July 10, 1962 W. Y. BROWN 3,043,224

SELF-CONTAINED SERVICE PUMP ASSEMBLY

Filed Aug. 4, 1960 4 Sheets-Sheet 1

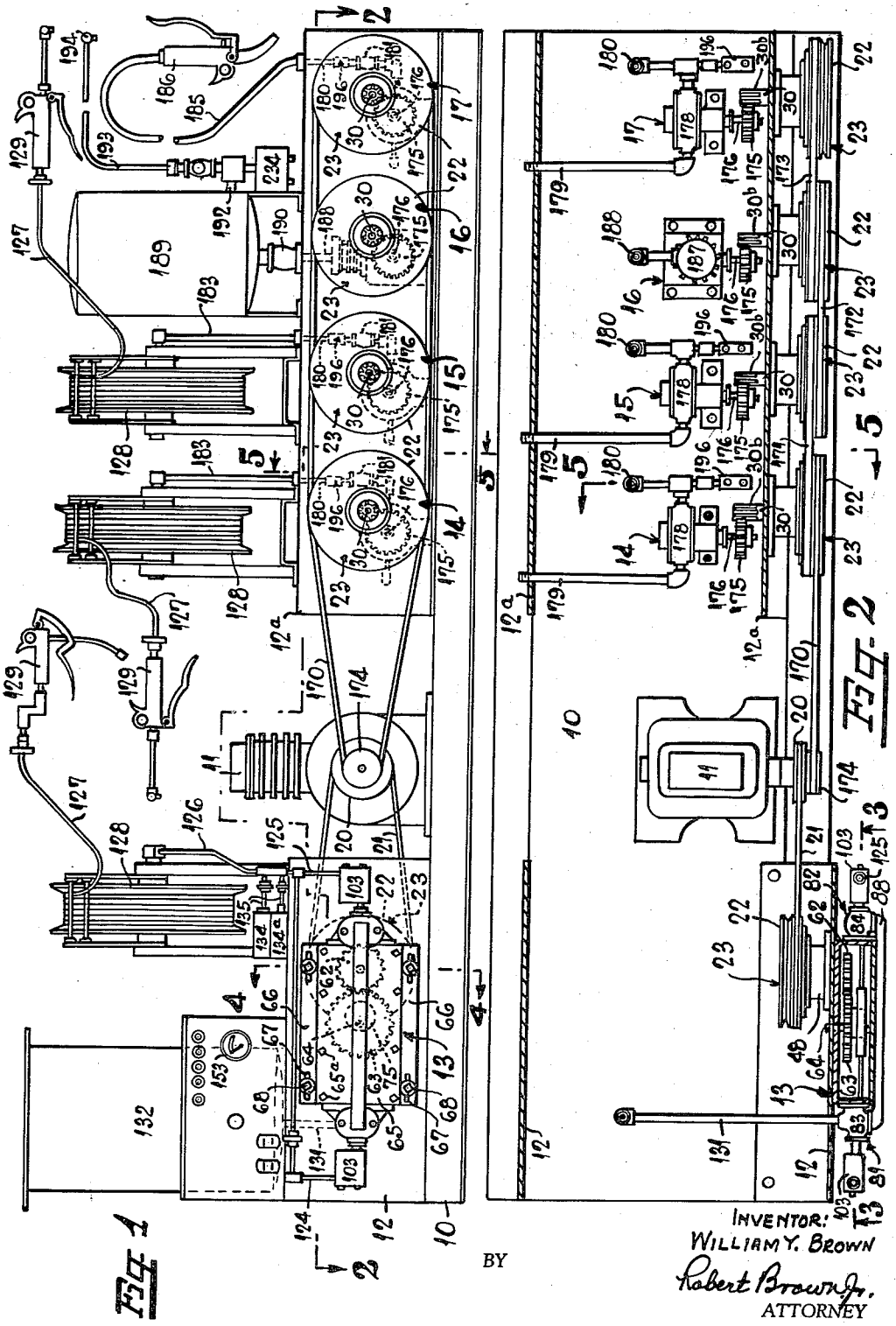


FIG. 1

FIG. 2

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