



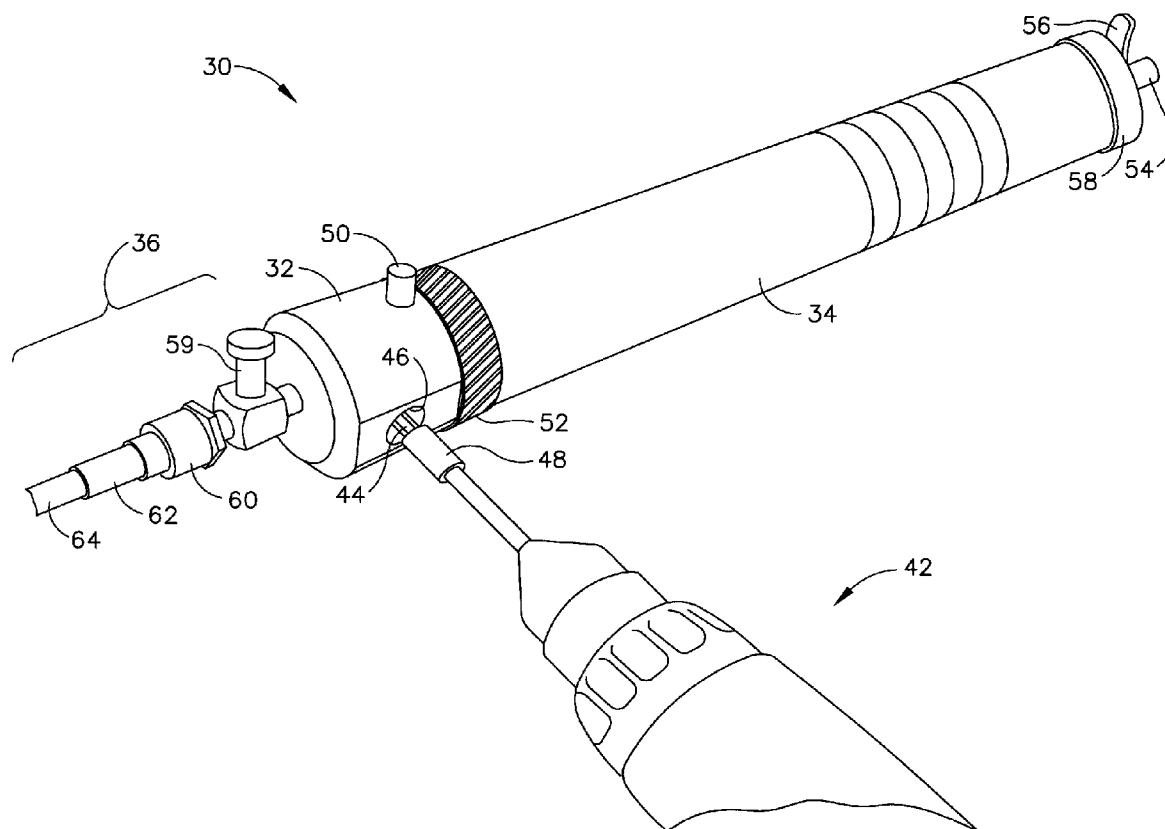
US 20060210409A1

(19) **United States**(12) **Patent Application Publication**
Sumner et al.(10) **Pub. No.: US 2006/0210409 A1**(43) **Pub. Date: Sep. 21, 2006**(54) **GREASE PUMP**(52) **U.S. CL.** 417/410.4; 417/440(76) Inventors: **William Paul Sumner**, Kingsport, TN
(US); **Don Keith Shinn**, Jonesborough,
TN (US)

Correspondence Address:

ALSTON & BIRD LLP**BANK OF AMERICA PLAZA****101 SOUTH TRYON STREET, SUITE 4000****CHARLOTTE, NC 28280-4000 (US)**(21) Appl. No.: **10/906,987**(22) Filed: **Mar. 15, 2005****Publication Classification**(51) **Int. Cl.**
F04B 17/00 (2006.01)(57) **ABSTRACT**

A grease pump including a gerotor pump. The grease pump includes a head, a source of grease, and a discharge conduit. The head has bores defining an inlet passage and an outlet passage, and additional bores in communication with the inlet passage that lead to an air vent valve and a grease fitting. The gerotor pump is disposed in the head and is caused to rotate by an external, separate rotary power tool. By design, the gerotor pump will stop pumping grease when air accumulates in the outlet passage, and air vent valves in fluid communication with the inlet passage and outlet passage may be used to relieve air from the device.



