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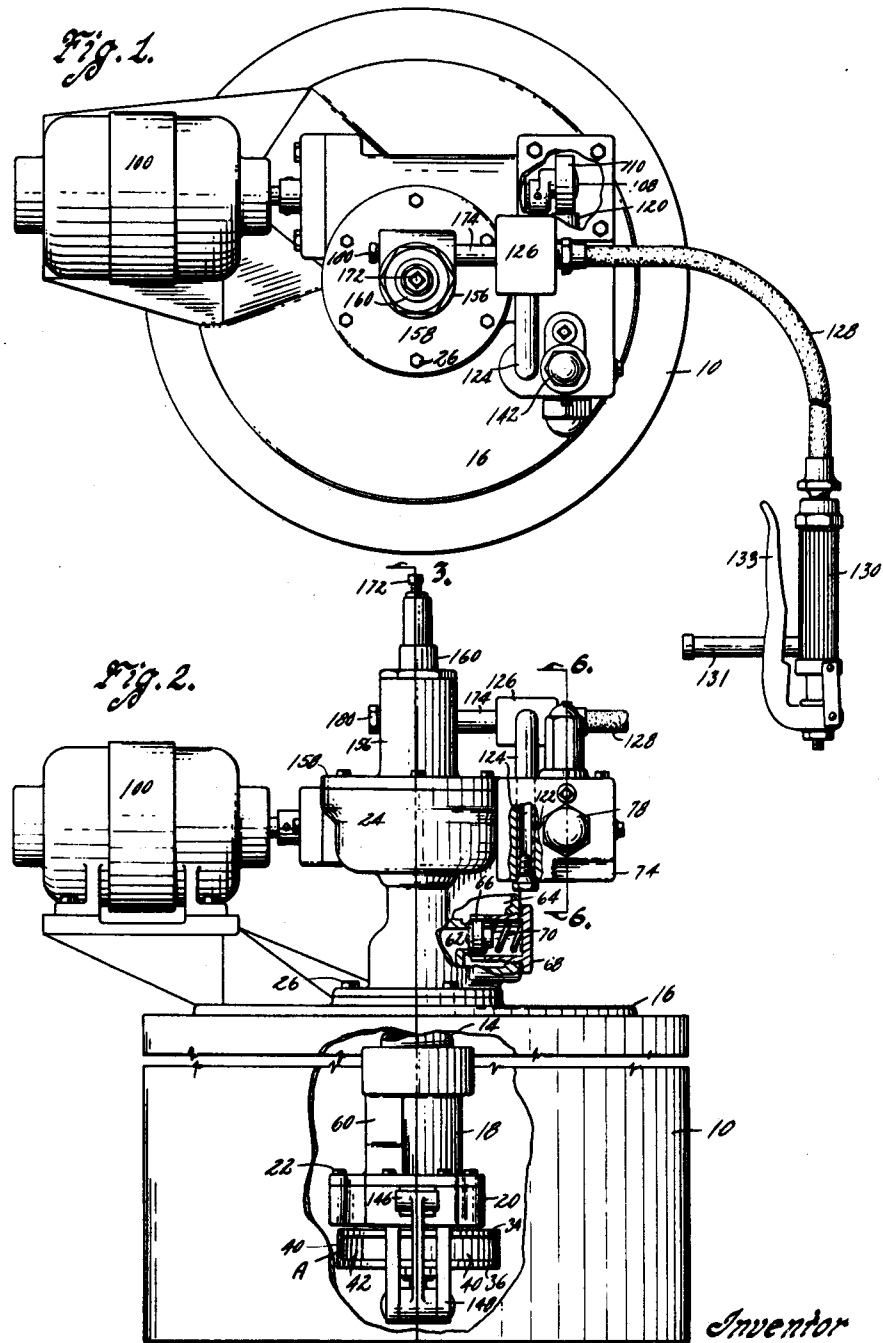
G. H. HARTMAN