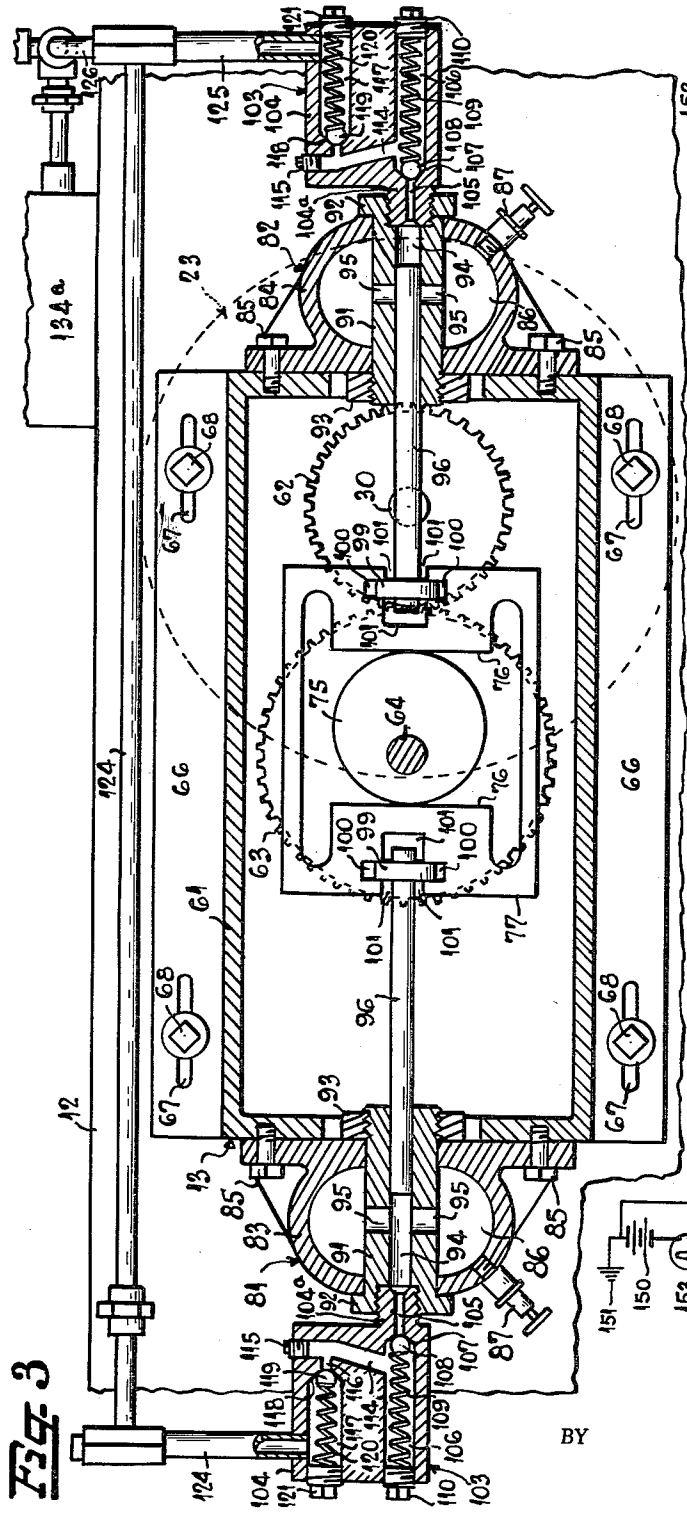


Fig. 3

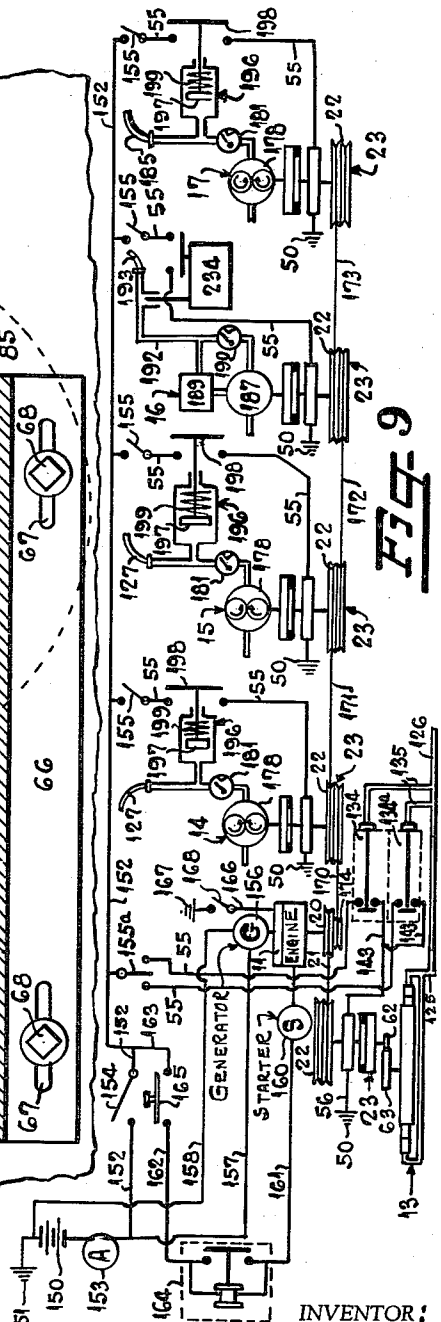


Fig. 9

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SELF-CONTAINED SERVICE PUMP ASSEMBLY

