2016	Erspamer et al.	N/A	N/A
9802605	12/2016	Wenger et al.	N/A	N/A
9809102	12/2016	Sunsdahl et al.	N/A	N/A
D804993	12/2016	Eck et al.	N/A	N/A
D805009	12/2016	Eck et al.	N/A	N/A
D805015	12/2016	Eck et al.	N/A	N/A
9856817	12/2017	Nicosia et al.	N/A	N/A
9884647	12/2017	Peterson et al.	N/A	N/A
9895946	12/2017	Schlangen et al.	N/A	N/A
9908577	12/2017	Novak et al.	N/A	N/A
9944177	12/2017	Fischer et al.	N/A	N/A
10011189	12/2017	Sunsdahl et al.	N/A	N/A
10017090	12/2017	Franker et al.	N/A	N/A
10036311	12/2017	Kaeser et al.	N/A	N/A
10066729	12/2017	Aitcin et al.	N/A	N/A
D832149	12/2017	Wilcox et al.	N/A	N/A
10099547	12/2017	Bessho et al.	N/A	N/A
10112555	12/2017	Aguilera et al.	N/A	N/A
10124709	12/2017	Bohnsack et al.	N/A	N/A
D835545	12/2017	Hanten et al.	N/A	N/A
10154377	12/2017	Post et al.	N/A	N/A
10160497	12/2017	Wimpfheimer et al.	N/A	N/A
10183605	12/2018	Weber et al.	N/A	N/A
10189524	12/2018	Schafer et al.	N/A	N/A
10202149	12/2018	Johnson et al.	N/A	N/A
10207555	12/2018	Mailhot et al.	N/A	N/A
10221727	12/2018	Walter et al.	N/A	N/A
10239571	12/2018	Kennedy et al.	N/A	N/A
10246153	12/2018	Deckard et al.	N/A	N/A
10259507	12/2018	Johnson et al.	N/A	N/A
10294877	12/2018	Arima et al.	N/A	N/A
10300786	12/2018	Nugteren et al.	N/A	N/A
10323568	12/2018	Kaeser et al.	N/A	N/A
D852674	12/2018	Wilcox et al.	N/A	N/A
10359011	12/2018	Dewit et al.	N/A	N/A
10369861	12/2018	Deckard et al.	N/A	N/A
10371249	12/2018	Bluhm et al.	N/A	N/A
10399401	12/2018	Schlangen et al.	N/A	N/A
10428705	12/2018	Bluhm et al.	N/A	N/A
10479422	12/2018	Hollman et al.	N/A	N/A
10486748	12/2018	Deckard et al.	N/A	N/A
10550754	12/2019	Nugteren et al.	N/A	N/A
10589621	12/2019	McKoskey et al.	N/A	N/A
10639985	12/2019	Battaglini et al.	N/A	N/A
10655536	12/2019	Mueller et al.	N/A	N/A
10697532	12/2019	Schleif et al.	N/A	N/A
10718238	12/2019	Wenger et al.	N/A	N/A
10723190	12/2019	Hu et al.	N/A	N/A
D896125	12/2019	Hashimoto et al.	N/A	N/A
D896702	12/2019	Dunshee et al.	N/A	N/A
D896703	12/2019	Dunshee et al.	N/A	N/A
10766533	12/2019	Houkom et al.	N/A	N/A
10767745	12/2019	Zauner et al.	N/A	N/A
10800250	12/2019	Nugteren et al.	N/A	N/A
D904227	12/2019	Bracy	N/A	N/A
10864828	12/2019	Sunsdahl et al.	N/A	N/A
10876462	12/2019	Draisey et al.	N/A	N/A
10926618	12/2020	Deckard et al.	N/A	N/A
10926664	12/2020	Sunsdahl et al.	N/A	N/A
10926799	12/2020	Houkom et al.	N/A	N/A
D913847	12/2020	Hashimoto et al.	N/A	N/A
10933932	12/2020	Spindler et al.	N/A	N/A
10946736	12/2020	Fischer et al.	N/A	N/A
10960941	12/2020	Endrizzi et al.	N/A	N/A

10967694	12/2020	Brady et al.	N/A	N/A
11104194	12/2020	Schlangen et al.	N/A	N/A
11173808	12/2020	Swain et al.	N/A	N/A
11220147	12/2021	Hu et al.	N/A	N/A
11235814	12/2021	Schlangen et al.	N/A	N/A
11285807	12/2021	Galsworthy et al.	N/A	N/A
11293540	12/2021	Leclair et al.	N/A	N/A
11306809	12/2021	Aitcin	N/A	N/A
11391361	12/2021	Leclair et al.	N/A	N/A
11607920	12/2022	Schlangen et al.	N/A	N/A
11624427	12/2022	Itoo et al.	N/A	N/A
11628722	12/2022	Rasa et al.	N/A	N/A
11680635	12/2022	Olason	N/A	N/A
11691674	12/2022	Schleif et al.	N/A	N/A
11752860	12/2022	Fields et al.	N/A	N/A
11780326	12/2022	Schlangen et al.	N/A	N/A
11787251	12/2022	Schlangen et al.	N/A	N/A
11884148	12/2023	Nelson et al.	N/A	N/A
11926190	12/2023	Schlangen et al.	N/A	N/A
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2002/0147072	12/2001	Goodell et al.	N/A	N/A
2002/0178968	12/2001	Christensen	N/A	N/A
2002/0179354	12/2001	White	N/A	N/A
2003/0001409	12/2002	Semple et al.	N/A	N/A
2003/0015531	12/2002	Choi	N/A	N/A
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2006/0191739	12/2005	Koga	N/A	N/A
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2007/0023566	12/2006	Howard	N/A	N/A
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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) The present application claims priority to U.S. Patent Application Ser. No. 63/351,574, filed Jun. 13, 2022, the complete disclosure of which is incorporated herein by reference.