1,943,605

GREASING APPARATUS

Filed Nov. 23, 1931

3 Sheets-Sheet 1



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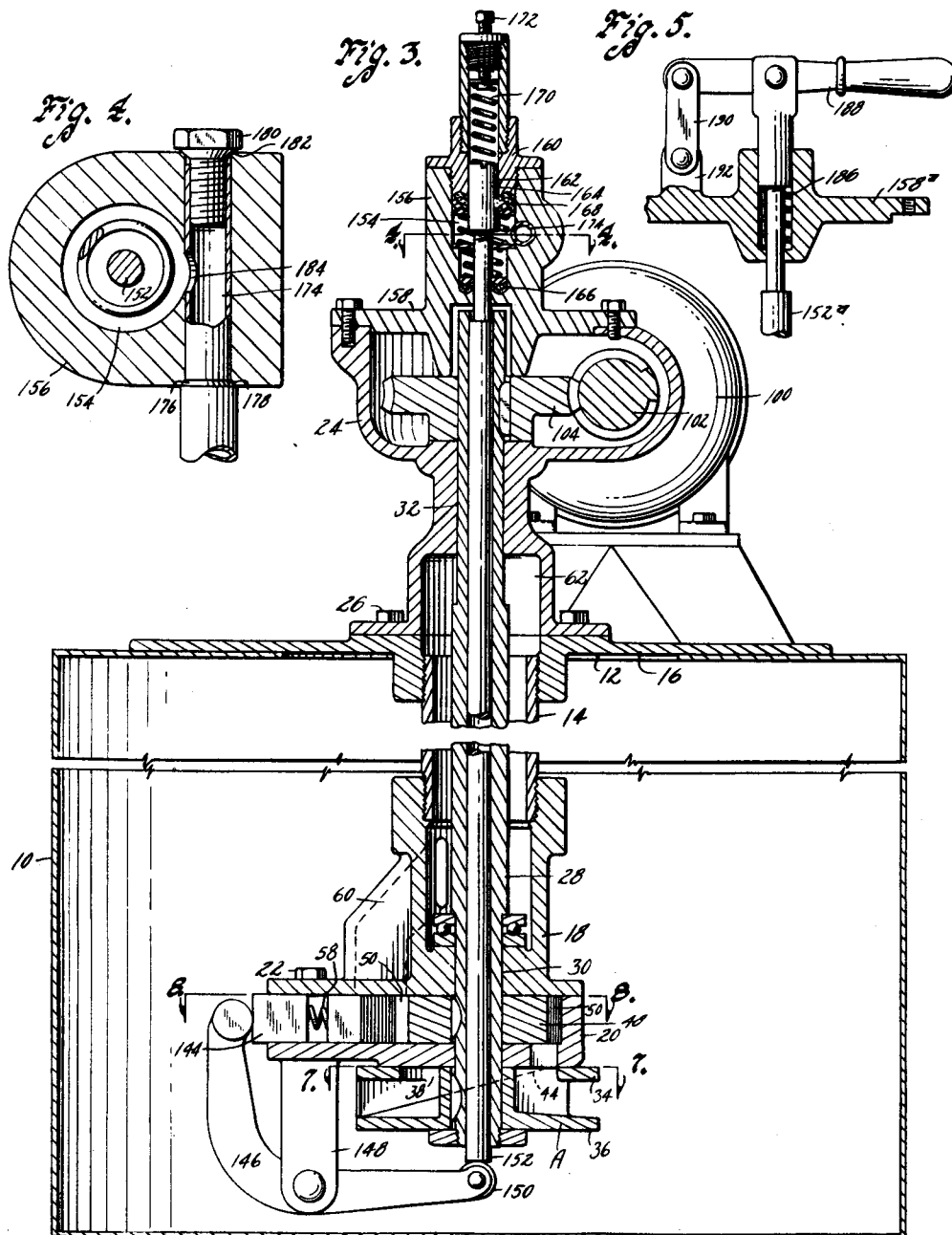
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3 Sheets-Sheet 2