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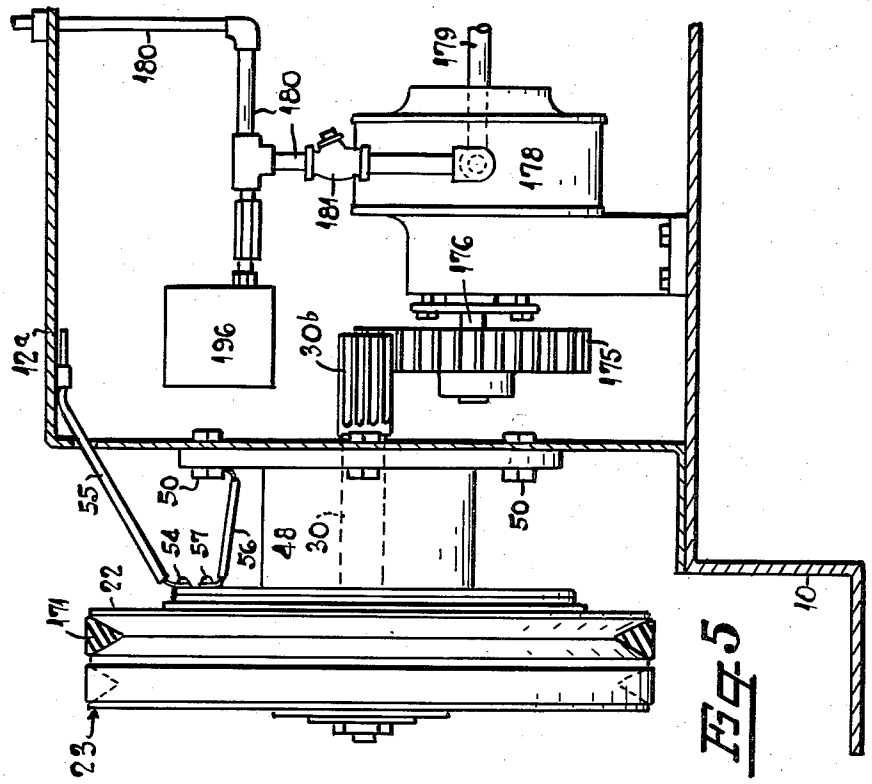


FIG 5

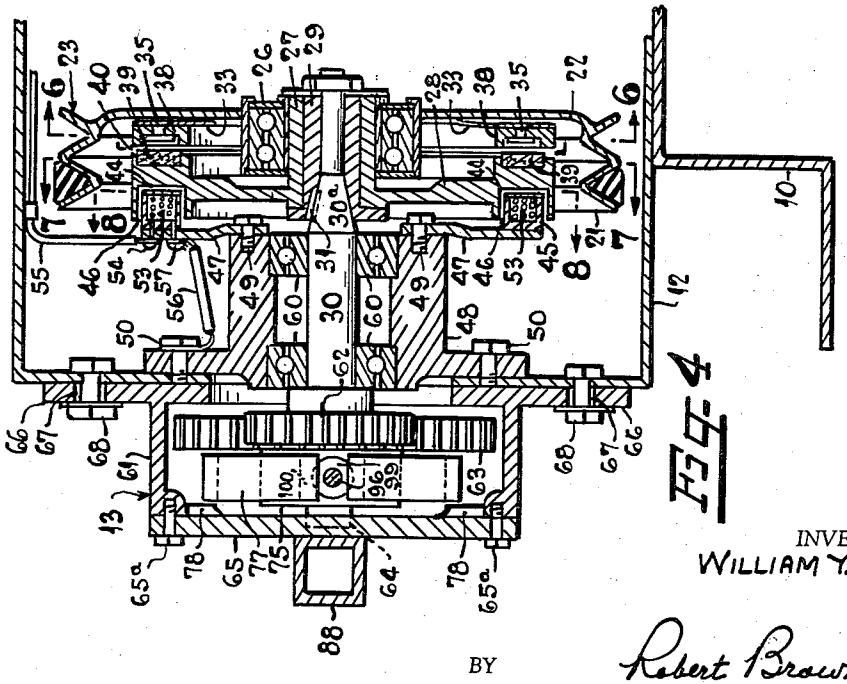


FIG 4

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SELF-CONTAINED SERVICE PUMP ASSEMBLY

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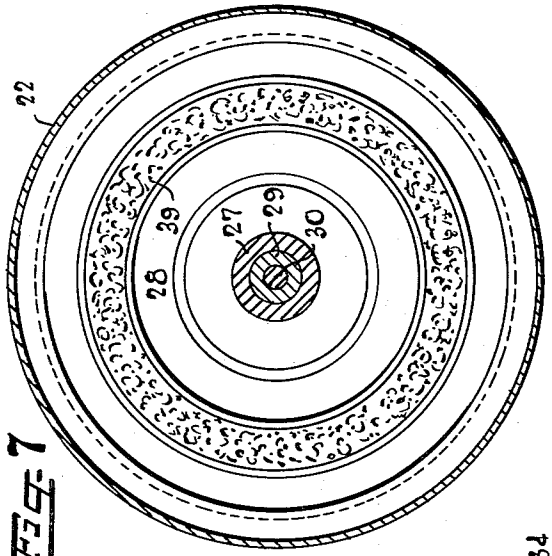