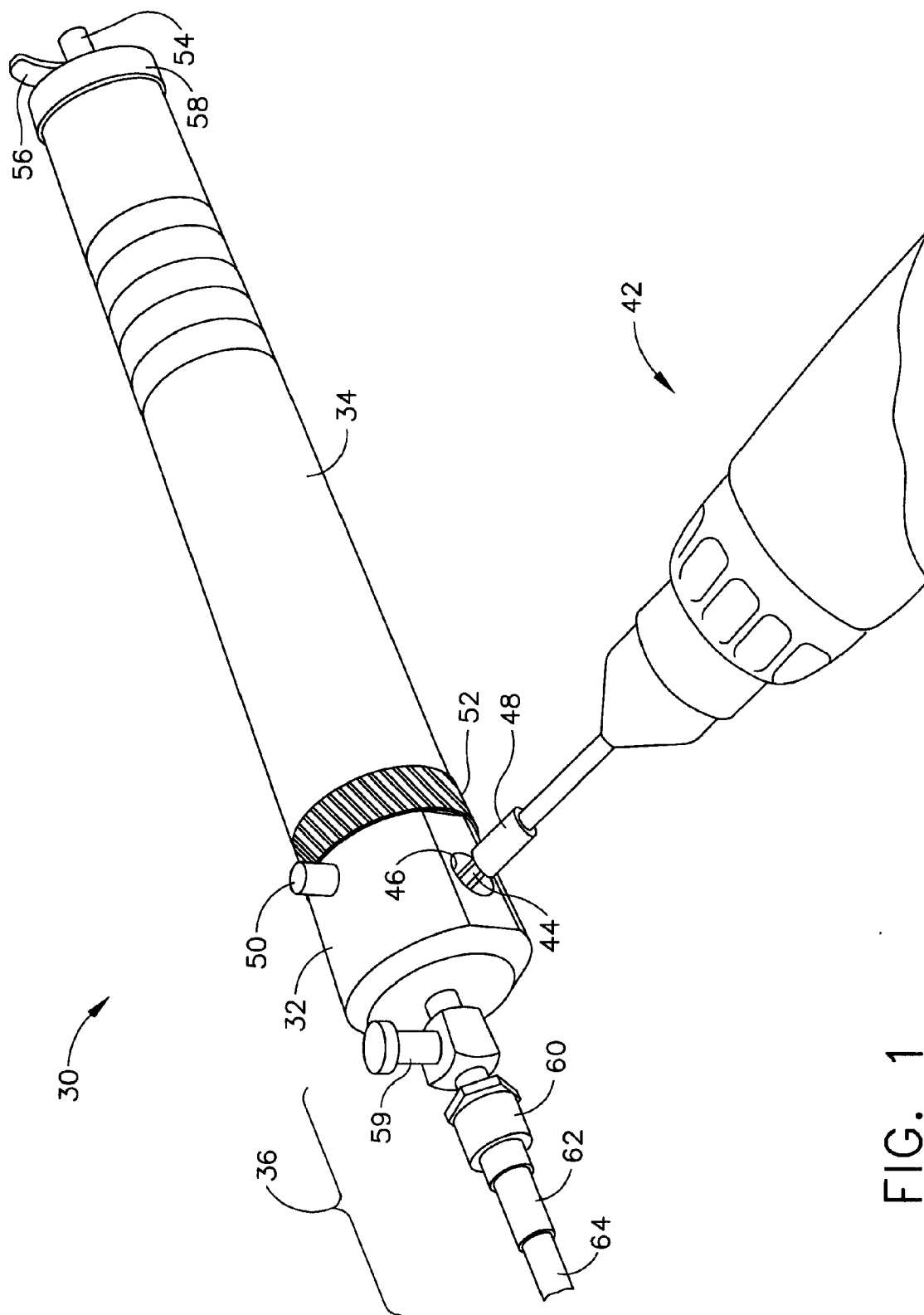


FIG. 1

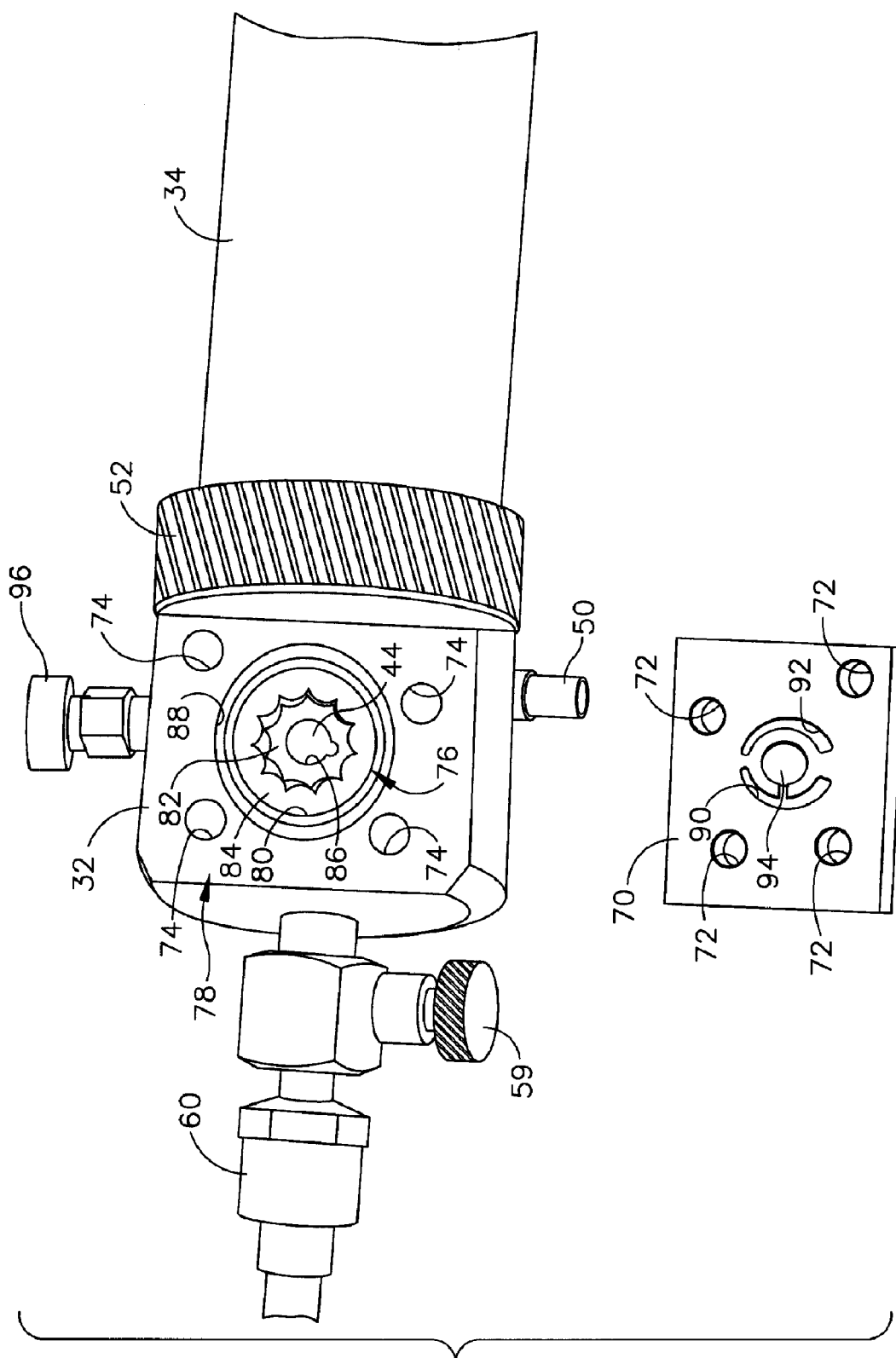


FIG. 2