FIELD OF THE DISCLOSURE
(1) The present invention relates generally to a vehicle and, in particular, to a vehicle with a turbocharged powertrain assembly.
BACKGROUND THE DISCLOSURE
(2) Generally, all-terrain vehicles (“ATVs”) and utility vehicles (“UVs”) are used to carry one or more passengers and a small amount of cargo over a variety of terrains.
(3) Power output and the powertrain system is important for providing such vehicles with the ability to move across various terrain. What are needed are improvements to the powertrain system for assuring increased and reliable power.
SUMMARY OF THE DISCLOSURE
(4) A utility vehicle is provided with an engine and turbocharger positioned on the hot side of the engine.
(5) According to one example, a utility vehicle includes a plurality of ground-engaging members, a frame supported by the ground-engaging members, and a powertrain assembly supported by the frame and including an engine supported by the frame, the engine including an exhaust side and a turbocharger operably coupled to the engine, the turbocharger having a turbine housing supporting a turbine and a compressor housing supporting a compressor, the turbocharger being positioned on the exhaust side of the engine and rearward of the engine, a space between the turbocharger and the engine being less than 9 inches.
(6) According to another example, the utility vehicle further includes an operator area and a cargo area supported by the frame, wherein the turbocharger is positioned vertically below at least a portion of the cargo area.
(7) According to another example, the powertrain assembly of the utility vehicle further includes a transmission operably coupled to the engine, wherein the turbocharger is positioned vertically higher than the transmission.
(8) According to another example, the muffler of the utility vehicle is coupled to the engine via an exhaust conduit, the exhaust conduit being less than two feet.
(9) According to another example, the powertrain assembly of the utility vehicle further includes an exhaust conduit positioned

fluidically between the engine and the muffler, and wherein the frame defines a frame envelope, the turbocharger being positioned within the frame envelope and the exhaust conduit extending at least partially outside of the frame envelope.
(10) According to another example, the powertrain assembly of the utility vehicle further includes a continuously variable transmission (CVT) operably coupled to the engine, the turbocharger being positioned laterally adjacent to the CVT.
(11) According to another example, the turbocharger of the utility vehicle is outside an envelope defined by the CVT.
(12) According to another example, the powertrain assembly of the utility vehicle further includes an intercooler, the intercooler being positioned laterally adjacent to the turbocharger.
(13) According to another example, the powertrain assembly of the utility vehicle further includes an air intake and an air filter fluidically coupled to the engine via the turbocharger, the air filter being positioned on a non-exhaust side of the engine.
(14) According to another example, a portion of the intercooler of the utility vehicle includes an air intake and an air exhaust, the air exhaust being positioned longitudinally forward of the turbocharger.
(15) According to another example, the powertrain assembly of the utility vehicle further includes an engine intake manifold operably coupled to the engine, and wherein the air exhaust of the intercooler is laterally adjacent at least a portion of the engine intake manifold.
(16) A utility vehicle is provided with an engine and an oil management system.
(17) According to one example, a utility vehicle includes a plurality of ground-engaging members, a frame supported by the ground-engaging members, and a powertrain assembly supported by the frame and including an engine supported by the frame a turbocharger operably coupled to the engine, and an oil management system fluidically coupled to the engine and the turbocharger, the oil management system including an oil pan defining a staging reservoir, a staging oil pick up member including an opening positioned proximate the staging reservoir, an engine oil pump fluidically coupled to the staging oil pick up member and operable to pump oil from the staging reservoir to the engine, and a turbo drain through which oil from the turbocharger is operable to drain from the turbocharger, the turbo drain operable to deliver the oil to be picked up by the staging oil pick up member.
(18) According to another example, the oil management system of the utility vehicle is a wet sump.
(19) According to another example, the staging oil pickup member of the utility vehicle includes an auxiliary opening, the auxiliary opening being fluidically coupled to the turbo drain.
(20) According to another example, the oil management system of the utility vehicle includes a channel in fluid communication with the turbo drain and the staging oil pick up member at the second opening, such that oil is drained from the turbocharger directly to the auxiliary opening of the staging oil pickup member.
(21) According to another example, the oil management system of the utility vehicle includes a delivery reservoir adjacent the staging reservoir and a delivery oil pickup member with an opening proximate the delivery reservoir, wherein the oil pump is operable to deliver oil from the staging reservoir to the delivery reservoir.
(22) According to another example, the oil management system of the utility vehicle includes a de-aerating member fluidically between the staging reservoir and the delivery reservoir.
(23) According to another example, the oil management system of the utility vehicle includes a delivery reservoir cover, wherein the delivery reservoir is a pressurized chamber when the delivery reservoir cover is installed and the oil pump is active.
(24) According to another example, the staging oil pickup member of the utility vehicle is positioned vertically above a portion of the staging reservoir.
(25) According to another example, the portion of the staging reservoir above which the staging oil pickup member of the utility vehicle is positioned defines a low pressure zone during operation.
(26) According to another example, the turbocharger of the utility vehicle drains into the low pressure zone of the staging reservoir.
(27) An off-road recreational vehicle is provided with an engine and a water cooling system.
(28) According to one example, an off-road recreational vehicle includes a plurality of ground-engaging members, a frame supported by the ground-engaging members, and a powertrain assembly supported by the frame and including an engine supported by the frame an air intake system fluidically coupled to the engine to provide air to the engine and including a throttle blade positioned fluidically upstream from the engine, and a water cooling system including a nozzle interfacing with the air intake system upstream from the throttle blade.
(29) According to another example, the nozzle of the off-road recreational vehicle interfaces with the air intake system within 8 inches from the throttle blade upstream from the throttle blade.
(30) According to another example, the nozzle of the off-road recreational vehicle is operable to atomize water.
(31) According to another example, the nozzle of the off-road recreational vehicle is positioned perpendicular to flow of air through the air intake system.
(32) According to another example, the water cooling system of the off-road recreational vehicle further includes a controller operable to activate the nozzle in predetermined conditions.
(33) According to another example, the predetermined conditions of the off-road recreational vehicle include one of high temperatures, wide open throttle, and increased power demands.
(34) According to another example, the water cooling system of the off-road recreational vehicle further includes a water reservoir supported by the frame.
(35) According to another example, the off-road recreational vehicle further includes a continuously variable transmission (CVT), wherein the CVT is fluidically coupled to the water reservoir.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The above mentioned and other features of this invention, and the manner of attaining them, will become more apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, where:

(2) FIG. **1** is a front perspective view of a utility vehicle of the present disclosure;

(3) FIG. **2** is a rear perspective view of the utility vehicle of FIG. **1**;

(4) FIG. **3** is a left side view of the utility vehicle of FIG. **1**;

(5) FIG. **4** is a right side view of the utility vehicle of FIG. **1**;

(6) FIG. **5** is a top view of the utility vehicle of FIG. **1**;

(7) FIG. **6** is a front side view of the utility vehicle of FIG. **1**;

(8) FIG. **7** is a rear side view of the utility vehicle of FIG. **1**;

(9) FIG. **8** is a perspective view of a powertrain assembly of the vehicle of FIG. **1**;

(10) FIG. **9** is a side view of the powertrain assembly of FIG. **8**;

(11) FIG. **10** is a top view of the powertrain assembly of FIG. **8**;

(12) FIG. **11** is a view of a powertrain assembly having an engine in an lateral or east-west configuration;

(13) FIG. **12** is a view of a powertrain assembly having an engine in a longitudinal or north-south configuration;

(14) FIG. **13** is a view of an alternative powertrain assembly having an engine in a longitudinal or north-south configuration;

(15) FIG. **14** is a top perspective view of a powertrain assembly with an engine and a turbocharger;

(16) FIG. **15** is a side view of the engine and turbocharger of FIG. **14**;

(17) FIG. **16** is a top view of the engine and turbocharger of FIG. **14**;

(18) FIG. **17** is a bottom perspective view of the engine and turbocharger of FIG. **14**;

(19) FIG. **18** is a bottom perspective view of an oil management system of an engine with a drain line from a turbocharger;

(20) FIG. **19** is a bottom view of the oil management system of FIG. **18**;

(21) FIG. **20** is a top perspective view of the oil management system of FIG. **18**;

(22) FIG. **21** is a top perspective view of an interior of an oil pan of the oil management system of FIG. **18**;

(23) FIG. **22** is a side perspective view of the oil management system of FIG. **18**;

(24) FIG. **23** is a side section view of the oil management system of FIG. **18**;

(25) FIG. **24** is a front section view of the oil management system of FIG. **18**;

(26) FIG. **25** is a top view of the oil management system of FIG. **18**;

(27) FIG. **26** is a front section view of reservoirs and pickup members of the oil management system of FIG. **18**;

(28) FIG. **27** is a section view of the oil management system of FIG. **18** positioned in a condition of high angularity;

(29) FIG. **28** is a section view of the oil management system of FIG. **18** positioned in another condition of high angularity;

(30) FIG. **29** is a view of an alternative embodiment of an oil management system;

(31) FIG. **30** is a section view of another alternative embodiment of an oil management system;

(32) FIG. **31** is a top view of an oil pan of the oil management system of FIG. **30**;

(33) FIG. **32** is a schematic of a water injection system; and

(34) FIG. **33** is an alternative schematic of a water injection system.

(35) Corresponding reference characters indicate corresponding parts throughout the several views. Unless stated otherwise the drawings are proportional.

DETAILED DESCRIPTION OF THE DRAWINGS

(36) The embodiments disclosed below are not intended to be exhaustive or to limit the invention to the precise forms disclosed in the following detailed description. Rather, the embodiments are chosen and described so that others skilled in the art may utilize their teachings. While the present disclosure is primarily directed to a utility vehicle, it should be understood that the features disclosed herein may have application to other types of vehicles such as other all-terrain vehicles, motorcycles, snowmobiles, and golf carts.

(37) With reference first to FIGS. **1-7**, the vehicle of the present invention will be described. As shown, a vehicle **10** is generally depicted which includes front ground-engaging members **12** and rear ground-engaging members **14**. The ground-engaging members **12**, **14** support a vehicle frame **16** (FIG. **3**), which supports an operator or seating area **20** comprised of a driver's seat **22** and a passenger seat **24**. A cab frame **26** generally extends over the seating area **20**. As best shown in FIG. **3**, the vehicle **10** further includes a steering assembly **30** for steering the front ground-engaging members **12** whereby the steering assembly **30** includes a steering wheel **32** which could be both tiltable and longitudinally movable.

(38) In some embodiments, the vehicle **10** is a four-wheel drive vehicle. As shown, the vehicle **10** may also include an outer body **41** including a hood **43**, side panels **44**, doors **45**, a cargo area **46** (e.g., a utility bed), and rear panels **48**, which are illustrated throughout FIGS. **1-7**. The vehicle **10** further includes a front suspension **40** and a rear suspension **42**.

(39) As seen in FIGS. **2-4** and **8-13**, the vehicle **10** include a powertrain assembly **100**. The component parts of the powertrain assembly **100** are discussed hereafter in greater detail with respect to FIGS. **8-10**. Illustratively, the powertrain assembly **100** is comprised of an engine **102**, a transmission **124** (e.g., a continuously variable transmission (CVT) **104**, and/or a shiftable transmission **106**), an exhaust assembly **108**, and a turbocharger **110**. The powertrain assembly **100** is supported by the vehicle frame **16**. The powertrain assembly **100** described herein may be further configured as shown in U.S. patent application Ser. No. 16/875,448 with a filing date of May 15, 2020 and/or U.S. patent application Ser. No. 16/875,494 with a filing date of May 15, 2020, the subject matter of which are incorporated herein by reference in their entireties.

(40) With reference now to FIGS. **8-10**, the powertrain assembly **100** will be described in greater detail. The powertrain assembly **100** provides power to the ground-engaging members **12**, **14** of the vehicle **10** (FIGS. **1-7**). The powertrain assembly **100** is supported on at least longitudinal frame members **17** and an engine mount **18** of the vehicle frame **16**. In one embodiment, the longitudinal frame members **17** are generally parallel to a centerline C.sub.L of the vehicle **10** (FIG. **5**) and the engine mount **18**

extends transversely to the centerline C.sub.L and the longitudinal frame members **17**.