Fig. 7

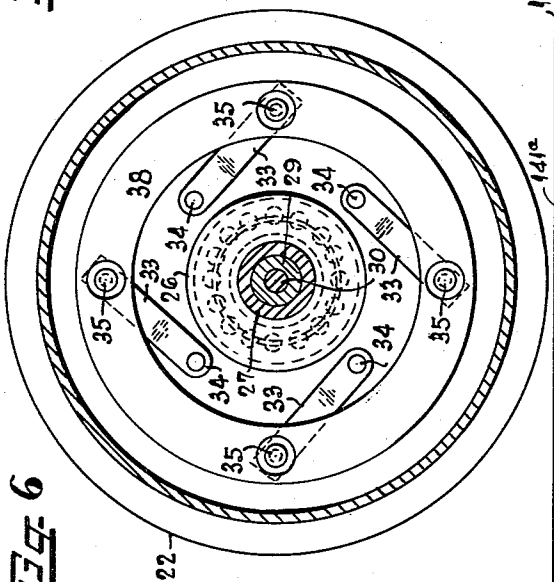


Fig. 6

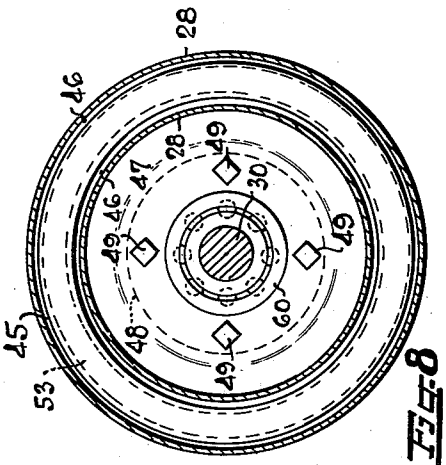


Fig. 8

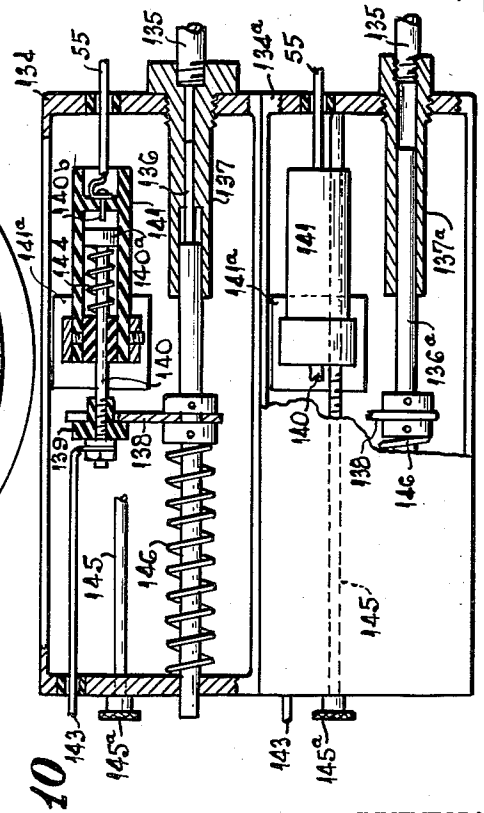


Fig. 10

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United States Patent Office

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SELF-CONTAINED SERVICE PUMP ASSEMBLY

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Filed Aug. 4, 1960, Ser. No. 46,633
2 Claims. (Cl. 103—23)

This invention relates to a service pump assembly and more particularly to lubricating and dispensing apparatus which comprises a battery of dispensing units selectively driven from a common source of power and designed to service various types of mechanical equipment.

In servicing heavy duty motor and factory equipment, for example, it becomes necessary to dispense large quantities of greases, gear oils, hydraulic oils, fuel oils, gasoline, compressed air, and the like. These substances are usually dispensed intermittently and at relatively high pressures, thus necessitating frequent starting and stopping which results in high load fluctuation. The load fluctuation varies not only in each separate dispensing unit, but also with the number of units in operation at a particular time. As a result of the high load fluctuation, it has been found desirable to employ a continuously operating power source from which each separate unit can be driven as desired.

In my Patent No. 2,008,850, dated July 23, 1935, there is disclosed a lubrication apparatus comprising a plurality of selectively operated reciprocable pumps driven from the same continuously operating power source, and in which each of the pump pistons is connectable to the power source by a latch mechanism. Although such apparatus has proven satisfactory in some types of dispensing operations, it dos not provide optimum advantages in heavy duty operations. A number of adverse factors have been encountered when making such use from this prior device, such as the shock produced upon latching, the instability of the latched connection, and the difficulty of maintaining alinement of the piston and its reciprocating means when the parts are unlatched.