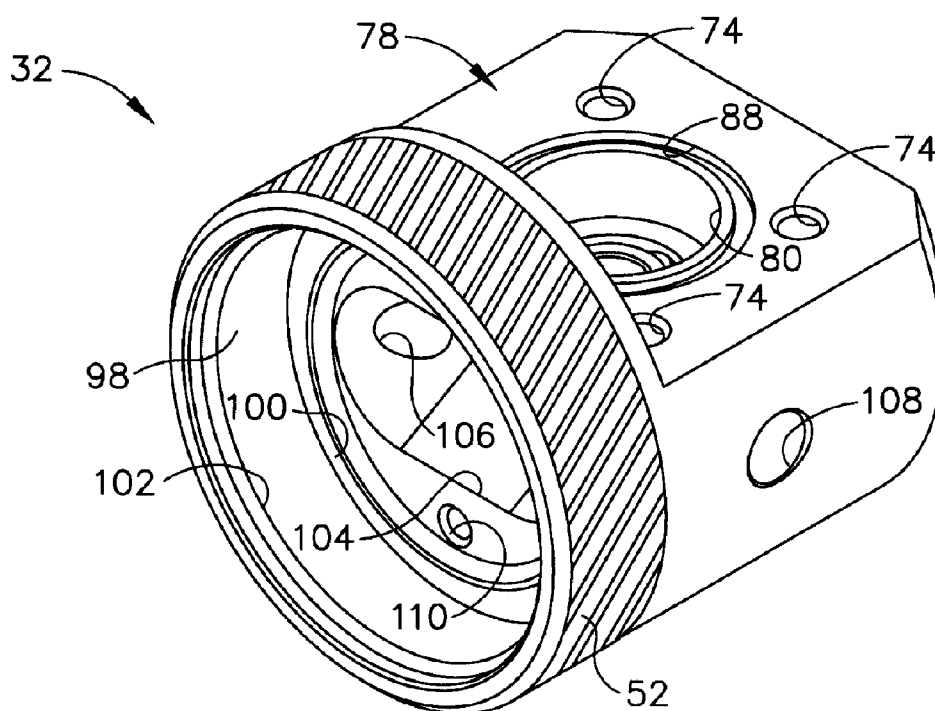


FIG. 3

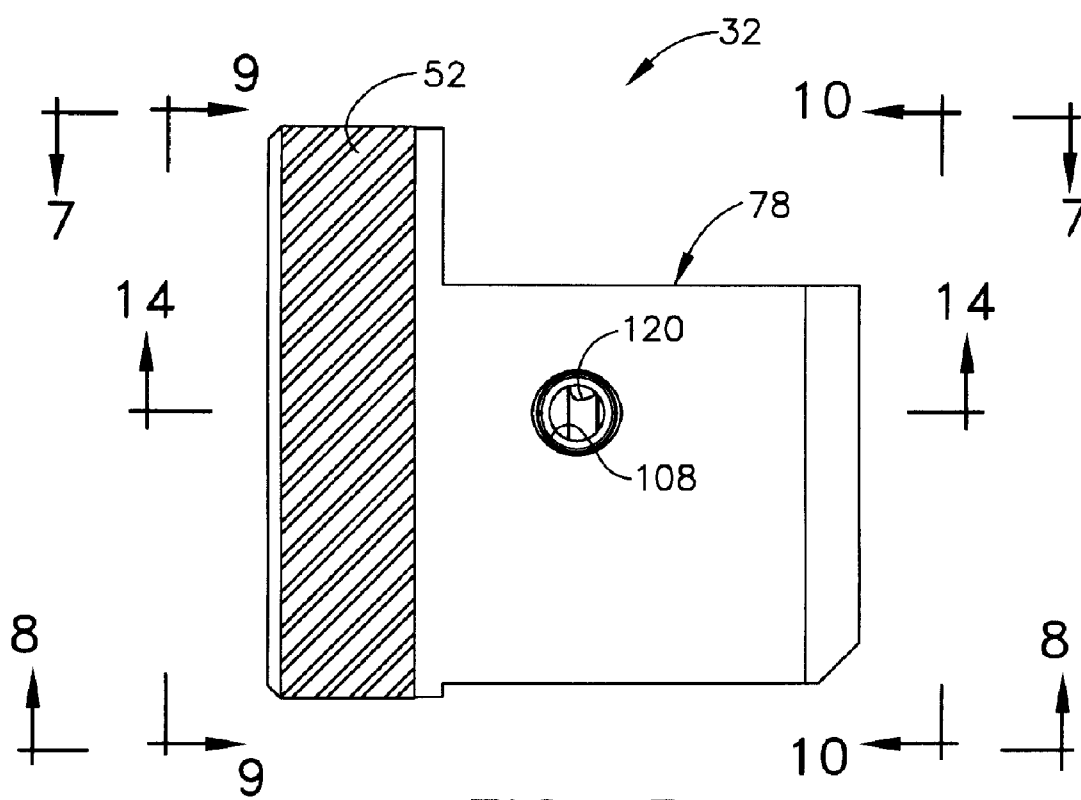
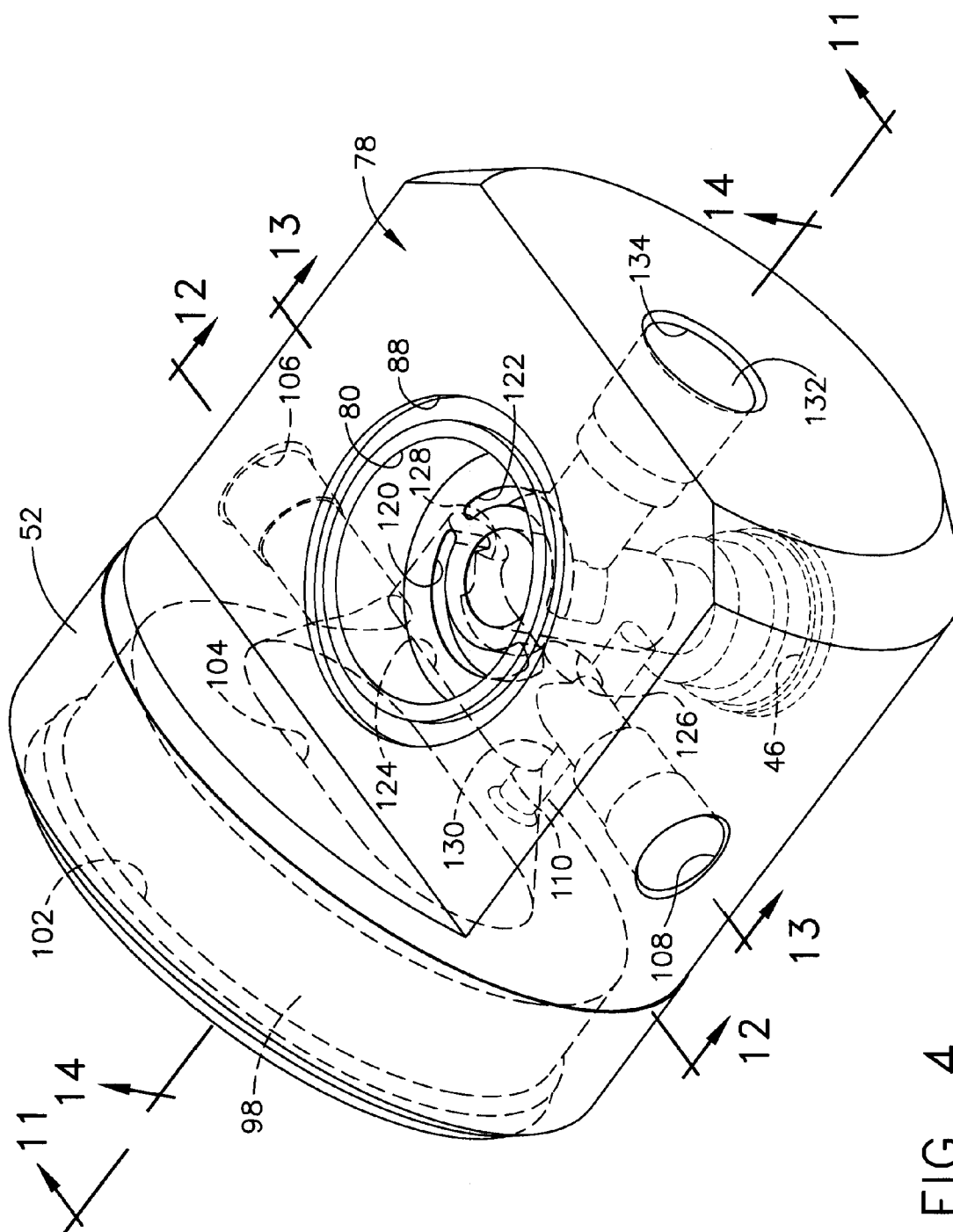