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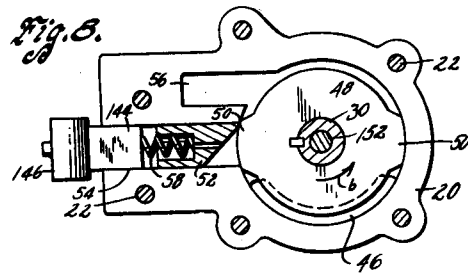
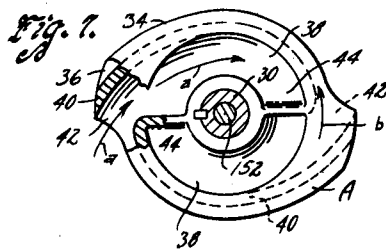
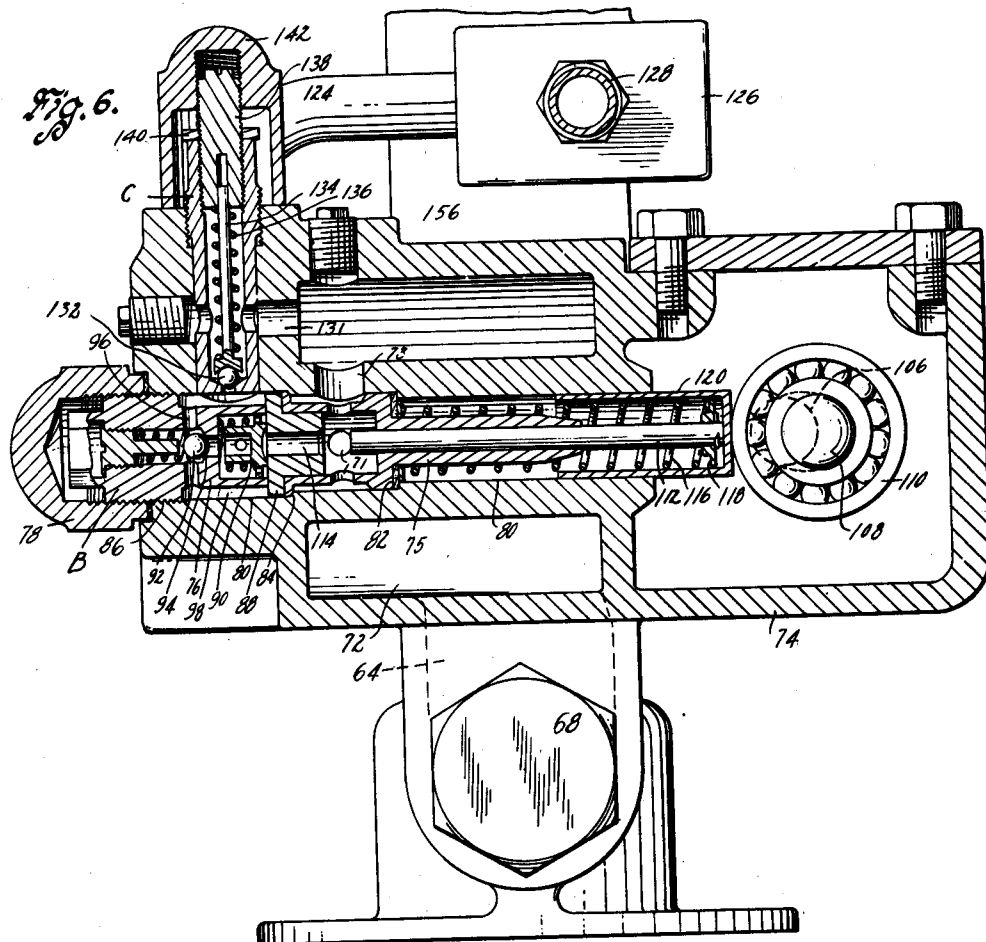
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,943,605

GREASING APPARATUS

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Application November 23, 1931
Serial No. 576,689

12 Claims. (Cl. 221—47.1)

An object of my present invention is to provide a greasing apparatus or lubricant dispensing device of portable character which may be operated by an electric motor or other power means and which is comparatively simple in proportion to the results obtained.