It is therefore an object of this invention to provide a battery of lubricating and dispensing units, each of which is connectable to a continuously operating power source by an improved mechanism which will overcome the above-mentioned difficulties. Specifically, I have provided an electro-magnetically oprated friction clutch, which clutch cooperates with both the power source and the dispensing unit in a novel manner to provide the requisite flexibility and dependability of operation.

It is another object of this invention to provide a double-acting lubrication pump operated by a continuously operating power source, in combination with a novel type of pressure controlled electro-magnetic friction clutch operatively connecting the power source with the pump.

It is a further object of this invention to provide a pressure controlled reciprocatory lubrication pump having a self-cleaning check valve arrangement disposed in the pump outlet conduit. This valve arrangement comprises a pair of spaced spring-pressed balls connected in series in the pump outlet in such a manner as to prevent reverse flow of the lubricant. When foreign matter in the lubricant becomes lodged in one of the valves of an arrangement, the other valve will function normally while the intermittent flow of the lubricant tends to dislodge the matter. In the present embodiment, such a valve arrangement is located in each of the two outlets of the double acting pump assembly.

It is another object of this invention to provide a pressure controlled reciprocatory pump having its piston

reciprocated by a cam operated Scotch yoke, in combination with means for automatically alining the yoke with the piston in response to the reciprocatory operating stresses.

It is yet another object of this invention to provide a self-contained service pump assembly having selectively operable units, each capable of performing a different servicing operation.

It is still another object of this invention to provide a self-contained service pump assembly of the class described, which is sufficiently light and compact to render it portable. The present invention is especially useful when it is desired to service equipment at its operating site, or at the point of break down in case of automotive equipment. The facilities of a modern service station can thus be made available without moving the equipment to be serviced.

It is another object of this invention to provide the combination of a lubrication pump, an electro-magnetic clutch for driving the same, and selectively operable means responsive to different pressures at the pump outlet for actuating the clutch.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is an elevational view showing a battery of pressure controlled service pump units driven from a common source of power;

FIGURE 2 is a sectional plan view taken along line 2—2 in FIGURE 1;

FIGURE 3 is an elongated vertical sectional view through a double acting grease pump assembly, and taken along line 3—3 in FIGURE 2;

FIGURE 4 is an enlarged transverse sectional view through the grease pumping assembly, and taken along line 4—4 in FIGURE 1;

FIGURE 5 is an enlarged transverse sectional view through the gear oil pumping unit, and taken along lines 5—5 in FIGURES 1 and 2;

FIGURE 6 is a transverse sectional detail view through the electro-magnetic clutch, and taken along line 6—6 in FIGURE 4;

FIGURE 7 is a transverse sectional detail view through the electromagnetic clutch, and taken along line 7—7 in FIGURE 4;

FIGURE 8 is a transverse sectional detail view through the electro-magnetic clutch, and taken along line 8—8 in FIGURE 4, and

FIGURE 9 is a schematic wiring diagram of the invention, and

FIGURE 10 is a view of a selectively operable pressure-actuated switch adapted to control the operation of the lubricating apparatus.

Referring more particularly to the drawings, the numeral **10** denotes a base member upon which is mounted a power unit such as gasoline engine **11**. A housing **12** is also mounted upon base **10**, which housing supports grease pump assembly **13**. Located at spaced points longitudinally of base **10** are gear oil pump unit **14**, hydraulic oil pump unit **15**, air compressor unit **16**, and gasoline or fuel oil pumping unit **17**.

Engine **11** has a V-type drive pulley **20** upon which is mounted V-belt **21**, said belt being also mounted on another V-type pulley **22** of electro-magnetic clutch broadly designated by reference character **23** (FIGURES 1, 2 and 4). The hub of pulley **22** is mounted upon the outer race of ball bearing **26**, the inner race of said bearing being securely fitted around hub **27** of friction disk **28**. Disk **28** is preferably made from conductive material such as cast iron.

The disk hub **27** securely fits around bushing **29**, said

bushing being secured to tapered portion 30*a* of shaft 30 by any suitable means such as key 31. The inside face of pulley 22 (FIGURE 6) has the inner ends of leaf springs 33 secured thereto as at points 34. The outer ends of each of said springs is bent axially away from the inside face of pulley 22 and is secured as at 35 to annular conductive friction ring 38. One face of ring 38 is disposed opposite to and engageable with a friction lining 39 secured upon one face of the friction disk 28. When the clutch is in disengaged position as shown in FIGURE 4, a small clearance 40 separates lining 39 from friction ring 38. Thus, the leaf springs 33 yieldably support friction ring 38 for movement axially of shaft 30 and toward and away from lining 39.

By inclining the leaf springs 33 to a non-radial position relative to the axis of rotation, a slight relative rotation occurs between friction elements 38 and 39 immediately upon engagement, thereby producing a gradual transmission of power and eliminating damage to the pumping mechanism resulting from impact and shock.