FIG. 5



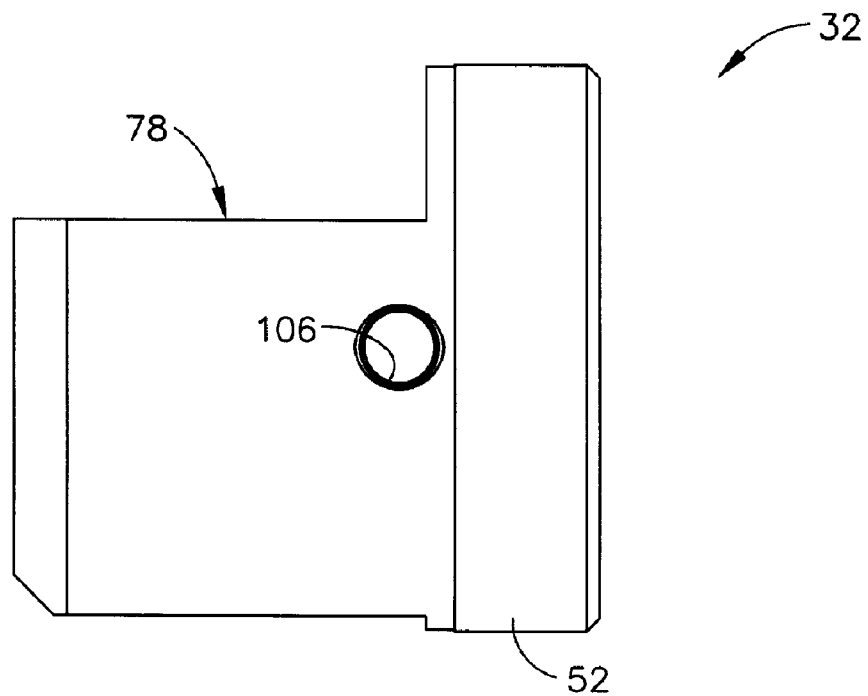


FIG. 6

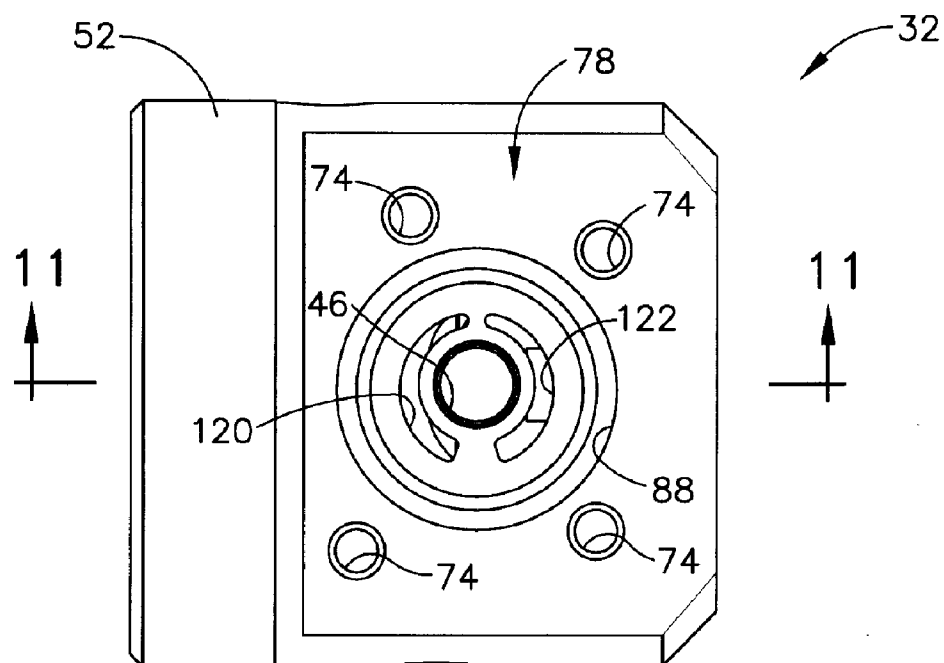


FIG. 7

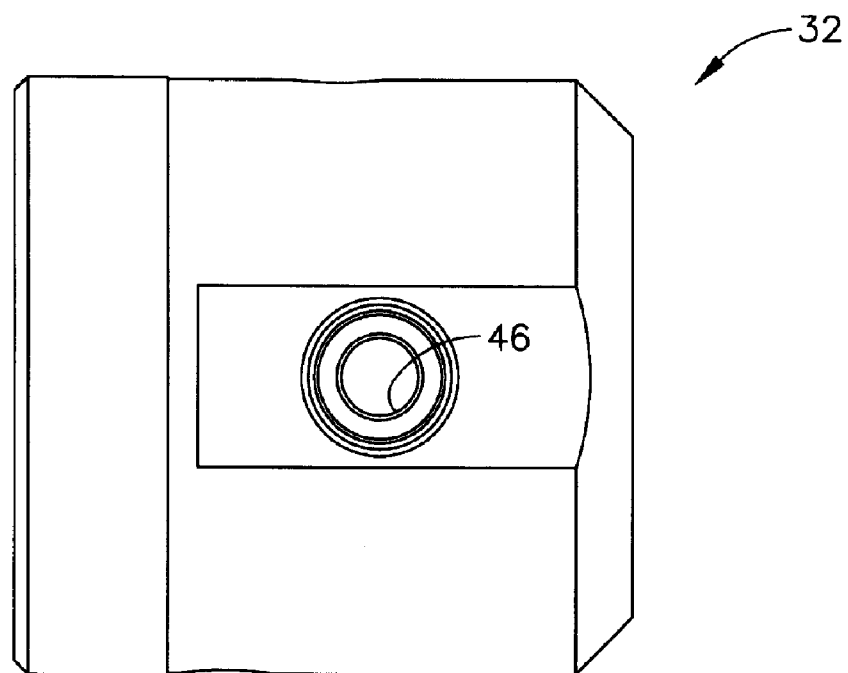


FIG. 8

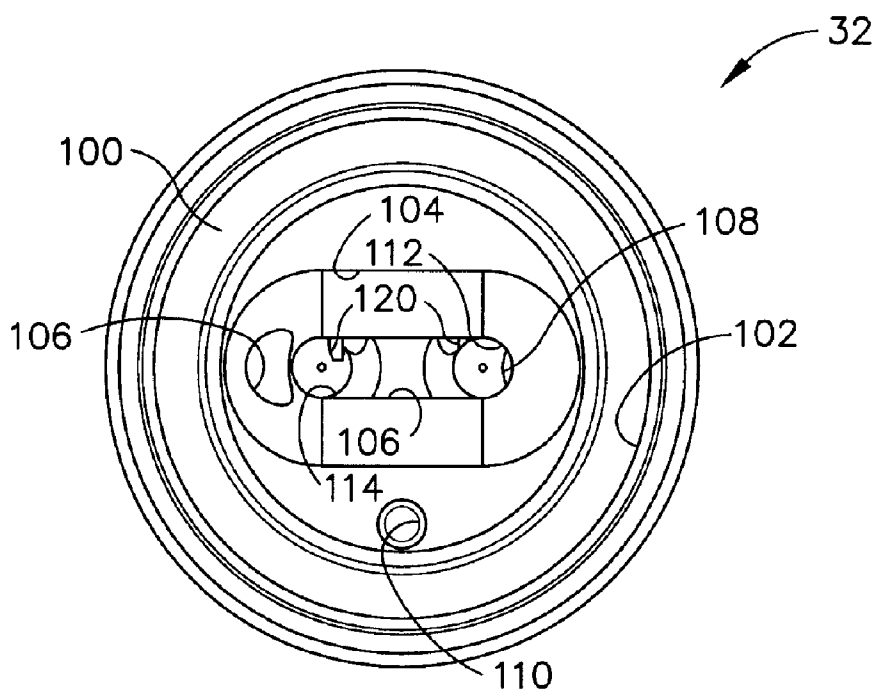


FIG. 9

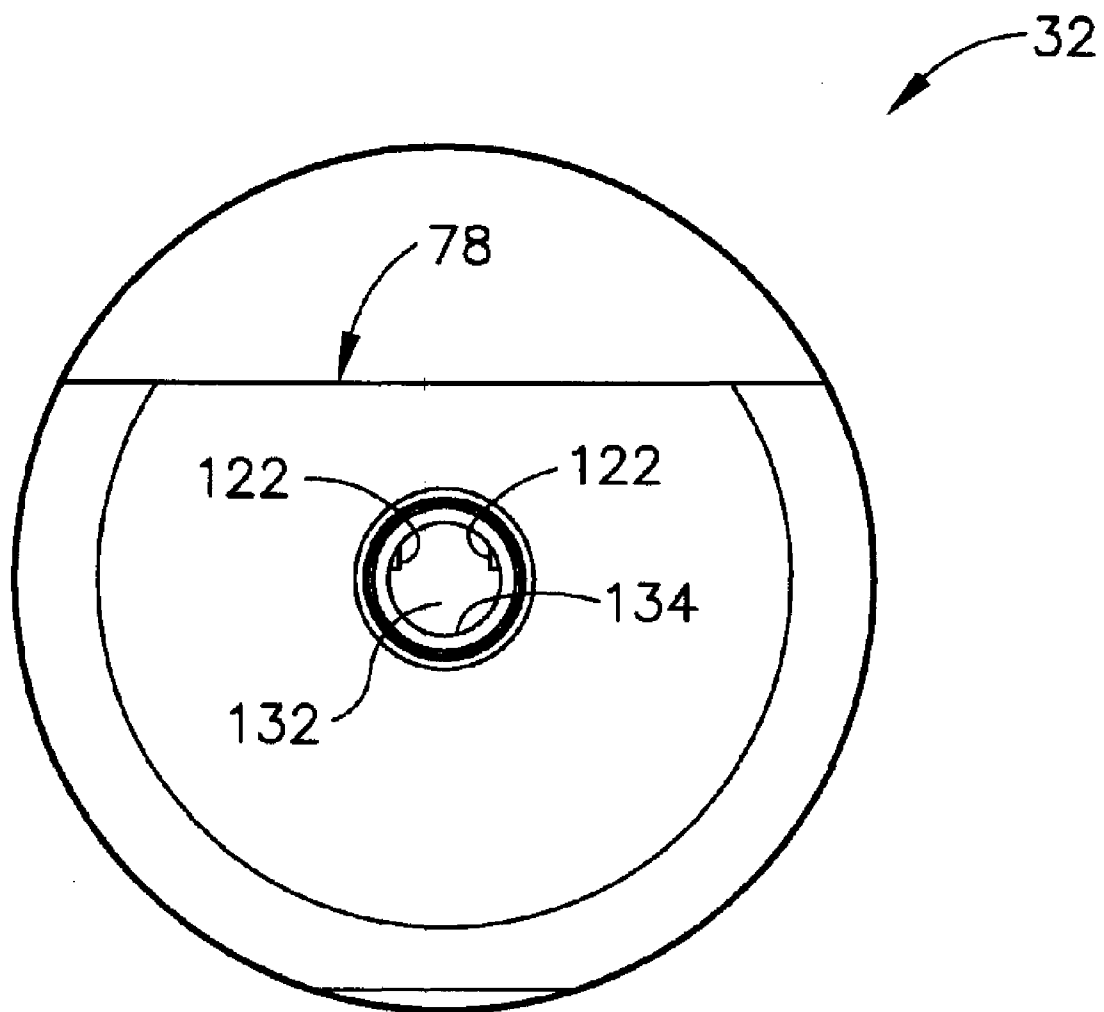


FIG. 10

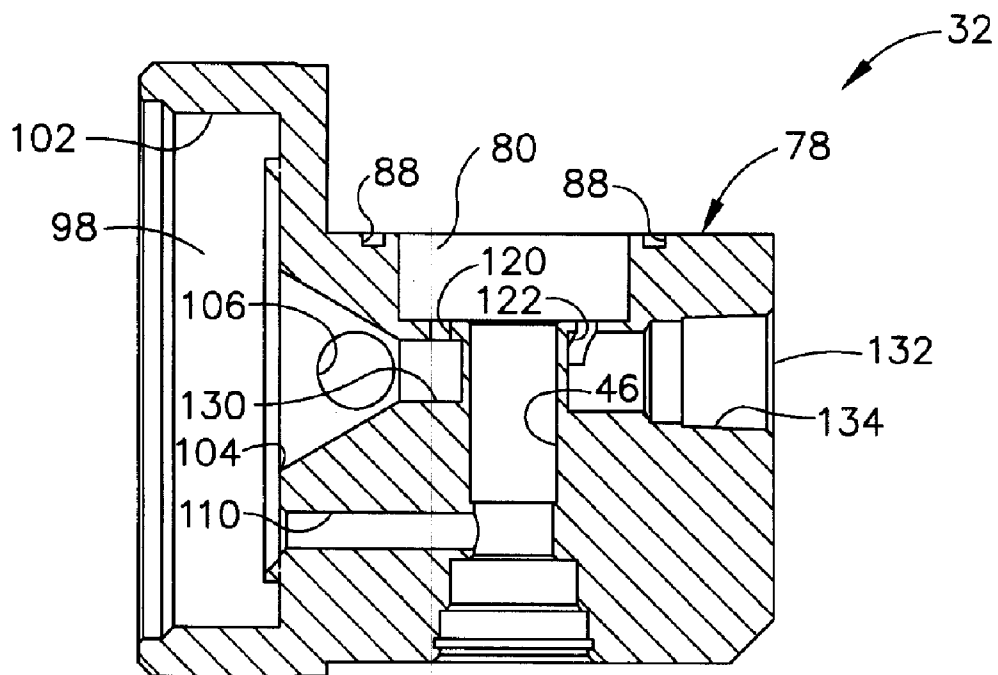


FIG. 11

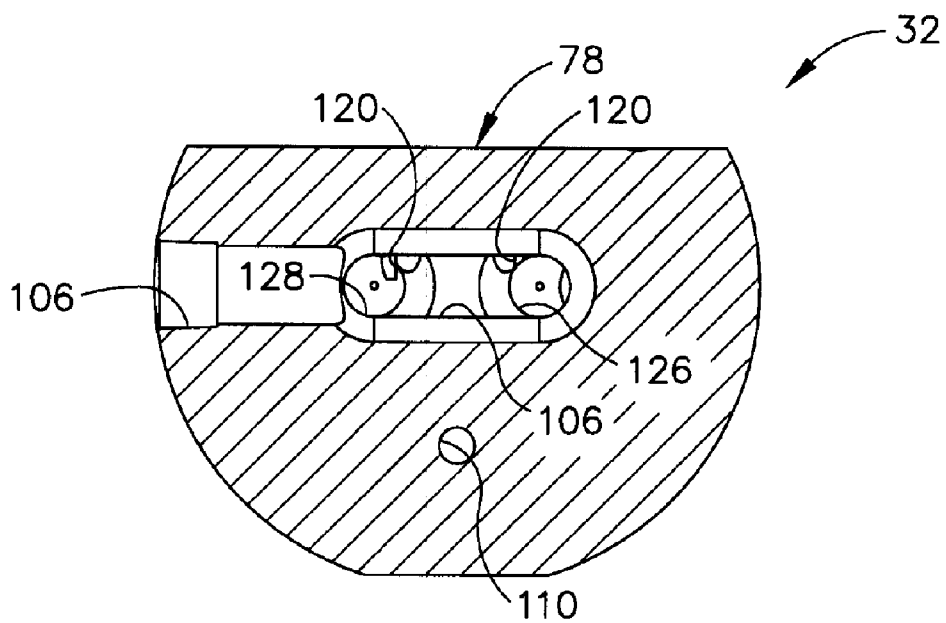


FIG. 12

32

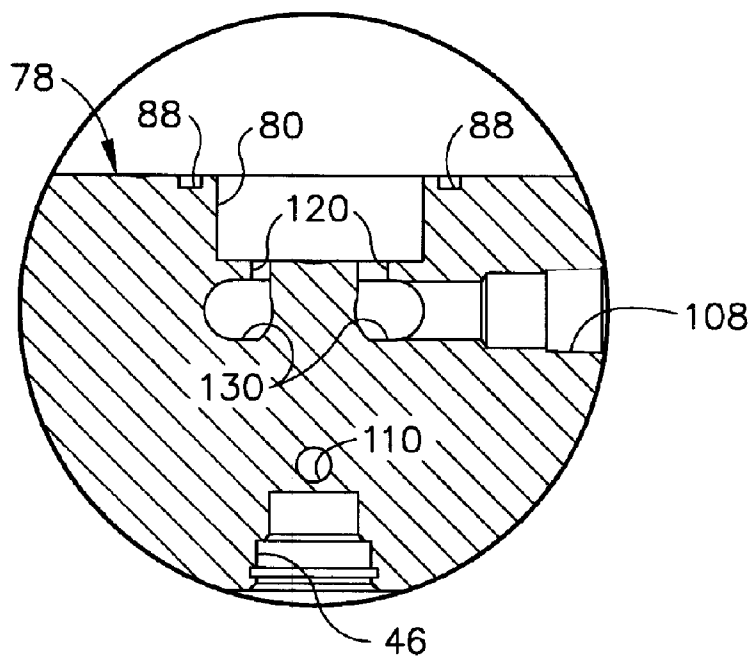


FIG. 13

32

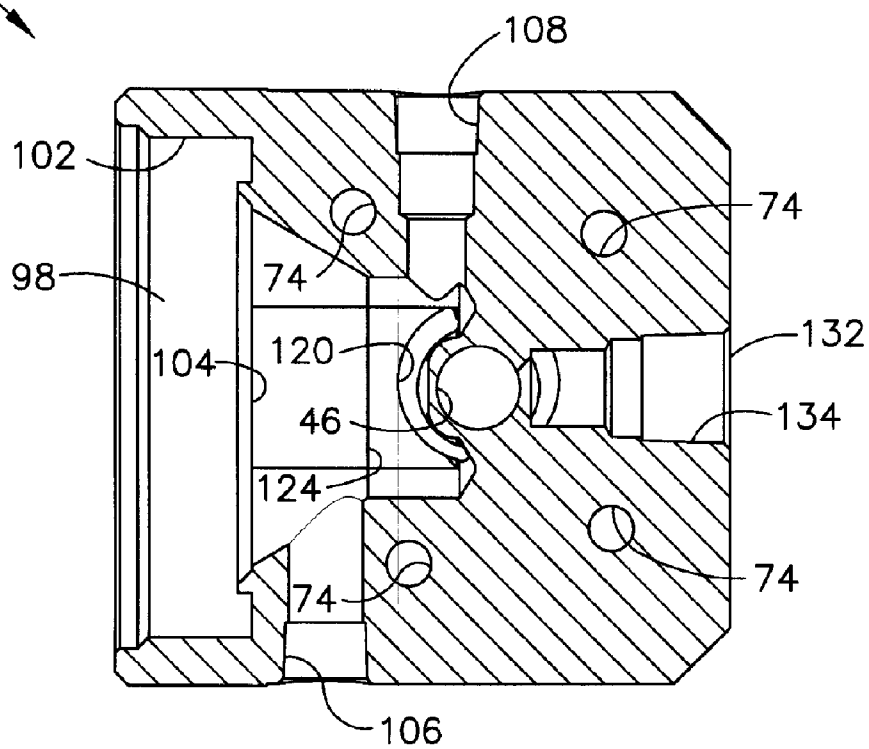


FIG. 14

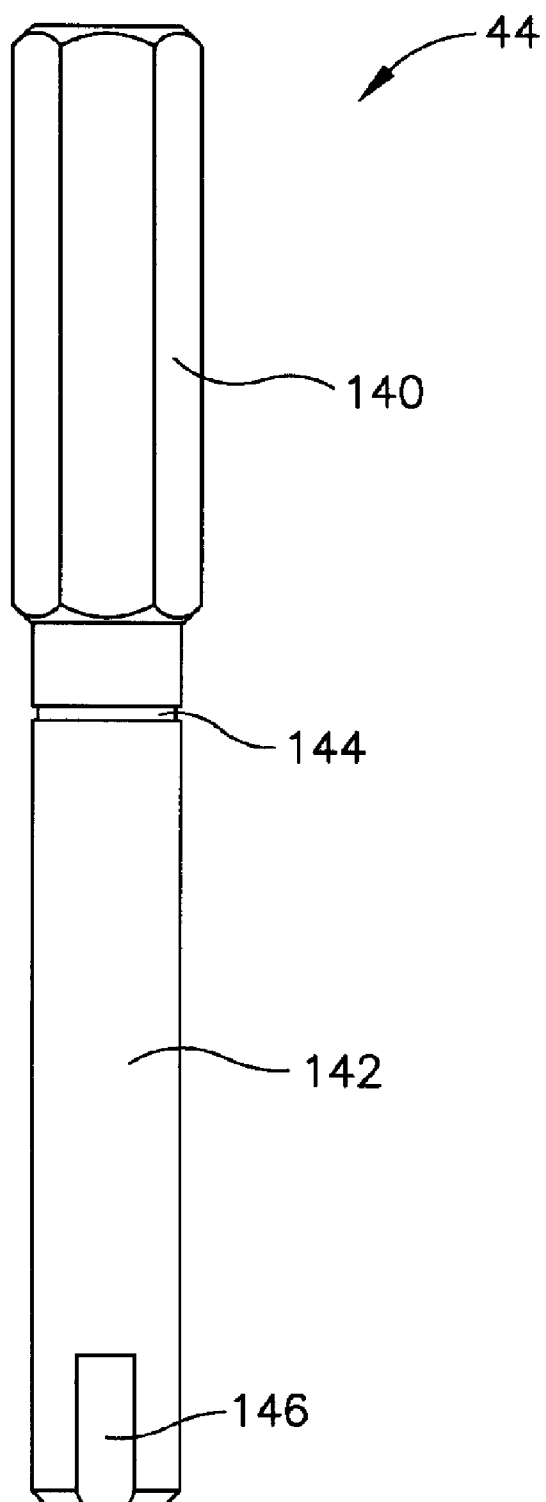


FIG. 15

GREASE PUMP**BACKGROUND**

[0001] This invention generally relates to a fluid pump and, more particularly, to a portable, externally driven fluid pump for pumping fluids such as lubricant, as in a handheld, externally driven grease pump.

[0002] Centralized lubrication systems for machinery have relatively large grease reservoirs that periodically require refilling. Refilling may be achieved, for example, with a bulk pump, a manual grease gun, or a handheld powered grease gun. Bulk pump systems are not always available and generally lack portability, and in some cases may be cost prohibitive to add to the centralized lubrication system. Manual grease guns and handheld powered grease guns, on the other hand, are portable and use a cartridge form of grease which may be preferred by many users.

[0003] In general, manual grease guns and powered grease guns have a piston and valve arrangement to pump grease. Such a design provides for relatively high pressure discharge and low flow rates. Conventional manual grease guns and handheld battery-powered grease guns generally comprise a housing including a head portion and a handle portion extending transversely from the head. A cylindrical barrel holding a supply of grease is removably secured to the head and extends from the head alongside the handle. The head portion includes a pump mechanism including a piston that reciprocates in a bore that forms a pump cylinder. The head portion has an inlet port in communication with the bore and the material in the barrel and an outlet port at one end of the bore connected to a flexible hose for delivering grease to a point of lubrication.

[0004] In a conventional powered grease gun, an electric motor is accommodated in the housing and a gear transmission mechanism is provided between the motor and the pumping mechanism. The gear transmission mechanism changes the rotating motion of the motor output shaft to the linear reciprocating motion of the piston while reducing the rotational speed and increasing torque.

