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Lubrication system for portable pipe threader

Abstract

A portable pipe threader includes a housing, a carriage, and at least one pipe threading tool. A drive assembly of the is at least partially positioned within the housing and includes an electric motor operable to provide torque to the pipe. A lubrication system is removably coupled to the housing and includes a reservoir for holding a lubricant and a pump powered by the drive assembly. A stand of the portable pipe threader is adjustable between collapsed and deployed states. When collapsed, a longitudinal axis of the housing is maintained at a first oblique angle relative to a horizontal reference plane parallel with a work surface upon which the stand is supported to funnel lubricant toward the reservoir. When deployed, the longitudinal axis is maintained at a second oblique angle to funnel lubricant away from an end of the pipe on which a working operation is performed.

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References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
1527185	12/1924	Hall	N/A	N/A
1672583	12/1927	Travers	210/801	B01D 17/0211
1831957	12/1930	Harrison	N/A	N/A
1956182	12/1933	Thewes	N/A	N/A
1966124	12/1933	Kimlin et al.	N/A	N/A
1973231	12/1933	Thewes	N/A	N/A
2004639	12/1934	Thewes	N/A	N/A
2076831	12/1936	Thewes	N/A	N/A
2110099	12/1937	Thewes	N/A	N/A
2205148	12/1939	Mayotte	N/A	N/A
2219721	12/1939	Ingwer et al.	N/A	N/A
2242954	12/1940	Ingwer	N/A	N/A
2255009	12/1940	Ingwer	N/A	N/A
2304027	12/1941	Sellmeyer	N/A	N/A
2350313	12/1943	Ingwer et al.	N/A	N/A
2374176	12/1944	Cook	N/A	N/A
2393498	12/1945	Miller	210/538	B01D 21/00
2581702	12/1951	Quijada	N/A	N/A
2591389	12/1951	Wallace	N/A	N/A
2600776	12/1951	Ingwer	N/A	N/A
2678453	12/1953	Rudolph	N/A	N/A
2680256	12/1953	Ingwer et al.	N/A	N/A
2680861	12/1953	Ingwer et al.	N/A	N/A
2693966	12/1953	Chasar	N/A	N/A
2745670	12/1955	Janik	N/A	N/A
2753575	12/1955	Ingwer	N/A	N/A

2768550	12/1955	Ingwer et al.	N/A	N/A
2778652	12/1956	Ingwer et al.	N/A	N/A
2891799	12/1958	Janik	N/A	N/A
2916749	12/1958	Ingwer et al.	N/A	N/A
2996737	12/1960	Bjalme	N/A	N/A
3002205	12/1960	Buyer	N/A	N/A
3009178	12/1960	Buyer	N/A	N/A
3012792	12/1960	Bjalme	N/A	N/A
3049737	12/1961	Weibel	N/A	N/A
3082445	12/1962	Buyer	N/A	N/A
3095772	12/1962	Ingwer	N/A	N/A
3188666	12/1964	Brown, Sr. et al.	N/A	N/A
3232629	12/1965	Obear	N/A	N/A
3270592	12/1965	Behnke	N/A	N/A
3316571	12/1966	Cutrone	N/A	N/A
3371258	12/1967	Brown	N/A	N/A
3398966	12/1967	Chalfant et al.	N/A	N/A
3413667	12/1967	Behnke	N/A	N/A
3427672	12/1968	Frank	N/A	N/A
3456956	12/1968	Herbkersman	N/A	N/A
3521313	12/1969	Baker	N/A	N/A
3526411	12/1969	Chalfant et al.	N/A	N/A
3562827	12/1970	Janik	N/A	N/A
3610640	12/1970	Bollin et al.	N/A	N/A
3631552	12/1971	Ivester	470/901	B23B 5/165
3811145	12/1973	Fink	N/A	N/A
3864774	12/1974	Fohl	N/A	N/A
3995869	12/1975	Mazingue	N/A	N/A
4002960	12/1976	Brookfield et al.	N/A	N/A
4209274	12/1979	Martin et al.	N/A	N/A
4213722	12/1979	Wagner	N/A	N/A
4225273	12/1979	Womack	N/A	N/A
4247124	12/1980	Wagner	N/A	N/A
4275490	12/1980	Bivins	N/A	N/A
4276490	12/1980	Saldinger	N/A	N/A
4279182	12/1980	Miyagawa et al.	N/A	N/A
4338556	12/1981	Hetzel	N/A	N/A
4370770	12/1982	Wagner	N/A	N/A
4402423	12/1982	Skowronski et al.	N/A	N/A
4581783	12/1985	Hayes et al.	N/A	N/A
4606249	12/1985	Hayes et al.	N/A	N/A
4613260	12/1985	Hayes et al.	N/A	N/A
4692071	12/1986	Hirota	N/A	N/A
4752163	12/1987	Fedor	N/A	N/A
4757598	12/1987	Redman	N/A	N/A
4787531	12/1987	Gress	N/A	N/A
D299466	12/1988	Hayes et al.	N/A	N/A
4795175	12/1988	Babb et al.	N/A	N/A
4808047	12/1988	Calevich et al.	N/A	N/A
4811639	12/1988	Gress et al.	N/A	N/A