(41) Referring to FIGS. **11-13**, the engine **102** is positioned at the rear of the vehicle **10** behind the seating area **20**. The engine **102** includes an engine or cylinder block **112** with at least one cylinder **114** (e.g., including a twin cylinder configuration, three cylinder configuration, other cylinder configurations). Illustratively, the engine **102** is an in-line, three-cylinder engine having a first, second, and a third cylinder **114**. In addition to the engine **102**, the powertrain assembly **100** includes an engine intake manifold assembly **120** providing air to the engine **102**, the exhaust assembly **108** routing exhaust from the engine **102** out of vehicle **10**, the transmission **124** operably coupled to the engine **102**, and a drivetrain having a drive shaft coupled to the transmission **124**. The engine **102** may be oriented either in lateral orientation (FIG. **11**) or in a longitudinal orientation (FIG. **12**). In the lateral orientation of FIG. **11**, a crankshaft (not shown) extends laterally or generally transverse to the centerline C.sub.L, whereas, in the longitudinal orientation of FIG. **12**, the crankshaft (not shown) extends parallel to or colinear with centerline C.sub.L.

(42) The engine **102** of powertrain assembly **100** may be placed in the vehicle **10** in a plurality of different configurations, with the present application illustrating at least two of these different configurations. In the first illustrative configuration, shown in FIG. **11**, the engine **102** is positioned in the vehicle **10** in a lateral orientation, where the cylinders **114** of the engine **102** are aligned from a right side **2** of the vehicle **10** to a left side of the vehicle **10** and the crankshaft (not shown) extends laterally between the right side and left side of the vehicle **10** such that the engine **102** is perpendicular to a centerline C.sub.L of the vehicle **10**. When the engine **102** is in the lateral orientation, the engine intake manifold assembly **120**, which includes an intake manifold **129**, at least one throttle body **130**, and/or intake manifold runners **132**, is positioned generally forward of the engine **102** and rearward of the seating area **20** such that a majority of engine intake manifold assembly **120** is between seating area **20** and a forwardmost point of the engine **102** and all of engine intake manifold assembly **120** is longitudinally between the seating area **20** and a centerline E.sub.L of the engine **102**. The centerline E.sub.L of the engine **102** is defined, in the first illustrative embodiment, as the laterally-extending centerline of the cylinders **114** such that the centerline E.sub.L intersects the midpoint or the vertically-extending reciprocation axis (e.g., reciprocation of a piston (not shown) therein) of each cylinder **114**.

(43) The exhaust assembly **108** of the first illustrative configuration (FIG. **11**), which includes an exhaust manifold **134**, at least one exhaust conduit **136**, and/or a muffler or silencer **138**, is positioned generally rearward of the engine **102** and forward of a rear of the vehicle **10** such that at least the exhaust manifold **134** and muffler **138** of the exhaust assembly **108** are longitudinally between the engine **102** and the rearward most point of the vehicle **10**. It may be appreciated that a portion of a tail pipe of the exhaust assembly **108** may extend rearwardly from the rear of the vehicle **10** without departing from the description and understanding of the exhaust assembly **108** disclosed herein.

(44) The transmission **124** of the first illustrative configuration (FIG. **11**) is laterally positioned between the engine **102** and the right side or left side of the vehicle **10** such that the transmission **124** extends along a right side or a left side of the engine **102**. The transmission **124** also may be positioned rearward of at least a portion of the engine intake manifold assembly **120** and forward of at least a portion of the exhaust assembly **122**. Illustratively, the transmission **124** is positioned laterally between the engine **102** and the left side **4** of the vehicle **10**.

(45) The configuration of the powertrain assembly **100** of the first illustrative configuration (FIG. **11**) allows for the powertrain assembly **100** to have a hot side and a cold side. More particularly, a hot side of the engine **102**, or the side of the engine **102** which contains more heat producing components, is generally defined as the rearward portion of the engine **102** (e.g., may be defined as the portion of at least the engine **102** positioned rearward of the engine centerline E.sub.L). The hot side of the engine **102** includes heat-producing components such as the exhaust manifold **134** which contains hot air exhaust from the engine **102** and other such components that may experience elevated temperatures during operation of the engine **102** compared to other components. Additionally, a cool/cold side of the engine **102**, or the side of the engine **102** which generates less heat, is generally defined as the forward portion of the engine **102** adjacent the seating area **20** (e.g., may be defined as the portion of at least the engine **102** positioned forward of engine centerline E.sub.L). The cool side of the engine **102** includes components that generate no or less heat such as the engine intake manifold assembly **120** which receives ambient air and other such components that do not experience elevated temperatures during operation of the engine **102**. Because the cool side of the engine **102** does not generate heat or generate as much heat as the hot side of the engine **102**, various heat sensitive components of the powertrain assembly **100** and/or the vehicle **10** may be positioned within or adjacent to the cool side of the engine **102**, such as electronics like sensors, controllers, etc. In addition to the strategic positioning of a hot and cold side of the engine **102**, this first illustrative configuration allows for throttle body **130** to be closer to the intake manifold **129** resulting in a shorter engine intake manifold assembly **120**.

(46) In the second illustrative configuration, shown in FIGS. **12** and **13**, the engine **102** is positioned in the vehicle **10** in a longitudinal configuration, where the cylinders **114** of the engine **102** are aligned in the fore/aft direction of the vehicle **10** and the crankshaft **116** extends longitudinally such that engine centerline EL of the engine **102** may be at least parallel to centerline C.sub.L of the vehicle **10**. In other embodiments, the engine centerline E.sub.L may be colinear with the centerline C.sub.L. As shown in FIGS. **12** and **13**, when the engine **102** is in the longitudinal/second illustrative configuration, longitudinal centerline E.sub.L of the engine **102** may be offset to the right of the centerline C.sub.L of the vehicle **10** in order to allow an output shaft (not shown) of shiftable transmission **106** and the drive shaft (not shown) of the drivetrain to be properly aligned. When the engine **102** is in the second or longitudinal configuration, the engine intake manifold assembly **120** is positioned laterally between the right side of the vehicle **10** and the engine **102**, portions of the exhaust assembly **122** extend along the left side of the vehicle **10** to a position rearward of the engine **102**, and the transmission **124** may be positioned longitudinally forward of the engine **102**. In various embodiments, at least a portion of the transmission **124** may be positioned below the seating area **20** and/or rearward of the seating area **20**. As such, the transmission **124** may be longitudinally intermediate a portion of the seating area **20** and a portion of the engine **102**.