[0005] In order for the grease gun to perform satisfactorily, significant force must be exerted. Unfortunately, manual grease guns may require hundreds of strokes in order to fill the centralized lubrication system reservoir because of the relatively large volume of grease required, which is burdensome on the user. This force requirement has also led to the development of large, heavy power transmission mechanisms in powered grease guns, resulting in awkward and difficult to handle grease guns. The power requirement also reduces the life cycle of a rechargeable battery. Moreover, since the transmission drive system includes numerous components, the manufacturing is relatively complicated and costly. Both manual and powered grease guns can pump air into the centralized lubrication system, which is undesirable.

[0006] For the foregoing reasons, there is a need for a powered grease pump which generates a high flow rate for filling centralized grease system reservoirs. There is a need for a pump that eliminates the need for translation of rotary tool movement to a linear reciprocating piston arrangement. There is also a need for a design that prevents pumping of air into centralized grease system reservoirs. Ideally the grease pump is externally driven by a battery-powered rotary tool.

SUMMARY

[0007] According to the present invention, a grease pump is provided for pumping of grease from a source of grease. The grease pump includes a housing having an inlet passage adapted to be in fluid communication with the source of grease, and an outlet passage. A gerotor pump is disposed in the housing and has an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage. Operation of the gerotor pump causes pumping of grease through the outlet passage.

[0008] Also according to the present invention, a grease pump for pumping grease is provided. The grease pump includes a housing, a gerotor pump, and a source of grease. The housing has an inlet passage and an outlet passage. The gerotor pump is disposed in the housing and is hydraulically interposed between the inlet passage and the outlet passage. The gerotor pump has an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage. The source of grease is secured to the housing, with a seal provided, and is in fluid communication with the inlet passage. In another embodiment a discharge conduit in fluid communication with the outlet passage may be provided. The discharge conduit may include an air vent valve.

[0009] Also in accordance with the present invention, a combination of a grease pump, grease cylinder and a rotary power tool are provided. The grease pump includes a housing having an inlet passage and an outlet passage and a gerotor pump. The gerotor pump is disposed in the housing and is hydraulically interposed between the inlet passage and the outlet passage. The gerotor has an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage. The grease cylinder is secured to the housing, with a seal, and is in fluid communication with the inlet passage. The rotary power tool is operably connected to the gerotor pump.