4819527	12/1988	Redman	N/A	N/A
5002440	12/1990	Tamaoki et al.	N/A	N/A
5074176	12/1990	Redman et al.	N/A	N/A
5076744	12/1990	Kitagawa et al.	N/A	N/A
5087013	12/1991	Gress et al.	N/A	N/A
5104268	12/1991	Kitagawa et al.	N/A	N/A
5158404	12/1991	Samas et al.	N/A	N/A
5199928	12/1992	Gress et al.	N/A	N/A
5458770	12/1994	Fentz	210/171	B01D 17/0211
5560582	12/1995	Beelen	N/A	N/A
5700140	12/1996	Gray et al.	N/A	N/A
5826469	12/1997	Haradem	N/A	N/A
5890852	12/1998	Gress	N/A	N/A
6439087	12/2001	Haas	N/A	N/A
6471220	12/2001	Babb	N/A	N/A
7854321	12/2009	Twig	206/483	B25H 3/023
7958805	12/2010	Rigolone et al.	N/A	N/A
8047923	12/2010	Emerson	N/A	N/A
9095917	12/2014	Patil et al.	N/A	N/A
9138818	12/2014	Kundracik et al.	N/A	N/A
9370835	12/2015	Kundracik et al.	N/A	N/A
9796033	12/2016	Kundracik et al.	N/A	N/A
10016830	12/2017	Hamm et al.	N/A	N/A
10239140	12/2018	Kundracik et al.	N/A	N/A
10668548	12/2019	Kundracik et al.	N/A	N/A
2003/0024357	12/2002	Hofmann et al.	N/A	N/A
2007/0137934	12/2006	Nappier et al.	N/A	N/A
2008/0210062	12/2007	Nitchman et al.	N/A	N/A
2008/0277335	12/2007	Allen	210/521	B01D 21/0003
2009/0248188	12/2008	Haas et al.	N/A	N/A
2011/0217196	12/2010	Gang	N/A	N/A
2013/0055862	12/2012	Kundracik	82/113	B23G 1/24
2015/0165534	12/2014	Hamm	N/A	N/A
2017/0100791	12/2016	Hamm et al.	N/A	N/A
2017/0259357	12/2016	Choi	N/A	N/A
2018/0147713	12/2017	Schmauder et al.	N/A	N/A
2019/0006980	12/2018	Sheeks et al.	N/A	N/A
2019/0044110	12/2018	Sheeks et al.	N/A	N/A
2019/0143430	12/2018	Kundracik et al.	N/A	N/A
2021/0129228	12/2020	Pechstein et al.	N/A	N/A
2021/0229200	12/2020	Pechstein et al.	N/A	N/A
2022/0314351	12/2021	Pechstein	N/A	B23G 1/24

FOREIGN PATENT DOCUMENTS

Patent No.	**Application Date**	**Country**	**CPC**
101704141	12/2009	CN	N/A
101758305	12/2009	CN	N/A
102513618	12/2013	CN	N/A
204035722	12/2013	CN	N/A
104942382	12/2014	CN	N/A

204770999	12/2014	CN	N/A
105171145	12/2014	CN	N/A
104588792	12/2016	CN	N/A
206084041	12/2016	CN	N/A
107378015	12/2016	CN	N/A
107511539	12/2016	CN	N/A
208067512	12/2017	CN	N/A
109773283	12/2018	CN	N/A
209094723	12/2018	CN	N/A
206509598	12/2018	CN	N/A
109226911	12/2019	CN	N/A
1527169	12/1968	DE	N/A
1527175	12/1969	DE	N/A
20016924	12/1999	DE	N/A
0249184	12/1992	EP	N/A
0569320	12/1992	EP	N/A
1524058	12/2004	EP	N/A
1907172	12/2014	EP	N/A
2605879	12/2018	EP	N/A
3584027	12/2019	EP	N/A
2005161515	12/2004	JP	N/A
2019048371	12/2018	JP	N/A
2010018409	12/2009	WO	N/A
2019006452	12/2018	WO	N/A

OTHER PUBLICATIONS

Ridgid Tools, “Model 535A Automatic Threading Machine,” <https://www.ridgid.com/us/en/535a-automatic-threading-machine> web page publicly available at least as early as Nov. 1, 2020. cited by applicant
Teledyne Oster, “Power Threaders,” Catalog No. 77, Copyright 1976 (28 pages). cited by applicant
Wheeler Mfg., “Universal Dies/Die Heads are suited for in-place threading,” <https://news.thomasnet.com/fullstory/universal-dies-die-heads-are-suited-for-in-place-threading-29007> press release dated Dec. 12, 2003. cited by applicant
International Search Report and Written Opinion for Application No. PCT/US2022/022805 dated Jul. 22, 2022 (10 pages). cited by applicant

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation-in-part of co-pending U.S. patent application Ser. No. 17/710,108 filed on Mar. 31, 2022, which claims priority to U.S. Provisional Patent Application No. 63/218,653 filed on Jul. 6, 2021, and U.S. Provisional Patent Application No. 63/168,741 filed on Mar. 31, 2021, the entire contents of all of which are incorporated herein by reference.

FIELD OF THE INVENTION

(1) The present invention relates to pipe threaders, and more particularly to lubrication systems for portable pipe threaders.