(47) In either the first or second illustrative configurations, the powertrain assembly **100** may further include the turbocharger **110**, which may be positioned behind the engine **102** in the transverse configuration of FIG. **11** or behind or to the side of the engine **102** in the longitudinal configuration of FIGS. **12** and **13**. However, in various embodiments, the turbocharger **110** may be

positioned at any location along exhaust conduit **136** between the exhaust manifold **134** and muffler **138**. In some embodiments, the turbocharger **110** may be integrated within a portion of the exhaust manifold **134** and/or positioned immediately adjacent the exhaust manifold **134**. The exhaust manifold **134** may include a run that is less than 12 inches, for example, less than 9 inches, less than 6 inches, less than 4 inches, less or than 2 inches. This places the turbocharger **102** in close proximity to the engine **102**, for example the space between the turbocharger **110** and the engine **102** may be less than 9 inches, less than 6 inches, less than 5 inches, less than 4 inches, less than 3 inches, less than 2 inches, or less than 1 inch. Be having the run between the engine **102** and the turbocharger **110** being shortened, the responsiveness of the turbocharger **110** is increased. The configuration of the inlets and outlets of the turbocharger **110** discussed below also facilitates the placement of the turbocharger **110** in such close proximity with the engine **102**.

(48) Referring to FIGS. **14-17**, the turbocharger **110** is positioned on the hot or exhaust side of the engine **102** and is in parallel with the engine **102**. When the engine **102** is provided in the East/West configuration, the turbocharger **110** is positioned rearward of the engine **102**. The turbocharger **110** is coupled to the engine block **112**. It is understood that the turbocharger **110** may be provided as a single integral unit with the exhaust manifold **134** or may be provided as a separate component that can be coupled to the exhaust manifold **134**. Accordingly, in some embodiments, the turbocharger **110** is coupled to the engine block **112** via the exhaust manifold **134** which is separate from the turbocharger **110** or in some embodiments is coupled to the engine block **112** via the exhaust manifold **134** that is integral with the turbocharger **110**. The turbocharger **110** is in fluid communication with the exhaust ports **123** of the engine **102**. Various turbochargers may be implemented, including but not limited to those shown in U.S. Pat. No. 10,300,786 issued May 28, 2019 and entitled “Utility Vehicle”, the subject matter of which is incorporated herein by reference in its entirety. In some embodiments, the exhaust manifold **134** includes a short run from the engine **102** to the turbocharger **110** (e.g., less than one foot, such as less than 8 inches or less than 6 inches). By having a shorter run from between the turbocharger **110** and the engine **102**, other air delivery components such as the second and third conduits **168**, **172** (which are discussed hereafter) have shorter segments exposed to the hot side of the engine **102** and therefore heat transfer is limited to those components which deliver air to the engine for combustion.

(49) The turbocharger **110** includes a turbine portion **140** and a compressor portion **150**. The turbine portion **140** includes a turbine housing **142**, a turbine (not shown), a turbine inlet **146**, and a turbine outlet **148**. In some embodiments, the turbine inlet **146** receives exhaust from the exhaust manifold **134** (e.g., the turbine inlet **146** is coupled to the exhaust manifold **134** or is integral with the exhaust manifold **134**). The compressor portion **150** includes a compressor housing **152**, a compressor (not shown), a compressor inlet **156**, and a compressor outlet **158**. A shaft (not shown) extends between turbine and the compressor.

(50) As shown in FIG. **16**, the compressor outlet **158** is aligned parallel to the engine centerline E.sub.L. The compressor inlet **156** is also aligned parallel to the engine centerline E.sub.L. By aligning the compressor inlet and outlet **156**, **158**, the turbocharger **110** includes a narrower profile extending away from the engine **102**. For example, when the engine **102** has an East/West configuration, the turbocharger **110** includes the compressor inlet and outlet **156**, **158** each facing towards the left side of the vehicle **10** (FIG. **8**). This reduces the profile of the turbocharger **110** in the longitudinal direction of the vehicle **10** when installed. The compressor inlet and outlet **156**, **158** are positioned on the same side of the compressor housing **152**. For example, the compressor inlet **156** may be positioned along or near a center of a side of the compressor housing **152** (e.g., along a compressor axis C.sub.A of the compressor **154**, see FIG. **16**) and the compressor outlet **158** is positioned at the periphery of the side of the compressor housing **152** (e.g., at an outer edge of the compressor **154** having an outlet axis O.sub.A that is substantially parallel to the compressor axis C.sub.A). Furthermore, by placing the compressor inlet and outlet **156**, **158** as described, thermal transfer of the turbocharger **110** and its corresponding components (e.g., conduits) is reduced. By having the compressor inlet **156** and the compressor outlet **158** parallel to each other, both the compressor inlet and outlet **156**, **158** extend laterally away from the engine **102** and therefore are oriented to limit heat transfer to the conduits which couple to each of the compressor inlet and outlet **156**, **158**. This also facilitates the close placement of the turbocharger **110** with the engine **102** as described above.

(51) More specifically, by placing the compressor inlet and outlet **154**, **156** as shown and described (e.g., FIGS. **10** and **16**), the conduits through which the air is travelling have a shortened length and their exposure to the hot side of the engine **102** is reduced. Referring to FIGS. **8-10**, for example, the vehicle **10** may include an air intake system **160** that includes an air intake inlet **162**, an air filter **164**, a first conduit **166** extending between the air intake inlet **162** and the air filter **164**, a second conduit **168** extending between the air filter **164** and the compressor inlet **156**, an intercooler **170**, a third conduit **172** extending between the compressor outlet **158**, and a fourth conduit **174** extending between the intercooler **170** and the engine intake manifold assembly **120**. The second and third conduits **168**, **172** are short segments on the hot side of the engine **102** in order to reduce thermal transfer to the air that moves through those conduits. For example, the portions of the second and third conduits **168**, **172** that are positioned on the hot side of the engine **102** are less than two to three feet, including less than one foot. Because the turbocharger **110** includes shorter conduits (e.g., first, second, third, and fourth conduits **166**, **168**, **172**, **174**), and because the turbocharger **110** is arranged to include a compact profile (e.g., the alignment of the compressor inlet and outlet **156**, **158**), the turbocharger **110** is able to limit thermal transfer and therefore increase the thermal efficiency of the turbocharger **110** and the powertrain assembly **100**, generally.