A further object is to provide a pump structure in which first, second and third stage pumps are provided with an automatic means for rendering the second stage pump ineffective and the third stage pump effective, such means being operated by the pressure of the lubricant being dispensed.

Still a further object is to provide a greasing apparatus or lubricant dispensing structure in which two pumps are provided, one for pumping a large volume of lubricant at low pressure and the other for pumping a small volume of lubricant at high pressure, both pumps being continuously operated from the same source of power, but only one of them being effective at a time.

A further object is to provide means for normally allowing lubricant pumped by the low pressure pump to pass through the high pressure pump without the high pressure pump imparting a high pressure to such lubricant, but the high pressure pump being effective and the low pressure pump ineffective when resistance to the lubricant being dispensed is encountered so that the device can be used in connection with lubricant receiving fittings and will normally quickly lubricate them under low pressure, but will more slowly lubricate them under high pressure if resistance to the flow of grease into the fitting is encountered.

Still a further object is to utilize the built up pressure caused by such resistance for automatically rendering the low pressure pump ineffective so that the high pressure pump can then operate, this operation being entirely automatic so that it does not require any of the user's attention.

A further object is to provide a pair of pumps, one being of high pressure type comprising a cylinder and a plunger, the plunger during a portion of its reciprocation being removed from the cylinder whereby the other pump may pump a large volume of lubricant through the cylinder during the period of time that the plunger traverses such portion of its reciprocation.

Another object is to provide a modified form of construction in which the pump that is rendered ineffective may be adjusted to an operative position manually so that the pump can operate continuously but will be effective as a pump only when so manually adjusted.

With these and other objects in view my invention consist in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in

my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of a portable greasing apparatus or lubricant dispensing device embodying my invention.

Figure 2 is a side elevation of the same, parts thereof being broken away and other parts shown in section.

Figure 3 is a vertical, enlarged, sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view similar to the top portion of Figure 3 showing the modified construction.

Figure 6 is an enlarged, sectional view on the line 6—6 of Figure 2 showing the third stage pump.

Figure 7 is a sectional view on the line 7—7 of Figure 3 showing the first stage pump; and

Figure 8 is a sectional view on the line 8—8 of Figure 3 showing the second stage pump.

On the accompanying drawings I have used the reference numeral 10 to indicate an original container for grease or other lubricant. The container 10 has an opening 12 in the top thereof through which the intake tube 14 of my lubricant dispensing device may be inserted.

The intake tube 14 is supported by a flange 16 resting on top of the container 10. A hub member 18 is secured to the lower end of the intake tube 14 and a second stage pump housing 20 in turn is secured to the hub 18 as by bolts 22. A worm gear housing 24 is secured to the flange 16 as by bolts 26. A tubular drive shaft 28 is journaled in bores 30 and 32 of the hub 18 and the housing 24 respectively.

A first stage pump member A is keyed to the lower end of the drive shaft 28 and includes upper and lower flanges 34 and 36. The flange 34 is provided with a pair of outlet openings 38, while a pair of spirally arranged wall members 40 connect the flanges 34 and 36 together. The walls 40 are arranged as shown in Figure 7 so that they provide inlet openings 42 into which the lubricant is forced as indicated by the arrows *a* when the pump member A rotates in the direction of the arrow *b*.

The flange 36 in the intake ends 42 is relatively low compared to the opposite ends 44 as perhaps best shown in Figure 3, partly by dotted lines. It is therefore obvious that rotation of the pump member A in the direction of the arrow *b* will cause lubricant from the container 10 to be elevated from the intake ends 42 to the opposite ends 44.