BACKGROUND OF THE INVENTION

(2) Portable pipe threaders include a stand and a carriage mounted to the stand having multiple pipe threading tools. These tools are usually a die holder including a die, a pipe cutter, and a pipe reamer. Typically, a motor transmits torque to a chuck. A pipe is clamped within the chuck and as the motor rotates the chuck, the pipe rotates with respect to the tools. The motor is an AC motor that receives power from a remote power source (e.g., via a power cord) and is usually controlled using a pedal, which upon actuation, triggers the motor to begin rotating the chuck and the pipe therein to cut the pipe, thread the pipe, etc. During threading operations, the thread-cutting dies, or other pipe threading tools, require lubrication to minimize friction and prevent excessive heat on the pipe and the tool. Some portable pipe threaders have an onboard lubrication system to lubricate the dies as the threads are being cut on the pipe, while others rely upon the operator to manually lubricate the dies with a hand-operated pump.

SUMMARY OF THE INVENTION

(3) The present invention provides, in one aspect, a portable pipe threader including a housing, a carriage supported by the housing, and at least one pipe threading tool coupled to the carriage and selectively operable to perform work on a pipe. A drive assembly of the portable pipe threader is at least partially positioned within the housing, the drive assembly including an electric motor operable to provide torque to the pipe. A lubrication system of the pipe threader is removably coupled to the housing, the lubrication system including a reservoir for holding a lubricant and a pump powered by the drive assembly. A stand of the portable pipe threader is adjustable between a collapsed state and a deployed state. In the collapsed state, a longitudinal axis of the housing is maintained at a first oblique angle relative to a horizontal reference plane parallel with a work surface upon which the stand is supported to funnel lubricant toward the reservoir. In the deployed state, the longitudinal axis of the housing is maintained at a second oblique angle relative to the horizontal reference plane parallel with the work surface upon which the stand is supported to funnel lubricant away from an end of the pipe on which a working operation is performed.

(4) The present invention provides, in another aspect, a portable pipe threader including a housing, a carriage supported by the housing, and at least one pipe threading tool coupled to the carriage and selectively operable to perform work on a pipe. A drive assembly is at least partially positioned within the housing, the drive assembly including an electric motor operable to provide torque to the pipe. A lubrication system includes a catch basin provided on one side of the housing, a reservoir for holding a lubricant, a debris shield positioned to shield the reservoir from debris, a drip catch having one or more pockets that open toward the debris shield, and a pump powered by the drive assembly to establish a flow of lubricant from the reservoir. A stand is adjustable between a collapsed state and a deployed state. With the stand in the collapsed state, the portable pipe threader can be put in a vertically stowed configuration in which a longitudinal axis of the housing is substantially vertical with respect to a floor or ground surface. In the vertically stowed configuration, the debris shield is oriented substantially vertically above the drip catch so that the drip catch pockets can catch and retain lubricant dripped from a proximal edge of the debris shield.

(5) The present invention provides, in yet another aspect, a portable pipe threader including a housing, a carriage supported by the housing, and at least one pipe threading tool coupled to the carriage and selectively operable to perform work on a pipe. A drive assembly is at least partially positioned within the housing, the drive assembly including an electric motor operable to provide torque to the pipe. A lubrication system includes a catch basin provided on one side of the housing, a reservoir for holding a lubricant, a return port provided in the catch basin for passing lubricant into the reservoir, and a pump powered by the drive assembly to establish a flow of lubricant from

the reservoir. A first baffle wall extends upwardly from a bottom wall of the reservoir, and a downwardly-depending second baffle wall extends from a bottom side of the catch basin at a position between the first baffle wall and the return port. The first and second baffle walls overlap vertically such that lubricant passing from the return port to an intake of the pump must pass below the second baffle wall and change directions, vertically upward along the first baffle wall in order to pass the first baffle wall, thereby forming a particle collection zone at the bottom of the first baffle wall.
(6) Other features and aspects of the invention will become apparent by consideration of the following detailed description and accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a perspective view of a portable pipe threader in accordance with an embodiment of the invention.
(2) FIG. **2** is a perspective view of an embodiment of a lubrication system for use with the portable pipe threader of FIG. **1**.
(3) FIG. **3**A is a cross-sectional view of a pump assembly for use with the lubrication system of FIG. **2**.
(4) FIG. **3**B is a side view of a pump assembly for use with the lubrication system of FIG. **2** in accordance with another embodiment of the invention.
(5) FIG. **4** is an exploded view of the lubrication system of FIG. **2**.
(6) FIG. **5** is a perspective, partial cutaway view of another embodiment of a lubrication system for use with the portable pipe threader of FIG. **1**.
(7) FIG. **6** is a perspective view of a portion of the lubrication system of FIG. **5**.
(8) FIG. **7** is a perspective view of a portion of the lubrication system of FIG. **5**.
(9) FIG. **8** is a cross-sectional view of a sealing mechanism for use with the lubrication system of FIGS. **5-7**.
(10) FIG. **9** is a side view of the portable pipe threader of FIG. **1** with a stand in a collapsed state.
(11) FIG. **10** is a side view of the stand of FIG. **9** in a deployed state.
(12) FIG. **11** is a perspective view of a lubrication system in accordance with another embodiment of the invention.
(13) FIG. **12** is a cross-section of a portion of the lubrication system taken along line **12-12** of FIG. **11**.
(14) FIG. **13** is a cross-section of a portion of the lubrication system taken along line **13-13** of FIG. **12**.
(15) FIG. **14** is a perspective view of a drip catch of the lubrication system of FIGS. **11-13**.
(16) FIG. **15** is a cross-section of the lubrication system taken along line **13-13** of
(17) FIG. **12**.
(18) Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.
DETAILED DESCRIPTION
(19) With reference to FIG. **1**, a portable pipe threader **10** includes a stand **100** and a main housing **51** supported on the stand **100**, and a carriage **42** supported on the main housing **51** having a plurality of pipe threading tools **46**, **50**, **54** supported by the carriage **42**. The pipe further includes a