(52) Referring again to FIGS. **8-10**, the turbocharger **110** is packaged within the vehicle **10** in order to optimize the ability of the powertrain assembly **100** to deliver power to the ground-engaging members **12**, **14**. As illustrated in FIG. **9**, the turbocharger **110** is positioned longitudinally rearward of the engine **102**, vertically below the cargo area **46**, longitudinally forward of the muffler **138**, vertically above at least a portion of the transmission **124**, laterally adjacent to the CVT **106** (see FIG. **11**), and laterally between rear frame members **19**. The turbocharger **110** is positioned below and spaced from the cargo area **46** such that it is not contacting or directly adjacent to the cargo area **46** to limit heat transfer to the cargo area **46** (e.g., when a utility bed includes a plastic body) and outside of an envelope formed by the CVT **106**. The turbocharger **110** is protected between the rear frame members **19** and is also positioned spaced from the rear ground-engaging members **14** and an envelope defined by the rear ground-engaging members **14**. As illustrated, the exhaust conduit **136** is coupled to the turbine outlet **148** and extends to the muffler **138**. In some embodiments, the exhaust conduit **136** is routed to the muffler **138** such that at least a portion of the exhaust conduit **136** extends beyond (e.g., outboard of) one of the rear frame members **19**. Thus, the turbocharger **110** is positioned within

a frame envelope defined by the rear frame members **19** envelope and the exhaust conduit **136** extends at least partially outside of the frame envelope. In some embodiments, the turbocharger **110** is within 4 feet (e.g., within 2 feet) of the rear suspension **42**. The turbocharger **110** may be packaged inboard of the rear suspension **42**, the positioning being operable to mitigate heat transfer to the components of the rear frame members **19** and the rear suspension **42**.

(53) Referring now to FIGS. **17-29**, the powertrain assembly **100** also includes an oil management system **180**. The oil management system **180** includes an oil pan **182** coupled to the engine **102** (FIGS. **17-20**), an oil pump **184** (FIG. **20**), at least one oil pickup member **186** (FIG. **20**), and a deaerator **188** (FIG. **20**). The oil pan **182** defines at least one reservoir into which oil is drained. Oil that is in the reservoir is pumped from the reservoir, through the oil pickup member **186** via the oil pump **184**, and into the engine **102** (e.g., a wet sump). The reservoir is also operable to receive oil drained from the turbocharger **110**. For example, the turbocharger **110** may include a drain **111** that is coupled to an oil drain line **190** that coupled to an oil drain line connector **192** on the oil pan **182** (FIG. **20**). The drain line connector **192** includes a channel **194** through which oil drains from the turbocharger **110** into the reservoir of the oil management system **180**.

(54) The oil pan **182** with the turbo drain line connector **192** allows the turbocharger **110** to continue to operate in conditions of high vehicle angularity. For example, the turbocharger **110** will continue to drain in conditions of 50 degree and greater angularity of the vehicle **10**, which can be caused in certain operating conditions of the vehicle **10** including climbing, rock crawling, accelerations, and so forth. The turbocharger **110** will continue to drain into the oil pan **182** in the high angularity conditions because a low pressure zone is formed where the oil from the turbocharger **110** is drained in the oil management system **180**. In some embodiments, the oil pan **182** includes a deep profile that is facilitated, in part, by the raising of the engine **102** from the frame **16**, which is discussed more fully in U.S. patent application Ser. No. 16/875,494, which is incorporated by reference herein. By having a deeper profile, the oil pan **182** and reservoir are able to hold oil even when the vehicle **10** is in high angularity and/or high acceleration situations (e.g., longitudinal, lateral, and compound angularity). The angle of the drain lines (i.e., the drain line connector **192** and channel for the turbocharger **110**) may be angled relative to a vertical axis such that even at high angularity or acceleration, oil does not travel backward through the oil management system **180**.

(55) Referring to FIG. **21**, the oil management system **180** including the oil pan **182** includes a pan bottom **200** and outer side walls **202**. The oil pan **182** defines a staging reservoir **204** and a delivery reservoir **206** and are separated from each other by a wall **208**. The oil pan **182** is formed such that oil from the engine **102** drains into and pools in the staging and delivery reservoirs **204**, **206**. In some embodiments, the oil pan **182** is formed to direct oil substantially to the staging reservoir **204** by including an interior side wall **210** that extends substantially around the delivery reservoir **206**. The pan bottom **200** and the interior side wall **210** are formed to facilitate oil draining and pooling to the staging reservoir **204**. The interior side walls **210** may include gaps **212** that allow the oil to drain or enter into the delivery reservoir **206**, however, the majority of the oil draining into the oil pan **182** from the engine **102** will be directed to the staging reservoir **204** when the engine **102** is in a neutral orientation (i.e., not on an incline, etc.). Referring to FIG. **20**, the delivery reservoir **206** is covered with a covering member **214** which allows the delivery reservoir **206** to retain oil supply to the engine **102** during certain angularity operations. The covering member **214** couples to the interior side wall **210** to form the partially pressurized chamber. It is noted that the gaps **212** in the interior side walls **210** are not sealed by the covering member **214**, thus allowing oil to enter or exit the delivery reservoir **206** through the gaps **212**. In some embodiments, the gaps **212** are positioned on one side of the interior side walls **210** which facilitates the delivery reservoir **206** to retain oil supply to the engine **102** during certain angularity operations (e.g., when the vehicle **10** is angled in such a way that the gaps **212** are vertically higher than other portions of the interior side walls **210**).