The outlet openings 38 of the flange 34 communicate with an inlet opening 46 of the second stage pump housing 20 (see Figures 3 and 8). A second stage pump rotor 48 is keyed to the tubu-

lar shaft 28 and is provided with lobes 50 contacting with the interior shaft of the housing 20. Different rotors 48 may be substituted for the one shown having more or less marked lobes 50 for pumping greater or less quantities of lubricant by the rotor 48.

A wiper 52 is slidably mounted in a square socket 54 of the housing 20 to wipe lubricant from the lobes 50 as the rotor 48 rotates in the direction of the arrow *b* and causes flow of such lubricant into a discharge passageway 56. The wiper 52 is normally and resiliently retained in contact with the rotor 48 by a spring 58.

The discharge passageway 56 extends up through a web 60 of the hub 18 (see Figure 3) and discharges into the intake tube 14. The lubricant is then forced up through the tube 14 by the second stage pump rotor 48 and into a cavity 62 of the worm gear housing 24.

The cavity 62 communicates with a cavity 64 (see Figure 2) with a check valve 66 interposed between the two cavities. The check valve 66 is mounted in a valve cage 68 and is spring pressed to close against the cavity 62 by a spring 70.

The cavity 64 communicates with a cavity 72 in a third stage pump housing 74. Within the housing 74, I provide a third stage pump assembly B consisting of a guide member 75, a valve cage 76, a closure nut 78 and other associated parts, which will now be described. All are mounted in a bore 80.

The guide member 75 is seated against a gasket 82 and against a shoulder 84. The cage 76 is screwed into a threaded portion 86 of the bore 80 and bears against a cylinder member 88 which is mounted in the guide member 75 and causes the guide member to seat against the shoulder 84 and against the gasket 82, the gasket being slightly compressible so that both joints can be rendered tight.

Within the valve cage 76 I provide a primary check valve 90 seated against the cylinder member 88 and a secondary check valve 92 seated against a seat 94. From the cylinder member 88, lubricant can be forced past the check valves 90 and 92 and through the passageway 96 into a cavity 98. The closure nut 78 retains the valve cage 76 in position and completely encloses it.

The tubular shaft 28 is rotated from a motor 100 which is provided with a worm 102 meshed with a worm gear 104. The worm gear 104 is keyed to the tubular shaft as shown in Figure 3. The shaft of the motor 100 extends into the third stage pump housing 74 as indicated at 106, and is provided with an offset or eccentrically mounted crank pin 108. A roller 110 is mounted on the crank pin 108 for contact with a plunger 112 guided in the guide member 75 and adapted to enter the cylinder 114 of the cylinder member 88 during a portion of the reciprocation of the plunger. The plunger 112 is held in engagement with the roller 110 by a spring 116 engaging a flange 118 of the plunger. A sleeve member 120 encloses the spring 116.

The cavity 98 into which the lubricant is forced after passing the check valves 90 and 92 communicates by a passageway 122 with a tube 124. The tube 124 extends to a header 126 which in turn communicates with a tubular dispensing hose 128 and discharge nozzle 130 (see Figures 1 and 2).

A by-pass valve C is arranged for by-passing lubricant under excessively high pressure from the passageway 98 back to the cavity 72 (see Figure 6). The valve assembly C comprises a valve

ball 132 normally seated by a follower pin 134 and a spring 136. The tension of the spring 136 is adjustable by rotating an adjusting sleeve 138. A lock nut 140 is provided for the adjusting sleeve 138. A closure nut 142 normally encloses the valve C but may be removed for adjusting the sleeve 138.

Referring to Figure 3 it will be noted that I have provided a backing block 144 for the spring 58. A bell crank lever 146 is pivoted on a bracket 148 and has a roller 150 engaged with a control rod 152. The control rod 152 extends through the tubular drive shaft 28 and into a cavity 154 of a hub 156. The hub 156 is formed on a cover plate 158 for the worm gear housing 24.