drive assembly **18** housed within the main housing **51** and mounted to the stand **100** having a motor **22** (e.g., a brushless direct current electric motor), a gear box **26** coupled to the motor **22** having an output gear (not shown), an electronic speed selection switch, such as a pedal **30**, that selectively controls the drive assembly **18**, and a plurality of guide rails **45** configured to support the carriage **42**. The drive assembly **18** is powered by a battery pack **38** supported by the stand **100** in selective electrical communication with the motor **22** to provide electrical power to the motor **22**. In some constructions, the battery pack **38** and the motor **22** can be configured as an **18** Volt high power battery pack and motor, such as the 18 Volt high power system disclosed in U.S. patent application Ser. No. 16/045,513 filed on Jul. 25, 2018 (now U.S. Patent Application Publication No. 2019/0044110), the entirety of which is incorporated herein by reference. In other constructions, the battery pack **38** and the motor **22** can be configured as an 80 Volt high power battery pack and motor, such as the 80 Volt battery pack and motor disclosed in U.S. patent application Ser. No. 16/025,491 filed on Jul. 2, 2018 (now U.S. Patent Application Publication No. 2019/0006980), the entirety of which is incorporated herein by reference. In such a battery pack **38**, the battery cells within the battery pack **38** have a nominal voltage of up to about 80 V. Further, in another embodiment, the battery cells within the battery pack **38** have a nominal voltage of up to about 120 V. In some embodiments, the battery pack **38** has a weight of up to about 6 lb. In some embodiments, each of the battery cells has a diameter of up to 21 mm and a length of up to about 71 mm. In some embodiments, the battery cells within the battery pack **38** are cylindrical battery cells, prismatic battery cells, pouch battery cells, or a combination thereof. In some embodiments, the battery pack **38** includes up to twenty battery cells. In other embodiments, the battery pack **38** includes up to thirty battery cells, up to forty battery cells, up to forty-five battery cells, or greater. In some embodiments, the battery cells are disposed in a single pack. In other embodiments, the battery cells are disposed in multiple packs, i.e., two packs, three packs, four packs, etc. In some embodiments, the battery cells are connected in series. In some embodiments, the battery cells are operable to output a sustained operating discharge current of between about 20 A and about 140 A, for example, about 40 A and about 60 A. In some embodiments, each of the battery cells has a capacity of between about 1.7 Ah and about 15.0 Ah. And, in some embodiments of the motor **22** when used with the 80 Volt battery pack **38**, the motor **22** has a power output of at least about 2760 W and a nominal outer diameter (measured at the stator) of up to about 80 mm, up to about 100 mm, up to about 120 mm, up to about 140 mm, or greater.

(20) With reference to FIG. **1**, the drive assembly **18** further includes a drive element **34** (e.g., a drive tube) coupled to the gear box **26** and powered by the motor **22**. The motor **22** is configured to supply torque to the output gear of the gear box **26** and rotatably drive the drive element **34** to rotate a pipe (not shown) or a selected one of the plurality of pipe threading tools. The pedal **30** is operable to activate the motor **22** and control a relative speed at which the pipe rotates. In other embodiments, the relative speed at which the pipe rotates can be selected using an electronic speed selection switch other than the pedal **30** (e.g., dial, keypad, button, etc.; not shown).

(21) With continued reference to FIG. **1**, the portable pipe threader **10** further includes a spindle **60** in which the pipe is clamped. The drive element **34** interconnects the spindle **60** and the output gear of the gear box **26**. Thus, torque from the motor **22** is transferred to the spindle **60**, causing it and the pipe to rotate, via the gear box **26** and the drive element **34**. With reference to FIG. **1**, the plurality of pipe threading tools **46**, **50**, **54** includes a die holder **46** having a plurality of dies (not shown) to cut threads on the pipe, a pipe cutter **50** to trim excess pipe, and a pipe reamer **54** to deburr, or otherwise smooth, an inner edge of a cut end of a pipe. The plurality of pipe threading tools **46**, **50**, **54** remain stationary on the carriage **42** while the pipe is rotated by the spindle **60**. The portable pipe threader **10** also includes a lubrication system **200** (FIG. **2**) configured to provide lubricant to the pipe during a threading operation using the die holder **46** and a particular die (not shown) installed therein.