(56) Referring to FIG. **20**, the oil management system **180** includes a first pickup member **186** that is positioned with the staging reservoir **204** and a second pickup member **187** positioned with the delivery reservoir **206** (see FIG. **25**). The first and second pickup members **186**, **187** are operable to uptake oil that is positioned in the respective reservoirs **204**, **206**. Each of the oil pickup members **186**, **187** may include a first opening **216** and a second opening **218** and a main lumen **220** defined within the oil pickup members **186**, **187** (see FIG. **26**). Oil is picked up by the oil pickup members **186**, **187** at the first opening **216** by creating a lower pressure zone in the lumen of the oil pickup members **186**, **187** (e.g., via the oil pump **184** which is in fluid communication with the oil pickup members **186**, **187** by way of the second opening **218**). The oil picked up by the first pickup member **186** is ejected from the oil pump **184** into the deaerator **188** which includes a spiral profile. The deaerator **188** removes air that may have been introduced into the oil collected in the staging reservoir **204** when taken up by the first oil pickup member **186**. This may also occur when the first opening **216** of the oil pickup member **186** is not submerged in oil (e.g., when the vehicle **10** is in configurations of high angularity such as when climbing, etc.) (see FIG. **27**). The deaerator **188** receives oil from the oil pump **184** and the oil travels through the deaerator **188** around a spiral portion **189** which forces air from the oil, and the deaerated oil is dumped into the delivery reservoir **206**. Oil can then be picked up by the second pickup member **187** and cycled back through the appropriate mechanical systems of the powertrain assembly **100** (e.g., the engine **102** and turbocharger **110**).

(57) Referring to FIGS. **27** and **28**, the oil management system **180** is shown in positions of high angularity. FIG. **27** depicts the oil management system **180** in a position such that the delivery reservoir **206** is in a vertically lower position than the staging reservoir **204**. When this occurs, the first opening **216** of the first oil pickup member **186** may not be submerged in oil and thus may pick up both oil and air from the staging reservoir **204**. Oil from the staging reservoir **204** is transferred to the delivery reservoir **206** via the deaerator **188**. Oil is picked up from the delivery reservoir **206** via the second pickup member **187** and delivered to the engine **102**. When the vehicle **10** is in a position that places the oil management system **180** in the configuration shown in FIG. **28**, the first opening **216** of the first oil pickup member **186** is submerged in oil and picks up oil from the staging reservoir **204** and transfers it to the delivery reservoir **206**. The first opening **216** of the second pickup member **187** remains submerged in oil because the oil being transferred from the staging reservoir **204** to the delivery reservoir **206**.

(58) Referring again to FIGS. **23** and **24**, the oil pickup members **186**, **187** may include an auxiliary arm **222**. The auxiliary arm **222** includes an auxiliary lumen **224** and an auxiliary opening **226**. The auxiliary lumen **224** is in fluid communication with the main lumen **220**. Oil drained from the turbocharger **110** is operable to be drained to a position proximate the auxiliary opening **226** of the oil pickup members **186**, **187** such that the oil is picked up at the auxiliary opening **226** and travels through the auxiliary

lumen **224** into the main lumen **220**. This allows oil to be drained directly from the turbocharger **110** and picked up without pooling in the reservoirs **204**, **206**. The low pressure zone formed at the auxiliary opening **226** of the oil pickup members **186**, **187** pulls the oil through and reduces clogging or backup of oil in the oil drain line **190** and channel **194** of the drain line connector **192**. For example, in one embodiment, the channel **194** of the drain line connector **192** can extend through the oil pan **182** (or in other embodiments through another conduit separate from the oil pan **182**) to a position proximate the auxiliary opening **226** of the oil pickup members **186**, **187**. In another embodiment the channel **194** of the drain line connector **192** may drain into one of the reservoirs **204**, **206**. These embodiments are discussed in more detail herein.

(59) Referring to the embodiment in which the channel **194** of the drain line connector **192** extend through the oil pan **182**, the channel **194** is integrally formed in the oil pan **182**. For example, FIGS. **23-25** depict the channel **194** extending through the pan bottom **200**. An orifice **228** is provided proximate the channel **194**. Oil in the channel **194** can exit the channel **194** at the orifice **228**. The auxiliary opening **226** of one of the oil pickup members **186**, **187** is positioned at or proximate the orifice **228** such that oil is taken up directly into the oil pickup member. The orifice **228** may be sized to include various diameters, which can result in various velocity of oil being pulled through the orifice **228** and various volumes per unit time being pulled through the orifice **228**. In the embodiment depicted, the channel **194** is a pressurized system which allows oil to be pulled through the channel **194** and limits oil from backing up in the oil drain line **190**. This is important when the vehicle **10** is in positions of high angularity where a gravity turbo drain system would be backed up and oil would not be able to drain from the turbocharger **110**. It is understood that the channel **194** may be formed to fluidly connect with the auxiliary opening **226** of either the first oil pickup member **186** (see FIG. **29**) or the second oil pickup member **187** (see FIG. **24**).

(60) Referring to FIG. **26**, a drain channel **229** may be formed through the wall **208** which connects the staging reservoir **204** and the delivery reservoir **206**, the drain channel **229** also extending down through the pan bottom **200**. This allows for a single access point when changing the oil of the powertrain assembly **100**. As is further depicted in FIG. **26**, the channel **194** for the turbo drain line connector **192** extends through the wall **208**.

(61) Referring to embodiments in which the channel **194** drains directly into one of the reservoirs **204**, **206**, in order to reduce clogging or backup of oil in the oil drain line **190** and channel **194** of the drain line connector **192**, the oil pickup member **186** is positioned proximate the opening to the channel **194** at the staging reservoir **204** of the oil pan **182** (see FIGS. **30-31**). The oil pickup member **186** is in fluid communication with the oil pump **184**. Because the opening of the pickup member **186** which receives oil from the staging reservoir **204** is positioned proximate the opening to the channel **194** of the drain line connector **192**, a low pressure zone is created in the reservoir **204** which causes oil to be pulled from the channel **194** and into the reservoir **204**, from the staging reservoir **204** into the oil pickup member **186**, and up into the oil pump **184**. This keeps the opening of the channel **194** clear (or maintains movement of oil through the channel **194**) and reduces the occurrence of oil backups or clogs from oil draining from the turbocharger **110**.

(62) Once the oil from the staging reservoir **204** is picked up, the oil can be recirculated into the engine **102** (e.g., via the deaerator **188**). The oil pickup member **186** can be integral with the oil pan **182** or can be a separate member that is coupled to the oil pan **182**. For example, is some embodiments, the oil pickup members **186**, **187** are formed from a stable polymer that is coupled to the oil pan **182** (e.g., via bolts).