The face of friction disk 28 remote from lining 39, has an annular recess 44 therein. A stationary ring 45, made of conductive material such as magnetic steel, is adapted to fit into recess 44 so that a slight clearance 46 will exist between the proximate surfaces of the respective members. Ring 45 is supported by plate 47 which, in turn, is secured to aluminum hub 48 as at 49. The flange of hub 48 is secured as at 50 to housing 12.

Ring 45 has a coil 53 therein, one end of said coil being connected as at 54 to lead wire 55, and the other end of the coil being connected to ground wire 56 as at 57. Wire 56 is grounded upon steel bolt 50 (FIGURE 4).

When the coil 53 is de-energized, the pulley 22 rotates idly about hub 27, bushing 29 and shaft 30, the three last-named members remaining stationary. When, however, current flows through coil 53 from wire 55, an electromagnetic field is created which causes one face of rotating friction ring 38 to move axially into engagement with lining 39 of friction disk 38, thereby causing members 22, 28, 30, 38 and 39 to rotate in unison.

Secured in hub 48 is a pair of alined ball bearings 60 which rotatably support the shaft 30, said shaft projecting into pump casing 61 of grease pump assembly 13 (FIGURES 3 and 4) and having a pinion 62 on the projecting end. Pinion 62 meshes with gear 63 on shaft 64, one end of shaft 64 being rotatably mounted in housing cover 65. Cover 65 is secured to casing 61 by means of stud bolts 65*a*.

Casing 61 has flanges 66 in which slots 67 are provided. A bolt 68 penetrates each of the slots 67 and is threadably secured in housing 12, thereby permitting longitudinal adjustment of the position of the pump assembly 13 (FIGURES 1 and 4).

Shaft 64 has fixedly mounted thereon adjacent the gear 63 an eccentric 75, which eccentric is confined between verti-parallel surfaces 76 of Scotch yoke 77. By observing FIGUR1 4, it can be seen that one side of yoke 77 engages bosses 78 on cover 65 while its other side engages the proximate face of gear 63, thereby restricting the lateral movement of the yoke as it is reciprocated horizontally by eccentric 75.

The Scotch yoke 77 is adapted to operate a pair of reciprocatory pump units broadly designated by reference characters 81 and 82, located at opposite ends of the pump casing 61 and alined with the Scotch yoke. These pump units are opposite hand one to another except for details which will be described later; consequently, like reference characters will be applied to like parts of the respective units.

Pump units 81 and 82 comprise housings 83 and 84 respectively, said housings being secured to the opposite ends of casing 61 by means of stud bolts 85. Each of the housings 83 and 84 has a hollow chamber 86 therein and a bleeder valve 87 communicating with the latter. Chambers 86 of the respective housings are connected by a by-pass conduit 88.

A pump cylinder 91 penetrates each of the housings 83 and 84, as well as the housing chambers 86. Each cylinder 91 is provided with an enlarged head 92 fitting against one outer wall of the cylinder, and a nut 93 threadably secured on the other end of the cylinder and fitting against the other outer wall of the housing, thus securing the cylinder in position.

The cylinders 91 have alined longitudinal bores 94 therein, respectively, and each of these bores communicate with a chamber 86 by means of a plurality of radially disposed bores in the cylinder.

The alined cylinder bores 94 are also alined with the Scotch yoke 77, and the proximate ends of the bores have the ends of pistons 96 mounted therein, the other ends of said pistons being attached to the opposite sides of yoke 77 in a manner which will be later described.

It will be observed from FIGURE 3 that the overall length of yoke 77 and attached pistons 96 is substantially the same as the distance between the radial bores 95. Hence, as the yoke and pistons are reciprocated, the piston of one of the pump units will draw a charge of grease from its associated chamber 86 through bores 95 and into longitudinal bore 94, while the piston of the other pump unit expels a charge of grease from its associated bore 94.

In order to prevent binding and to promote smooth operation of the pump elements, the Scotch yoke 77 is attached to the ends of pistons 96 in such a manner that the yoke will automatically aline itself with the pistons in response to the operating stresses. This self-alining feature is made possible by providing a collar 99 on the proximate ends of each of the pistons, said collar fitting into a vertical slot 100 in yoke 77. A horizontally disposed slot 101 intersects each of the vertical slots 100 at approximately the mid-point thereof, said horizontal slot being adapted to receive the end of piston 96 (FIGURES 3 and 4). The width of slot 100 is substantially the same as the width of collar 99, but the depth of the slot is somewhat greater than the collar diameter. Also, the height of horizontal slot 101 is greater than the diameter of piston 96. Therefore, relative transverse movement between the ends of pistons 96 will be permitted by the above-described clearances in response to the operating stresses to cause the yoke to aline itself correctly with the reciprocating pistons.