(22) With continued reference to FIG. **1**, the stand **100** includes an upright portion **168** configured

to support the threader **10** and a stand locking mechanism **120** for selectively locking the stand **100** in a deployed state (FIG. **1**) and a collapsed state (FIG. **9**). The stand **100** further includes a plurality of first and second support legs **110**, **160** pivotably coupled via rotatable joints **170** (e.g., bolts, screws, etc.), an axle **165** pivotably coupled to the second support legs **160** having a plurality of wheels **130**, a plurality of list-assist springs **125** for aiding the stand **100** from moving from the collapsed state to the deployed state, and a handle assembly **135** integrated with the first support legs **110** having feet portions **140** to support the threader **10** in the deployed state where the threader **10** is elevated from a work surface **105** during use. The handle assembly **135** further includes grip portions **150** for the user to grasp the stand **100** during transport of the threader **10** and loading skis **155** coupled to the first support legs **110** for allowing the stand **100** to travel more easily over difficult surfaces when it is being transported (e.g., being pulled up stairs).

(23) FIG. **2** illustrates the lubrication system **200** for use with the threader **10**. The lubrication system **200** is removably couple to, or engaged with, the housing **51** of the threader **10**. As shown, the system **200** includes a catch basin **210** having a shroud **215** for collecting the lubricant that is sprayed from the pipe as it is undergoing work from one of the pipe threading tools **46**, **50**, **54**, a plurality of brackets **220** for selectively mounting the system **200** to the guide rails **44**, and a debris shield **235** (FIG. **1**) for allowing lubricant to pass into the basin **210** while preventing larger debris (i.e., metal chips) from passing through. As shown in FIG. **4**, the catch basin **210** includes one or more raised ledges **212** for supporting a first edge of the debris shield **235**. The raised ledges **212** are provided on a first or proximal end of the catch basin **210** that is positioned adjacent the housing **51** and the drive assembly **18**. An opposite end of the catch basin **210** includes one or more lubricant openings to pass lubricant into a reservoir **240** positioned underneath the basin **210** for collecting lubricant. The lubrication system **200** further includes a pump assembly **300** mounted to the basin **210** via a mounting aperture **305** in one of the brackets **220** (FIG. **4**), a drain **245** having a drain cap **250** positioned at lower portion of the reservoir **240**, and a seal **260** positioned between the basin **210** and the reservoir **240** to seal the basin **210** and the reservoir **240** to prevent leakage. During use of the system **200**, the basin **210** is configured to be slightly inclined downward along the guide rails **44** and away from the main housing **51** in order to direct the lubricant away from the pipe and into the reservoir **240**.

(24) With reference to FIGS. **2-4**, the pump assembly **300** includes a pump housing **310**, a pump drive shaft **320** extending from the housing **310**, a positioning spring **325** surrounding the drive shaft **320** for guiding the alignment of the shaft **320**, a plurality of bearings **330** for supporting the drive shaft **320**, and a plurality of bearing cups **335** for housing each of the respective bearings **330**. The pump assembly **300** further includes a lip seal **350** positioned between the drive shaft **320** and the housing **310** for sealing the drive shaft **320** with respect to the pump housing **310**, a pump intake **355** for drawing lubricant from the reservoir **240**, a pump outlet **345** (FIG. **2**) for fluidly coupling a hand-held oiling system or an onboard oiling system integrated with the pipe threader **10**, and a fastener **340** for limiting the travel freedom of the housing **310** to the basin **210** (via the bracket **220**).

(25) When the lubrication system **200** is mounted to the guide rails **44**, the positioning spring **325** is configured to facilitate the alignment of the pump drive shaft **320** with a gearbox output **27** for rotatably driving the pump **315**. The gearbox output **27** is configured to be selectively rotatably driven by the gearbox **26** in order to let the user cycle between powering just the pump assembly **300**, just the threader **10**, or both the pump assembly **300** and the threader **10** simultaneously. To further aid in the alignment of the drive shaft **320** with the gearbox output **27**, the positioning spring **325** allows the assembly **300** to rotate in any direction within the mounting aperture **305**. Furthermore, sufficient clearance exists (e.g., 2 mm) between the mounting aperture **305** and the bearing cup **335** to permit the pump housing **310** to translate in one or more directions relative to the bracket **220** to easily pilot the drive shaft **320** into the gearbox output **27**.

(26) FIG. **3**B illustrates a flexible guide shaft **323** that can replace the rigid drive shaft **320** in some

embodiments of the pump assembly **300**. The flexible drive shaft **323** is configured to ensure proper alignment with the gearbox output **27** when the system **300** is mounted to the guide rails **44**. Additionally, the flexible drive shaft **323** can reduce the stresses that could be transmitted from the shaft **323** to the pump assembly **300** due to poor alignment with the gearbox output **27**. The flexible drive shaft **323** is formed from a wire wound into a helix and this configuration allows the flexible drive shaft **323** to be bendable in all directions, as indicated by arrows **326***a*, **326***b* relative to a center axis **324** of the flexible drive shaft **323** in its relaxed, straight configuration. For example, the free end **323***a* of the flexible drive shaft **323** is bendable up to and including ninety degrees (90°) relative to the fixed end **323***b* of the flexible drive shaft **323** in any direction from the center axis **324**.

(27) With continued reference to FIGS. **2-4**, the lubrication system **200** is configured to be completely modular, meaning that the entire system **200** is selectively mountable to the guide rails **44** such that when the system **200** is removed, the system **200** becomes a closed system, effectively sealing off both the pump assembly **300** and the gearbox output **27**, thereby preventing any oil leak paths from the system **200** or to the gear box **26**. Since the system **200** is removable, this gives the user the option to remove the system **200** when the application of lubricant to the pipe is unnecessary. Also, this allows the user to selectively reduce the weight of the threader **10** during transport or when the user is adjusting the threader **10** between the collapsed and deployed states. Additionally, the lubrication system **200** is only operable while the system **200** is mounted to the threader **10** and the drive shaft **320** receives torque from the gearbox output **27**, which reduces unnecessary wear on the pump **315** and the gearbox **26**.