[0010] Also in accordance with the present invention, a method of pumping grease is provided. The method includes providing a housing having an inlet passage and an outlet passage, and disposing a gerotor pump in the housing. The gerotor pump is hydraulically interposed between the inlet passage and the outlet passage. The gerotor has an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage. The source of grease is secured to the housing, with a seal, and is in fluid communication with the inlet passage. The gerotor pump is operated to pump the grease.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] For a more complete understanding of the present invention, reference should now be had to the embodiments shown in the accompanying drawings and described below. In the drawings:

[0012] **FIG. 1** is a perspective view of a grease pump according to the present invention;

[0013] **FIG. 2** is partially exploded reverse perspective view of a portion of the grease pump shown in **FIG. 1**;

[0014] **FIG. 3** is a perspective view of the head of the grease pump shown in **FIG. 1**;

[0015] FIG. 4 is a perspective view of the head of the grease pump shown in FIG. 1 with internal bores shown in phantom line.

[0016] FIG. 5 is a right side elevation view of the head of the grease pump shown in FIG. 1;

[0017] FIG. 6 is a left side elevation view of the head of the grease pump shown in FIG. 1;

[0018] FIG. 7 is a top plan view of the head of the grease pump shown in FIG. 1;

[0019] FIG. 8 is a bottom plan view of the head of the grease pump shown in FIG. 1;

[0020] FIG. 9 is a rear elevation view of the head of the grease pump shown in FIG. 1;

[0021] FIG. 10 is a front elevation view of the head of the grease pump shown in FIG. 1;

[0022] FIG. 11 is a section of the head of the grease pump shown in FIG. 1 taken along line 11-11 of FIGS. 4 and 7;

[0023] FIG. 12 is a cross section of the head of the grease pump shown in FIG. 1 taken along line 12-12 of FIG. 4;

[0024] FIG. 13 is a cross section of the head of the grease pump shown in FIG. 1 taken along line 13-13 of FIG. 4;

[0025] FIG. 14 is a section of the head of the grease pump shown in FIG. 1 taken along line 14-14 of FIGS. 4 and 5; and

[0026] FIG. 15 is an elevation view of a shaft that drives the gerotor of the grease pump shown in FIG. 1.

DESCRIPTION

[0027] Certain terminology is used herein for convenience only and is not to be taken as a limitation on the invention. For example, words such as “front,” “rear,” “upper,” “lower,” “left,” “right,” “horizontal,” “vertical,” “upward,” and “downward” merely describe the configuration shown in the Figures. Indeed, the components may be oriented in any direction and the terminology, therefore, should be understood as encompassing such variations unless specified otherwise.