Communicating with the outlet end of each cylinder bore 94 is a self-cleaning check valve assembly broadly designated by the reference character 103. Briefly stated, this assembly comprises a pair of serially arranged check valves in the outlet line of each reciprocatory pump unit. Should foreign matter in the grease become lodged in one of the valves, the other valve will continue to function normally while the intermittent pump action tends to dislodge the matter. The assembly comprises a block 104 having stud 104*a* threadably secured in the head 92 of cylinder 91, said stud having a restricted bore 105 therein which communicates with the outer end of alined bore 94. The other end of bore 105 communicates with a larger alined bore 106, and a valve seat 107 is provided at the junction of the two bores. A ball 108 is yieldably pressed against seat 107 by means of compression spring 109 confined in bore 106 by means of nut 110.

A vertically disposed bore 114 extends upwardly from a point in horizontally disposed bore 106 near the valve seat 107, the upper end of said bore 114 extending to the surface of block 104 and being closed by nut 115. Communicating with the upper portion of bore 114 is a second horizontally disposed bore 116 which, in turn, communicates with a larger alined horizontal bore 117. A valve seat 118 is provided at the junction of bores 116 and 117, said seat having a ball 119 yieldably held thereon by means of a compression spring 120. Spring 120 is confined in bore 117 by means of nut 121.

Each of the serially arranged check valves serves to prevent reverse flow of grease into the pump, and in addition, automatically serves as a spare when the companion valve becomes clogged with foreign matter. Usually any obstructing matter will become dislodged in a short time, due to the reciprocatory movement of the grease column in which the obstructed valve is located. Without this dual valve arrangement, the obstruction of a valve would interrupt the greasing operation until the obstructing matter is removed.

The lower ends of conduits **124** and **125** are respectively connected to horizontal bores **120** of valve assemblies **103**, there being one such assembly connected to the outlet of each pump unit **81** and **82**. Conduits **124** and **125** merge into pipe **126** (FIGURES 1 and 3), said pipe **126** being connected to dispensing hose **127** wound upon reel **128**. The outer end of hose **127** has a suitable dispensing nozzle **129** secured thereon.

Grease is supplied to pumping units **81** and **82** through a common inlet conduit **131** (FIGURES 1 and 2), said conduit leading from the lower portion of grease container **132** mounted upon housing **12**.

The operation of grease pump assembly **13** is controlled by the pressure in its delivery hose **127**, which pressure is adapted to operate either the high-pressure switch **134** or the low-pressure switch **134***a* depending upon the position of selectively operable control switch **155***a*. In the present installation, the switch **134** permits pump operation under pressures ranging from 1,000 lbs./sq. in. to 12,000 lbs./sq. in., and switch **134***a* under pressures ranging from 100 lbs./sq. in. to 1,000 lbs./sq. in. The ranges may be varied, however, by means of an adjustment mechanism comprising a portion of each switch and more fully described in Patent No. 2,111,969. When, for example, a predetermined high pressure of 12,000 lbs. per square inch has been built up in the hose, the high-pressure switch **134** is automatically opened (FIGURES 9 and 10) to sever the flow of current to electromagnetic clutch **23**, thereby disconnecting the grease pump assembly from its continuously operating source of power; and when a predetermined low pressure of 1,000 lbs./sq. in. is reached in hose **127**, the switch **134** is automatically closed to establish a flow of current through clutch **23** and to connect pump assembly **13** with its power source. Likewise, when the low-pressure **134***a* has been selected for operation, the flow of current through electro-magnetic clutch **23** will be interrupted at a high pressure of 1,000 lbs./sq. in. and reestablished at a low pressure of 10 lbs./sq. in.

Pressure switches **134** and **134***a* are connected to outlet conduit **126** by means of pipes **135** and are preferably of the type disclosed in the Patent No. 2,111,969, dated March 22, 1938. Switches **134** and **134***a* are substantially identical except for the different sizes of the respective hollow cylinders in which reciprocate pistons **136** and **136***a*.

One end of a transversely disposed arm **138** is secured to the intermediate portion of each piston **136** and **136***a*, the other end of each of said arm fitting around insulation collar **139** on conductive rod **140**. Rod **140**, in turn, is slidably mounted in insulation cylinder **141**, and the end of rod **140** has an enlarged contact head **140***a* adapted to move relative to contact **140***b* to make or break the electrical circuit flowing through the wires **55**, either to switch **134** or **134***a*; and then from the selected latter switch the current flows to wire **143** and to coil **53** of electro-magnetic clutch **23**. Spring **144** normally tends to urge the conductor **140**, **140***a* in an opposite direction from cylinder **141** (FIGURE 10), whereas spring **146** normally resists the pressure in cylinder **137**. As the pressure in cylinder **137** increases, the piston **136** or **136***a* will move to the left in FIGURE 10, and at the same time the members **138**, **140** and **140***a* will be moved therewith to break the circuit.

It will be observed that member **141** is mounted on a bracket **141***a*, which bracket is threadably secured upon an adjustment rod **145**, said rod having knurled nut **145***a* on the end thereof whereby the rod may be manually turned to adjust the gap between contacts **140***a* and **140***b* and thus establish a different range of operating pressures. The pressure ranges assigned to the switches **134** and **134***a* should complement one another but not overlap so that both switches will not be operated simultaneously.