(28) FIGS. **5-8** illustrate a lubrication system **400** for use with another embodiment of the threader **10**. The lubrication system **400** is configured as an integrated system being partially housed within the housing **51** of the threader **10**. The system **400** includes a basin **410** having a plurality of mounting brackets **430** for mounting the basin **410** to the guide rails **44**, a shroud portion **415** movable relative to the basin **410** along guide grooves **412** for collecting the lubricant that is sprayed from the pipe as it is undergoing work from one of the pipe threading tools **46**, **50**, **54**, and a debris shield **435** (FIG. **6**) for collecting larger debris (i.e., metal chips) and preventing such debris from flowing into a drain **440** located at a lower portion of the basin **410**.

(29) The lubrication system **400** further includes a valve assembly **500** for fluidly coupling the drain **440** to a reservoir **420** housed within the housing **51** of the threader **10**. The valve assembly **500** is also configured to seal the reservoir **420** when the reservoir **420** is removed, or otherwise disengaged, from the basin **410** and removed from the threader **10**. The valve assembly **500** includes a housing **503**, a valve **510** located within the housing **503**, a compression spring **515** for biasing the valve **510** toward a seat defining an inlet **504** to the reservoir **420**, and a tube **445** extending into the reservoir **420** for depositing the lubricant flowing from the basin **410** into the reservoir **420**. To couple the basin **410** to the reservoir **420**, the user mounts the basin **410** onto the guide rails **44** and inserts the drain **440** into the inlet **504**, which biases the valve **510** rearward against the bias of the spring **515**, thereby allowing lubricant to flow freely between the basin **410** and the reservoir **420**. If the user wishes to empty the reservoir **420**, the reservoir **420** has an end cap **422** that can be removed to drain the lubricant.

(30) FIG. **9** illustrates an embodiment of the threader **10** using the integrated lubrication system **400** in the collapsed state where the stand **100** and threader **10** are oriented adjacent the work surface **105**. In this state, the threader **10** is supported on the stand **100** via a plurality of brackets **107** (FIG. **10**) located on the upright **168** configured to incline the main housing **51** slightly rearward along a spindle axis **600** at a first oblique angle Al with respect to a reference plane P**1**, with the pipe threading tools **46**, **50**, **54** being at a higher elevation than the spindle **60**, to promote drainage of the lubricant from the basin **410** into the reservoir **420**. In some embodiments, the first oblique angle Al is between, and including one to two degrees (1°-2°) above a horizontal line. Alternatively, in the deployed state (FIG. **10**), the main housing **51** is angled slightly forward along

the spindle axis **600** at a second angle A**2** with respect to the reference plane P**1**, with the pipe threading tools **46**, **50**, **54** being at a lower elevation than the spindle **60**, to permit lubricant to flow away from the pipe as work is being performed—also preventing lubricant from collecting in and/or flowing through the pipe. In some embodiments, the second oblique angle A**2** is between, and including, one to two degrees (1°-2°) below the horizontal reference plane P**1**. Although the stand **100** providing the first and second angles A**1**, A**2** is illustrated with the integrated lubrication system **400**, it may also be incorporated with other lubrication systems disclosed herein, and variations thereof.

(31) FIGS. **11**-**15** illustrate another lubrication system **700** that is similar in most respects to the lubrication system **200** of FIGS. **1**, **2** and **4** in that it includes a catch basin **710** positioned directly over a lubricant reservoir **740**. The catch basin **710** includes a shroud **715** and a plurality of mounting brackets **720**. As with the lubrication system **200**, the reservoir **740** is positioned outside of the housing **51** of the threader **10**. A debris shield **735** is situated within the catch basin **710** and provided with small lubricant apertures such that the debris shield **735** passes lubricant from its upper side to its lower side and into the reservoir **740** while blocking or catching debris at the upper side to prevent its passage into the reservoir **740**. The lubrication system **700** further includes a drip catch **730** mounted in the catch basin **710** at the proximal end (i.e., the end extending along the housing **51**) of the catch basin **710**. As shown in FIG. **14**, the drip catch **730** includes one or more pockets or cups **733** that open toward the debris shield **735** and toward a center of the catch basin **710**. In other words, the drip catch pockets **733** are open in a horizontal direction when the pipe threader **10** is in either of the positions of FIGS. **1** and **9**.