[0028] Referring now to the drawings, wherein like reference numerals designate corresponding or similar elements throughout the several views, an embodiment of the present invention is shown, designated generally at 30. It is understood that, although the present invention will be described in detail herein with reference to the exemplary embodiment of a grease pump 30, the present invention may be applied to, and find utility in, pumping fluids or materials other than grease, and in particular those with high viscosity. The present invention may be used in applications ranging without limitation from, for example, industrial to home appliance uses.

[0029] Certain pumps operate based on rotary rather than linear reciprocating motion. Rotary pumps having pumping elements consisting of a driving inner rotor and a driven outer rotor are generally referred to as internal rotary gear pumps. One particular class of internal rotary gear pumps is commonly known as internal gerotor pumps. Gerotor-type pumping elements are characterized by an inner rotor having one less tooth than the outer rotor, with each tooth of one

rotor always being in contact with some portion of the other rotor. This interaction between the rotors results in continuous driving contact. When the gears are rotated, a series of expanding and contracting chambers is formed which, when connected with appropriate passages, provides pumping action.

[0030] In operation, a rotating shaft drives the inner rotor which in turn drives the outer rotor. The axis of the outer rotor is positioned at a fixed eccentricity from the axis of the inner rotor and shaft. The teeth on the respective gears cooperate to define a plurality of variable volume pumping chambers whereupon during rotation of the gear rotors, a pumping chamber increases in volume to a maximum volume, then decreases in volume. Fluid from the pump's low pressure inlet port is drawn into pumping chambers that are increasing in volume. Upon further rotation of the gerotor pump, when the pumping chambers are decreasing in volume, the fluid is pushed out through the pump's outlet port at a higher pressure. Gerotor pumps may be designed to provide relatively high flow rates at low pressures. One example of a gerotor pump that may be used in the present invention is model 10010-Z0170 manufactured by Nichols Portland, a division of Parker Hannifin Corp., of Portland, Me.

[0031] Referring now to FIG. 1, the grease pump 30 comprises a housing or head 32, a tubular reservoir or grease cylinder 34, and a discharge conduit 36. As will be discussed further below, the head 32 has an inlet passage at its rear and an outlet passage at its front. The head 32 houses a gerotor pump, which is driven by a conventional rotary tool 42, such as a battery-powered hand drill. A shaft 44 extends from a bore 46 and is accessible externally of the head 32. A socket 48 mounted to the rotary tool 42 turns the shaft 44 causing the gerotor pump to rotate. As with all bores through the outside of the head 32 in the present invention, a seal is provided as known by one of ordinary skill in the art. A grease fitting 50 is provided for filling the head 32 with grease for priming the pump at the beginning of use, and for bulk-filling the cylinder if so desired by the user.

[0032] One end of the grease cylinder 34 is removably secured to the head 32 at the rear of the head 32 for holding a supply of grease. The cylinder 34 is aligned substantially coaxial with the longitudinal axis of the head 32. The head 32 has a knurled portion 52 at the rear of the head 32. The inside of the knurled portion 52 is threaded for screwing the head 32 to the cylinder 34. The knurled surface is provided for convenience in gripping and screwing the head 32 onto the cylinder 34. The cylinder 32, as the source of the pumped material, is shown as a conventional grease cylinder, but could be any shape or size appropriate to serve as a supply for pumped material. It is understood that a wide variety of fluids other than grease, motor oil, or other lubricant, can be dispensed according to the present invention, such as, for example, sealants such as caulk, glue, and cake frosting as well as other high viscosity fluids or semi-solid materials when relatively low pressure and high flow rates are desired. There is a spring and follower inside the cylinder 34 that applies pressure to direct the grease to the head 32. The spring and follower ride along a rod 54 that extends outside the cylinder 34. A handle 56 allows manipulation of the follower. An end cap 58 might be used to seal the outer end

of the cylinder 34, but the cylinder including the sides and bottom may also be of single piece construction without a separate end cap 58.

[0033] The discharge conduit 36 extends from the front end of the head 32 for delivering grease to desired points of lubrication. The discharge conduit 36 includes an air vent valve 59 threaded to the front end of the head 32, a coupler 60 connected to the air vent valve 59, an adapter 62 connected to the coupler 60, and a flexible hose 64 connected to the adapter 62. The air vent valve 59 is closed during normal operation and may be closed when filling the cylinder 34 with grease through the grease fitting 50. This air vent valve 59 is used to eliminate air trapped by the gerotor pump but not transmitted through the discharge conduit 36. The air vent valve 59 is opened to release pressurized air, and closed once the air is discharged.

[0034] The materials of the various components may be selected as known by one of ordinary skill in the art. For example, the head 32 may be machined aluminum, steel, or other metal. Likewise, the gerotor pump may be a machined metal. The cylinder 34 may be made of aluminum, steel, other metal, or paperboard. Other metals may be selected based on the application or preference of the designer. Optionally the materials could include plastic.

[0035] FIG. 2 shows a portion of the grease pump 30 from a view of the opposite side of the head 32 from that of FIG. 1. A plate 70, which may be fastened to the head 32 with screws (not shown) through openings 72 in the plate and openings 74 in the head, is removed to expose the gerotor pump 76 and the top surface 78 of the head 32. The gerotor pump 76 is disposed in a bore 80 in the head 32 and has an inner rotor 82 and an outer rotor 84. Both the inner rotor 82 and outer rotor 84 turn. The inner rotor 82 has a central keyed opening 86 for nonrotatably accommodating the shaft 44 for driving the inner rotor 82. The inner rotor 82 drives the outer rotor 84. An annular void 88 is provided in the head 32 for accommodating a gasket to provide a seal between the top surface 78 of the head 32 and the plate 70.

[0036] The plate 70 includes recesses 90, 92 that correspond to the inlet and outlet of the gerotor pump 76, as will be described below. The recesses 90, 92 serve to balance pressure across the width of the gerotor pump 76. A plastic thrust bearing 94 may be provided in a recessed central area of the plate 70 to abut the inner end 146 (FIG. 15) of the shaft 44 as the shaft 44 passes through the gerotor pump 76.

[0037] An inlet-side air vent valve 96 is provided. This air valve vent 96 is sealingly connected to the head 32 and is in fluid communication with an inlet passage 98, described below. The inlet-side air vent valve 96 may be opened to allow discharge of unwanted air that might be trapped in the cylinder 34 during cartridge loading, and also to help prime the gerotor pump 76.

[0038] Referring now to FIGS. 3 and 4, the rear portion of the head 32 defines the inlet passage 98 having an annular recess 100 provided for a gasket (not shown) to form a seal between the head 32 and the cylinder 34. Although for clarity threads are not shown, the inlet passage bore 102 is threaded for connecting to the externally threaded end of the cylinder 34. The inlet passage 98 then narrows into a substantially oval shaped chamber 104. All of the bores in the head, except those for screws to fasten the plate 70 (FIG.

2), are shown in FIG. 4 in solid or phantom line. The grease filler fitting bore 106 may be seen on the inside of the head, and the exterior of the air vent valve bore 108 may be seen from the outside of the head 32; both open into the inlet passage 98. A pressure balancing bore 110 extends longitudinally from inlet passage 38 to the opening for the shaft 44. The pressure balancing bore 110 helps prevent the seal between the shaft bore 46 and the shaft 44 from blowing out by allowing grease to flow from the shaft bore 46 to the inlet passage 98 as pressure increases in the shaft bore 46.

[0039] FIGS. 5-15 show views of all the bores, with no phantom lines. As shown in FIGS. 4 and 7, the gerotor pump bore 80 is in fluid communication with an arcuate inlet opening 120 and an arcuate outlet opening 122. The sliver shapes of the inlet opening 120 and outlet opening 122 conform to those generally used with gerotor pumps. As shown in FIGS. 4, 11, and 14, the inlet opening 120 is in fluid communication with the inlet passage 98 in the rear end of the head 32. As previously noted, the shape of the inlet passage 98 is first defined by a circular bore 102 and then an oval bore 104. As best seen in FIGS. 4 and 14, the inlet passage 38 further narrows to a smaller oval shaped opening 124 having forwardly extending circular bores 126, 128 at each end that together form an inlet chamber 130 with the smaller oval bore 124. The inlet opening 120 to the gerotor pump 76 (FIG. 2) opens into the inlet chamber 130.