(63) Referring now to FIGS. **32-33**, a water injection system **250** is provided with the powertrain assembly **100**. More specifically, the water injection system **250** is operable to cool the air intake tract, e.g., the air intake inlet **162**. The water injection system **250** includes an injector **252**, a water reservoir **254**, a pump **256**, and a controller **258**. The water injection system **250** cools the air intake **162** fluidically prior to a throttle blade **260** of the throttle body **130** (see FIG. **11**). In some embodiments, the water injection system **250** interfaces with the air intake **162** (e.g., the injection **252** is positioned with the air intake **162**) at a distance of about 5 inches or less from the throttle blade **252** (e.g., 3-4 inches pre-throttle blade). The injector **252** is mounted to the air intake **162** at about a 90 degree angle such that that injector **252** is substantially perpendicular to the flow of air through the air intake **162**. The injector **252** is optimized to atomize the water to provide increased surface area for cooling the air intake **162**.

(64) By cooling the air prior to the throttle blade **260**, only one interface with the air intake inlet **162** is required as the cooled air is distributed to each of the cylinders while allowing the throttle blade **260** to remain close to the cylinders to provide a responsive engagement. The lower intake air temperatures increase the octane rating of the fuel and help sustain the target horsepower. The water injection system **250** is operable to remove heat from the air to provide about a 10-15 degree Celsius temperature drop. The water injection system **250** may be mounted on the frame **16** of the vehicle **10** (e.g., an off road vehicle). The water injection system **250** is positioned on the CVT-side of the powertrain assembly **100**.

(65) The water cooling system **250** may be activated in various conditions. For example, the controller **258** may activate based on sensed conditions such as certain operating temperature, increased power demands, and so forth. For example, when the vehicle **10** is being operated in wide open throttle, a predetermined boost threshold is met, the water cooling system **250** is activated and water is pumped through to the injector **252** intake and the water contacting the air intake **162** is operable to remove heat from the air (10-15° C. of temperature drop) flowing into the engine **102**. The water is operable to add a high octane level and changes the knock propensity. That decreases the occurrence of the engine **102** de-rating and allows the engine **102** to continue to make power. In some embodiment, the water injection system **250** is operable to initialize in de-rate conditions. This allows the powertrain assembly **100** to maintain higher levels of performance in high temperature internal engine conditions.

(66) In some embodiments, the water injection system **250** and the CVT **104** may be at least partially integrated. For example, controller **258** may be operable to control the operation of the water injection system **250** and operation of the CVT **104**. Furthermore, the CVT and the water injection system **250** may be fluidically coupled to the water reservoir **254** (e.g., a common reservoir).

(67) While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this 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.

Claims

1. A utility vehicle, comprising: a forward portion of the vehicle, a rearward portion of the vehicle, and a longitudinal direction of the vehicle extending between the forward portion and the rearward portion; a plurality of ground-engaging members; a frame supported by the ground-engaging members, the frame including a cab frame; an operator area and a cargo area supported by the frame, wherein the cargo area is rearward of the operator area in the longitudinal direction of the vehicle and vertically lower than an upper portion of the cab frame, the cargo area including at least a first upstanding wall and a second upstanding wall positioned laterally opposite each other forming a partially enclosed compartment with a floor extending between the first and the second upstanding walls; and a powertrain assembly supported by the frame and including: an engine supported by the frame, the engine including an exhaust side, the engine being positioned rearward of the operator area in the longitudinal direction of the vehicle; a turbocharger operably coupled to the engine, the turbocharger having a turbine housing supporting a turbine and a compressor housing supporting a compressor, the turbocharger being positioned on the exhaust side of the engine and rearward of the engine in the longitudinal direction of the vehicle, a space between the turbocharger and the engine being less than 9 inches; wherein the powertrain assembly includes a muffler coupled to the engine via an exhaust conduit, the exhaust conduit being less than two feet; and wherein the exhaust conduit is positioned fluidically between the engine and the muffler, and wherein the frame defines a frame envelope, the turbocharger being positioned within the frame envelope and the exhaust conduit extending at least partially outside of the frame envelope.
2. The utility vehicle of claim 1, wherein the powertrain assembly further comprises a transmission operably coupled to the engine, wherein the turbocharger is positioned vertically higher than the transmission.
3. The utility vehicle of claim 1, wherein the powertrain assembly further includes a continuously variable transmission (CVT) operably coupled to the engine, the turbocharger being positioned laterally adjacent in a lateral direction to the CVT.
4. The utility vehicle of claim 3, wherein the turbocharger is outside an envelope defined by the CVT.
5. The utility vehicle of claim 1, wherein the powertrain assembly further includes an intercooler, the intercooler being positioned laterally adjacent in a lateral direction to the turbocharger.
6. The utility vehicle of claim 5, wherein the powertrain assembly further includes an air intake and an air filter fluidically coupled to the engine via the turbocharger, the air filter being positioned on a non-exhaust side of the engine.
7. The utility vehicle of claim 6, wherein a portion of the intercooler includes an intercooler air intake and an air exhaust, the air exhaust being positioned longitudinally forward of the turbocharger.
8. The utility vehicle of claim 7, wherein the powertrain assembly further includes an engine intake manifold operably coupled to the engine, and wherein the air exhaust of the intercooler is laterally adjacent in a lateral direction to at least a portion of the engine intake manifold.
9. The utility vehicle of claim 1, further comprising a steering assembly including a steering wheel, wherein the plurality of ground engaging members includes a plurality of front wheels, and wherein the steering assembly is configured to steer the plurality of front wheels.
10. The utility vehicle of claim 1, wherein the space between the turbocharger and the engine is greater than one inch.
11. The utility vehicle of claim 1, wherein an exhaust conduit is greater than one inch.
12. The utility vehicle of claim 1, further comprising a suspension system including a trailing arm hingedly coupled to the frame.
13. The utility vehicle of claim 12, wherein rear ground engaging members of the plurality of ground engaging members are coupled to the trailing arm.