(32) When the stand **100** is collapsed, the threader **10** can be stowed in a horizontal stowed position as shown in FIG. **9**, or alternately a vertically stowed position in which the grip portions **150** are positioned vertically above the wheels **130** (i.e., the threader **10** rotated counter-clockwise approximately **90** degrees from the orientation of FIG. **9**). The vertically stowed position can enable the user to prop the threader **10** up against a wall, for example. In the vertically stowed position, ends of the guide rails **44** may be in contact with the ground, while the handle assembly **135** with its grip portions **150** is vertically above. Thus, the debris shield **735** is also oriented substantially vertically, as opposed to its substantially horizontal operational position. In the vertically stowed position, following use of the threader **10** involving lubricant supply, remnant lubricant will flow along the debris shield **735** toward the proximal edge **737** of the debris shield **735**. The drip catch **730** is oriented such that the pockets **733** are open vertically upward in the vertically stowed position, and directly below the proximal edge **737**. As such, lubricant can drip from the debris shield **735** into the pockets **733** of the drip catch **730**. As long as the threader **10** remains in the vertically stowed position, the lubricant can be retained in the pockets **733** and prevented from spilling out of the catch basin **710**. In the illustrated embodiment, there are three pockets **733** in the drip catch **730**, and the three pockets **733** are arranged in a row along the proximal end of the catch basin **710**. The central pocket **733** is situated between the ledges **712** of the catch basin **710** that support the debris shield's proximal edge **737**. The two outboard pockets **733** extend outward from the respective ledges **712** to cover the remainder of the proximal edge **737** of the debris shield **735**. Thus, with the exception of the area occupied by the ledges **712**, the drip catch **730** covers the entire length of the proximal edge **737** for catching and retaining lubricant dripped from the debris shield **735**.

(33) As shown in FIGS. **12** and **13**, the drip catch **730** is coupled to the catch basin **710** with a plurality of fasteners **742** through a flange or mounting portion **745** of the drip catch **730**. As such, the mounting portion **745** includes a corresponding plurality of fastener holes **747** as shown in FIG. **14**. In the illustrated embodiment, there are four fasteners **742**—two of which are provided in a central or inboard portion of the drip catch **730** to engage with (e.g., thread into) the ledges **712**. As shown in FIG. **12**, each ledge **712** can have multiple adjacent steps or lands for supporting the debris shield **735** and the drip catch **730**. FIGS. **12** and **13** also illustrate a reduced-width portion or

cutout **752** along the mounting portion **745** to accommodate the pump intake **355**. In the normal use orientation, the debris shield **735** is held in the catch basin **710** by gravity, although horizontal positioning can be set by one or more registration tabs **756** of the debris shield **735** that engage the outside of the bracket(s) **720** at the distal side, opposite the proximal edge **737**. In order to maintain the operational position of the debris shield **735** in the catch basin **710** in a vertically stowed position, the drip catch **730** further includes a retainer tab **762**.

(34) The retainer tab **762** can be formed in a central part of the mounting portion **745**, as an extension projecting transverse to a primary elongation direction of the drip catch **730**. The retainer tab **762** can extend over the proximal edge **737** of the debris shield **735** such that the proximal edge **737** is sandwiched (with or without direct contact) between the one or more ledges **712** of the catch basin **710** and the retainer tab **762**. A small clearance (e.g., 3 mm or less) may be provided between the retainer tab **762** and the debris shield **735** to block the proximal edge **737** of the debris shield **735** from substantial movement away from the catch basin **710**. In other constructions, the retainer tab **762** can be elastically deflected by contact with the proximal edge **737** in the normal assembly condition. In any case, the retainer tab **762**, which may be the only retainer tab or one of a plurality, prevents the accidental disassembly of the debris shield **735** from the catch basin **710**. The retainer tab **762** also ensures that the proximal edge **737** remains in a position to drip lubricant directly into the pockets **733** in a vertically stowed position of the threader **10**.

(35) In the lubricant reservoir volume below the catch basin **710** and above a bottom wall **766** of the reservoir **740**, the lubrication system **700** includes one or more structures configured to change the lubricant flow direction and velocity in order to inhibit the passage of solid particles (e.g., dirt, metal, etc.) toward the pump intake **355**. In particular, FIG. **15** illustrates that the reservoir **740** includes a baffle wall **770** extending up from the bottom wall **766**. The baffle wall **770** can be integrally formed with the bottom wall **766** or separate and affixed thereto. The baffle wall **770** can extend across the entire reservoir **740**, between two opposite sidewalls so that lubricant returning to the reservoir **740** from a return port **774** of the catch basin **710** (e.g., with a filter **776**) must traverse over the baffle wall **770** to reach a terminal end of the pump intake **355**. The baffle wall **770** extends up to a height that is in some constructions at least **30** percent, or at least 40 percent of a distance between the bottom wall **766** and the bottom of the catch basin **710** at the location of the baffle wall **770**. In some constructions, the baffle wall **770** has a height of at least 15 mm, or at least 20 mm. In addition to the baffle wall **770** of the reservoir **740**, a downwardly depending second baffle wall **780** extends from the catch basin **710** at a position between the baffle wall **770** and the return port **774**. The second baffle wall **780** extends down to an extent that is below the upper terminal edge of the baffle wall **770** (e.g., at least 5 mm below, or at least 8 mm below). In other words, lubricant passing from the return port **774** to the pump intake **355** must pass below the second baffle wall **780** and change directions, vertically upward, in order to pass the baffle wall **770**. The baffle wall **770** and the second baffle wall **780** are also placed in relatively close proximity to each other so that lubricant flow velocity is accelerated on the passage between the walls **770**, **780**. A minimum gap between the walls **770**, **780** can be less than 12 mm, or less than 9 mm. Particles entrained with the lubricant have a higher mass and are carried by momentum into the baffle wall **770** rather than freely up and over toward the pump intake **355**. From there, these particles fall by gravity to the bottom of the baffle wall **770** on the side proximate the return port **774** and opposite the pump intake **355**, thus forming a particle collection zone **784**.