A cylinder member 160 is screwed into the upper end of the hub 156 and has a cylinder bore 162 to receive a piston 164 of the control rod 152. The rod 152 and the piston 164 are packed relative to the hub 156 by packings 166 and 168 respectively. These packings are retained tight by springs as clearly shown.

The control rod 152 is normally retained in the position of Figure 3 by a spring 170 of sufficient tension to normally aid the spring 58 in keeping the wiper 52 against the pump rotor 48 and the tension of the spring 170 may be adjusted by an adjusting screw 172.

The cavity 154 is hydraulically connected with the header 126 by a pipe 174. This serves to introduce the pressure built up in the hose 128 into the cavity 154 for acting on the piston 164 as will hereinafter be described.

In Figure 4 I have shown how the pipe 174 is connected with the hub 156 and sealed relative thereto. It will be noted that the pipe has a shoulder 176 seating against a seat 178 of the hub 156. The shoulder and seat are retained in tight engagement with each other by a cap screw 180. The cap screw 180 seats against a seat 182 of the hub 156 and screws into the pipe 174 whereby tightening of the cap screw draws the shoulders 176 and 178 together, as well as drawing the head of the cap screw 180 against the seat 182. The pipe 174 has an opening 184 in its side to communicate with the cavity 154. The same construction just described is illustrated in Figure 2 for connecting the pipe 124 with the third stage pump housing 74.

In Figure 5, I have shown a modified construction in which parts similar to those shown in Figure 3 are given the same reference numeral with the addition of the distinguishing characteristic—*a*. The control rod 152_a in this instance is retained in raised position by a spring 186. The control rod may be lowered manually by a lever 188 which is pivoted by a link 190 to an ear 192 on the closure plate 158_a. The purpose and use of this modification will be hereinafter described.

Practical operation

Having fully described the details of construction of my portable greasing apparatus or lubricating device, I will now describe the operation thereof:

With the pump motor 100 in operation, the first stage pump A and the pump rotor 48 will be continuously rotated and likewise the crank pin 108 will be continuously rotated for imparting reciprocation to the plunger 112. With the nozzle portion 131 of the discharge nozzle 130 connected with a lubricant receiving fitting, the valve of the nozzle may be opened by depressing 1.

a handle 133 in the ordinary manner so that the lubricant dispensing device can commence pumping lubricant into the lubricant receiving fitting. If the fitting will receive lubricant freely the normal operation of the mechanism is as follows:—

The rotating first stage pump A picks up lubricant from the container 10 and discharges it through the passageway 46 into the housing 20. The pump rotor 48, in conjunction with the wiper 52, pumps a large volume of lubricant at low pressure up through the passageway 56, intake tube 14 and check valve 66 to the cavities 64 and 72. From the cavity 72 the lubricant passes through openings 73 and 71 and then through the cylinder 114 while the plunger 112 is in the disengaged position of Figure 6. This large volume of lubricant opens the check valves 90 and 92 and flows through them and the passageway 96 into the cavity 98, from which it flows through the passageway 122 and pipe 124 and on to the hose 128 so that it can be supplied to the discharge nozzle 130.

The foregoing normal operation permits of quick filling of the bearing on which the lubricant receiving fitting is mounted, but if it so happens that great resistance is encountered, because of the bearing being clogged or for any other reason, the pressure in the hose will be built up and will likewise be built up in the cavity 154 (see Figure 3). This causes the piston 164 to be raised against the action of the spring 170, thereby releasing the tension of the spring 58 so that the wiper 52 is ineffective and consequently renders the second stage pump ineffective even though the rotor 48 continues to rotate. The rotor 48 and the first stage pump, however, continue to supply lubricant, through the intake pipe 14, to the space around the plunger 112 with plenty of chance for slippage of the first and second stage pumps relative to the lubricant, because of their attempting to supply more lubricant than can be handled by the third stage pump.