[0040] As best seen in FIGS. 4, 11, and 14, the gerotor pump outlet opening 122 opens into the outlet passage 132. The outlet passage 40 is defined by a circular outlet passage bore 134. The outlet passage bore 134 increases in diameter while extending toward and terminating at the front end of the head 32. Although threads are not shown for clarity, the outlet passage bore 134 is threaded and receives the externally threaded end of the air vent valve 59 (FIGS. 1 and 2).

[0041] The gerotor pump 76 by design will not pump air, so if and when air accumulates in the outlet side of the gerotor pump 76, pumping of grease will stop. It is a preferred design feature of the present invention to prevent the delivery of air to the delivery point of the grease. One such delivery point may be a centralized lubrication system. The present invention accomplishes this by ceasing to pump grease if more than a nominal amount of air accumulates in the gerotor pump 76 housing. The air vent valve 59 on the discharge conduit 36 and in fluid communication with the outlet passage 132 is opened to release the air. Design considerations include building the inlet 120 and outlet 122 of the gerotor 76, and specifying the clearances between the outer rotor 84 and the head 32, based on the viscosity and compressibility of grease, oil, or other thick fluids that are to be pumped. When air accumulates in the inlet passage 98 or the outlet passage 132, the pumping efficiency of the gerotor pump 76 changes dramatically due to the much lower viscosity and much higher compressibility of air. The clearances between parts allow internal bypass of air within the gerotor pump 76 that stall the pumping action. Also, as the rotor turns, it can compress the air without discharging it, thus providing a reservoir for the air before it bleeds across the gerotor pump clearances. In one embodiment, the cumulative clearance between the gerotor components, the head 32, and the plate 70 add up to a range of 0.0005 inches to 0.0013 inches (0.0127 mm to 0.0330 mm).

[0042] The shaft bore 46 passes through the head 32 as shown in FIGS. 4, 8, 11, and 14. The shaft bore 46 is coaxial

with the axis of the gerotor pump bore 80, and is perpendicular to the longitudinal axis of the head 32. The air vent bore 108 extends laterally through the head 32 to the inlet chamber 130 as best seen in FIGS. 4, 5, 13, and 14. The grease filler fitting bore 106 extends laterally through the head 32 to the inlet passage 98 as best seen in FIGS. 4, 11, 12, and 14. The pressure balancing bore 110 extends from the inlet passage 98 to the shaft bore 46, substantially parallel to the axis of the head 32 as best seen in FIGS. 4 and 11.

[0043] FIG. 15 shows the shaft 44 for driving the gerotor pump 76. The upper end 140 of the shaft 44 is adapted to fit a standard socket that could connect to a rotary tool. The portion below the upper end 140 is the shank 142, which includes a groove 144 for making a seal in the shaft bore 46. At the lower end of the shaft is a keyed portion 146, shaped to allow the shaft 44 to fit in the keyed opening 86 in the gerotor pump 76.

[0044] In use, the user connects the discharge conduit 36 to a centralized lubrication system. The user grips the cylinder 34 or the head 32 in one hand, and a powered rotary tool such as a battery powered hand drill 42 in the other. The user fits the socket 48 of the hand drill 42 to the shaft 44, and turns on the hand drill 42. The shaft 44 turns the gerotor pump 76 for pumping grease from the cylinder 34 to the centralized lubrication system; there are no moving parts other than the shaft 44 and the gerotor pump 76. Alternatively, the grease pump 30 could be laid on a flat surface or otherwise mounted to a fixture for use.

[0045] Although the present invention has been shown and described in considerable detail with respect to only a few exemplary embodiments thereof, it should be understood by those skilled in the art that we do not intend to limit the invention to the embodiments since various modifications, omissions and additions may be made to the disclosed embodiments without materially departing from the novel teachings and advantages of the invention, particularly in light of the foregoing teachings. Such modifications may include, but not be limited to, integrating the outlet air vent valve into the housing such that a separate part is not required, and combining the inlet filler fitting with the inlet air vent valve so that only one part is required. Accordingly, we intend to cover all such modifications, omission, additions and equivalents as may be included within the spirit and scope of the invention as defined by the following claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Thus, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs a helical surface, in the environment of fastening wooden parts, a nail and a screw may be equivalent structures.

What is claimed is:

1. A grease pump for pumping of grease from a source of grease, the grease pump comprising:

a housing having an inlet passage adapted to be in fluid communication with the source of grease and an outlet passage; and

a gerotor pump disposed in the housing and having an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage,

wherein operation of the gerotor pump pumps grease through the outlet passage.

2. The grease pump of claim 1, further comprising a shaft rotatably disposed in the housing and operably connected to the gerotor pump, wherein the shaft is accessible external to the housing.

3. The grease pump of claim 1, further comprising an air vent valve sealingly secured to the housing and in fluid communication with the inlet passage.

4. The grease pump of claim 1, further comprising a grease fitting sealingly secured to the housing and in fluid communication with the inlet passage.

5. The grease pump of claim 1, further comprising an air vent valve in fluid communication with the outlet passage.

6. The grease pump of claim 1, wherein the housing has a central longitudinal axis and the gerotor pump has a central longitudinal axis perpendicular to the central longitudinal axis of the housing.

7. A grease pump for pumping of grease, comprising:

a housing having an inlet passage and an outlet passage;

a gerotor pump disposed in the housing and hydraulically interposed between the inlet passage and the outlet passage, the gerotor pump having an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage; and

a source of grease sealingly secured to the housing and in fluid communication with the inlet passage.

8. The grease pump of claim 7, further comprising rotary means for turning the gerotor pump.

9. The grease pump of claim 8, wherein the rotary means for turning the gerotor comprises an electric motor and the electric motor is external to the housing.

10. The grease pump of claim 9, wherein the rotary means comprises a hand drill.

11. The grease pump of claim 7, further comprising an air vent valve sealingly secured to the housing and in fluid communication with the inlet passage.

12. The grease pump of claim 7, further comprising a grease fitting sealingly secured to the housing and in fluid communication with the inlet passage.

13. The grease pump of claim 7, further comprising an air vent valve in fluid communication with the outlet passage.

14. The grease pump of claim 7, wherein the housing has a central longitudinal axis and the gerotor pump has a central longitudinal axis, and the gerotor pump axis is perpendicular to the housing axis.

15. The grease pump of claim 7, wherein the source of grease comprises a grease cylinder.

16. The grease pump of claim 7, further comprising a discharge conduit in fluid communication with the outlet passage.

17. The grease pump of claim 16, wherein the discharge conduit comprises an air vent valve.

18. The grease pump of claim 16, wherein the discharge conduit comprises a flexible hose.

19. The grease pump of claim 16, further comprising a receiving reservoir in fluid communication with the discharge conduit.

20. The grease pump of claim 19, wherein the receiving reservoir comprises a centralized lubrication system reservoir.

21. In combination:

a grease pump comprising:

a housing having an inlet passage and an outlet passage; and

a gerotor pump disposed in the housing and hydraulically interposed between the inlet passage and the outlet passage, having an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage;

a grease cylinder sealingly secured to the housing and in fluid communication with the inlet passage; and

a rotary power tool, operably connected to the gerotor pump.

22. The combination of claim 21, further comprising a discharge conduit in fluid communication with the outlet passage.

23. The combination of claim 21, further comprising an air vent valve in fluid communication with the outlet passage.

24. A method of pumping grease, comprising the steps of:

providing a housing having an inlet passage and an outlet passage;

disposing a gerotor pump in the housing, hydraulically interposed between the inlet passage and the outlet passage, having an inlet in fluid communication with the inlet passage and an outlet in fluid communication with the outlet passage;

sealingly securing a source of grease to the housing in fluid communication with the inlet passage; and

operating the gerotor pump to pump the grease.

25. The method of claim 24, further comprising the step of providing an air vent valve in fluid communication with the inlet passage.

26. The method of claim 24, further comprising the step of providing a grease fitting in fluid communication with the inlet passage.

27. The method of claim 24, further comprising the steps of:

providing a shaft operably connected to the gerotor pump and accessible external to the housing;

mounting a rotary tool to the shaft; and

actuating the rotary tool to turn the shaft and the gerotor pump, causing the gerotor pump to pump grease from the grease cylinder to the outlet passage.

28. The method of claim 27, further comprising the step of releasing air from the outlet passage, including:

providing an air vent valve in fluid communication with the outlet passage;

opening the air vent valve;

delivering grease into the housing through the grease fitting; and

closing the air vent valve once the air is discharged and fluid is present at the outlet of the air vent valve.

* * * * *