(36) Although the invention has been described in detail with reference to certain preferred embodiments, variations and modifications exist within the scope and spirit of one or more independent aspects of the invention as described.

(37) Various features of the invention are set forth in the following claims.

Claims

1. A portable pipe threader comprising: a housing; a carriage supported by the housing; at least one pipe threading tool coupled to the carriage and selectively operable to perform work on a pipe; a drive assembly at least partially positioned within the housing, the drive assembly including an electric motor operable to provide torque to rotate the pipe; and a lubrication system including: a catch basin provided on one side of the housing, a reservoir for holding a lubricant, a debris shield positioned to shield the reservoir from debris formed during the work on the pipe, a drip catch having one or more pockets that open toward the debris shield, and a pump powered by the drive assembly to establish a flow of lubricant from the reservoir; and a stand adjustable between a collapsed state and a deployed state, wherein, with the stand in the collapsed state, the portable pipe threader can be put in a vertically stowed configuration in which a longitudinal axis of the housing is substantially vertical with respect to a floor or ground surface, and wherein, in the vertically stowed configuration, the debris shield is oriented substantially vertically above the drip catch so that the one or more pockets of the drip catch can catch and retain lubricant dripped from a proximal edge of the debris shield.
2. The portable pipe threader of claim 1, further comprising: a battery pack configured to provide electrical power to the motor and/or to the lubrication system.
3. The portable pipe threader of claim 1, wherein the electric motor is a brushless direct current electric motor.
4. The portable pipe threader of claim 1, wherein the drip catch includes a reduced-width portion that accommodates an intake of the pump.
5. The portable pipe threader of claim 1, wherein the one or more pockets are a plurality of pockets in the drip catch.
6. The portable pipe threader of claim 1, wherein the drip catch is engaged with the debris shield to retain the debris shield with respect to the catch basin in the vertically stowed configuration.
7. The portable pipe threader of claim 1, wherein the drip catch is coupled to the catch basin with a plurality of fasteners that pass through a mounting portion of the drip catch.
8. The portable pipe threader of claim 7, wherein a retainer tab of the drip catch extends from the mounting portion to extend over the proximal edge of the debris shield such that the proximal edge is sandwiched between one or more ledges of the catch basin and the retainer tab.
9. The portable pipe threader of claim 8, wherein the retainer tab is provided centrally along the drip catch.
10. The portable pipe threader of claim 1, wherein the at least one pipe threading tool is a die holder having a particular die, wherein the work performed on the pipe by the at least one pipe threading tool comprises cutting threads into the pipe while the pipe is rotated by a spindle, and wherein the torque from the electric motor is transferred to the spindle.
11. The portable pipe threader of claim 10, further comprising: a pipe cutter to trim excess pipe; and a pipe reamer to deburr an inner edge of a cut end of the pipe.
12. A portable pipe threader comprising: a housing; a carriage supported by the housing; at least one pipe threading tool coupled to the carriage and selectively operable to perform work on a pipe; a drive assembly at least partially positioned within the housing, the drive assembly including an electric motor operable to provide torque to rotate the pipe; and a lubrication system including: a catch basin provided on one side of the housing, a reservoir for holding a lubricant, a return port provided in the catch basin for passing lubricant into the reservoir, and a pump powered by the drive assembly to establish a flow of lubricant from the reservoir, and the pump having an intake, wherein a first baffle wall extends upwardly from a bottom wall of the reservoir, and a second baffle wall extends vertically downward from a bottom side of the catch basin and the second baffle wall is disposed at a position between the first baffle wall and the return port, and wherein the first and second baffle walls overlap vertically such that lubricant passing from the return port to the intake of the pump must pass below the second baffle wall and change directions so as to

flow vertically upward along the first baffle wall in order to pass over the first baffle wall, thereby forming a particle collection zone at a bottom of the first baffle wall.

13. The portable pipe threader of claim 12, wherein the lubrication system includes: a debris shield positioned over the catch basin to prevent ingress of debris formed during the work on the pipe into the reservoir, a drip catch having one or more pockets that open toward the debris shield, and a stand adjustable between a collapsed state and a deployed state, wherein, with the stand in the collapsed state, the portable pipe threader can be put in a vertically stowed configuration in which a longitudinal axis of the housing is substantially vertical with respect to a floor or ground surface, and wherein, in the vertically stowed configuration, the debris shield is oriented substantially vertically above the drip catch so that the one or more pockets of the drip catch can catch and retain lubricant dripped from a proximal edge of the debris shield.

14. The portable pipe threader of claim 13, wherein the drip catch is engaged with the debris shield to retain the debris shield with respect to the catch basin in the vertically stowed configuration.

15. The portable pipe threader of claim 13, wherein the drip catch is coupled to the catch basin with a plurality of fasteners that pass through a mounting portion of the drip catch.

16. The portable pipe threader of claim 12, wherein the at least one pipe threading tool is a die holder having a particular die, wherein the work performed on the pipe by the at least one pipe threading tool comprises cutting threads into the pipe while the pipe is rotated by a spindle, and wherein the torque from the electric motor is transferred to the spindle.

17. The portable pipe threader of claim 16, further comprising: a pipe cutter to trim excess pipe; and a pipe reamer to deburr an inner edge of a cut end of the pipe.