The current supplied to clutch **23** is derived from storage battery **150**, said battery having one of its terminals grounded at **151** and its other terminal connected to a wire conduit **152**. Ammeter **153** and master switch **154** are installed in conduit **152**. Pull switch **155** is installed in lead wires **55** of each of the units **14** through **17**, and the previously mentioned selectively operable pull switch **155***a* is installed in the lead wires **55** of the lubrication unit **13**. To supply the coil **53** of the electromagnetic clutch **23** with current, the master switch **154** and one of the switches **155** and **155***a* are closed; and when the pressure in delivery hose **127** reaches a predetermined low, the pressure switch **134** or **134***a* will be operated to complete the circuit and reestablish pump operation (FIGURES 9 and 10).

Battery **150** is charged by generator **156** connected to battery poles by wires **157** and **158**. Starter **160** is connected to gasoline engine **11** and to battery **150** in a conventional manner by wires **161**, **162**, **163** and **152**. A solenoid switch **164** is installed between wires **161** and **162**, whereas a push-button switch **165** is installed between wires **162** and **163**. By closing master switch **154** and then the switch **165** the engine **11** may be started. Wire **166** leads from the magneto of engine **11** to ground **167**, said wire having switch **168** installed therein. Thus, the engine may be stopped by closing switch **168**.

The continuously operating engine **11** also drives four other electromagnetic clutches **23** respectively connected to the pumps of gear oil unit **14**, hydraulic oil unit **15**, compressed air unit **16**, and fuel oil unit **17**. These four clutches are connected in series with one another and with engine **11** by means of belts **170**, **171**, **172** and **173**. Belt **170** is mounted upon take-off pulley **174** of engine **11** and transmits the power to the four clutches **23** through the above-described interconnecting belts.

The four last-named electro-magnetic clutches are identical in all essential respects to the clutch **23** described in detail in connection with the grease pumping assembly **13**. Each of the shafts **30** of the latter four clutches, however, has a small pinion **30***b* formed on its projecting end rather than the larger pinion **62** in the first instance. Pinions **30***b* mesh with larger gears **175** on shafts **176** of units **14**, **15**, **16** and **17** respectively.

Each of the shafts **176** of units **14**, **15**, and **17** drives a gear pump **178**, said pump having an intake conduit **179** leading to one side thereof and an outlet conduit **180** leading from its other side. These outlet conduits each have a check valve mounted therein for preventing reverse flow of the lubricating materials or fuels.

By observing FIGURE 1, it will be seen that the outlet conduit **180** of each of the pumping units **14** and **15** is connected to a pipe **183**, said pipe being connected to a dispensing hose **185** leading therefrom. Each hose **185** has a suitable nozzle **186** secured on its outer end.

The operation of the air compressor pumping unit **16** is similar to that described in connection with grease pumping assembly **13**, and accordingly is provided with a suitable conventional time interval switch **234**. The operation of pumping units **14**, **15** and **17** is automatically controlled by the pressures in the respective delivery conduits and in a manner slightly different from that described in connection with unit **13**. Units **14**, **15** and **17** are each provided with "flip" switch **196** schematically illustrated in FIGURE 9, which switch operates in-

stantly upon lowering of the pressure in the delivery hose.

Switch **196** comprises a piston **197** having a conductive switch bar **198** connected thereto and adapted to close and open a gap in conduit **55** to control the flow of current to electro-magnetic clutch **23**. Bar **198** is held open by the pressure in the outlet pipe and moved to closed position by spring **199** when the pressure falls.

In the drawings and specification, preferred embodiments of the invention are shown, and although specific terms are employed they are not intended for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. Lubrication apparatus comprising a pump having a shaft by which it is driven, a prime mover for driving said shaft, rotary means loosely mounted on said shaft, driving means interconnecting said prime mover with said loosely mounted rotary means to cause the latter to be continuously rotated, a stationary magnetic ring member concentric with the pump shaft, a coil embedded in said ring member, a friction disk secured upon said rotary means and axially movable of the shaft, said disk being disposed within the field of magnetic flux of said ring member, a second friction disk fixed upon said shaft and disposed between said first disk and said stationary magnetic ring, whereby when said coil is energized the rotation of said first disk will cut the lines of magnetic flux produced by the ring member to cause the first friction disk to be moved axially of the shaft and into engagement with the second friction disk, electric circuit means of said coil including a source of electrical current, a plurality of pressure switches for controlling respectively a plurality of ranges of pressures, means for communicating the pressures at the outlet of said pump to each of said pressure switches, an electrical circuit for each said pressure switch, and switch means for selectively connecting said circuits with said current source.

2. Lubrication as defined in claim 1 wherein torsion spring means is provided for securing said first-named friction disk upon said rotary means whereby the shock occurring from a sudden increase of torque will be damped.

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