Practically the entire power of the motor 100 will now be utilized in operating the high pressure third stage pump plunger 112 for supplying the lubricant under much higher pressure than possible by the second stage pump rotor 48. This will be evident because of the pressure in the hose 128 being built up to such an extent that the second stage pump is rendered ineffective by the control rod 152 as just described, and the plunger 112 will force a small quantity of lubricant at high pressure in to the hose 128 each time the plunger reciprocates into the cylinder 114. As soon as the high pressure condition is relieved, the spring 170 will force the control rod 152 downwardly so that the second stage pump is again and automatically rendered effective and accomplishes the dispensing operation thereafter until high resistance is again encountered. Thus it will be obvious that large quantity, low pressure dispensation normally occurs, but small quantity, high pressure dispensation is automatically effected whenever called for because of conditions encountered.

The check valve 66 serves to trap a quantity of lubricant in the cavities 64 and 72 which is supplied to the third stage pump B when pressure built up in the hose 128 and the cavity 154 raises the piston 164 for releasing the tension of the spring 58 and thus rendering the second stage pump ineffective. The by-pass valve 132 is provided for an emergency in which the bearing is frozen and the third stage pump has a tendency to build up a pressure in the hose 128

which would eventually burst the hose or cause other damage. It will be obvious that before such an excessively high pressure is reached, the valve 132 will open against the tension of the spring 136 so that a reciprocation of the plunger 112 causes the lubricant to pass the valve 132 and flow back into the cavity 72 through a passageway 131.

Although I have illustrated first, second and third stage pumps, the second and third stage pumps only can be used, or the first and second ones can be used for a dispenser which dispenses only a large quantity of lubricant at low pressure. Again, the second stage pump only might be used. In the event that the first and second, or second stage pump only were used, the control rod 152a may still be utilized. It may be used where the motor 100 operates continuously and the second stage pump is normally ineffective, by the spring 186 raising the rod 152, but can be rendered manually effective by depressing the lever 188 and thus applying tension on the spring 58.

Instead of a manual control, however, the pump may be left as in Figure 3 which will provide an automatic rendering of the second stage pump ineffective when the valve in the discharge nozzle is closed and the pressure subsequently builds up.

The particular arrangement of mechanism provides for automatic selective operation of the second or third stage pump only depending on conditions encountered and cuts down the time for the lubricating operation.

Changes as shown in the modification and others as well, can be made without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:—

1. A lubricant dispensing structure comprising first, second and third stage pumps, a discharge nozzle, means for normally causing dispensation of a large volume of lubricant therethrough at low pressure by said second stage pump, said third stage pump being operative to pump a small volume of lubricant through said discharge nozzle at high pressure upon the lubricant encountering a predetermined resistance during dispensation from said discharge nozzle and means operated by the increased pressure of the lubricant in said nozzle for rendering said second stage pump ineffective as a pump and operable only as a movable element in the lubricant flowing from said first stage pump to said third stage pump upon such operation of said third stage pump.

2. A lubricant dispensing structure comprising first, second and third stage pumps, said second stage pump comprising a rotor and a movable wiper, a discharge nozzle, means for normally causing dispensation of a large volume of lubricant therethrough at low pressure by said second stage pump, said third stage pump being automatically operative to pump a small volume of lubricant through said discharge nozzle at high pressure upon the lubricant encountering a predetermined resistance during dispensation from said discharge nozzle and means operated by the increased pressure of the lubricant in said nozzle for moving said wiper to an ineffective position upon such operation of said third stage pump.

3. In a lubricant dispensing structure, a dis-

- charge nozzle, first and second stage pumps for discharging lubricant therefrom, means for continuously and simultaneously operating said pumps, said second stage pump including a rotor and a wiper blade coacting with the periphery thereof and means for moving said wiper blade to non-wiping position to thereby render said second stage pump inoperative to pump lubricant when desired.
4. In a lubricant dispensing structure, a discharge nozzle, first and second stage pumps for discharging lubricant therefrom, means for continuously and simultaneously operating said pumps, said second stage pump including a rotor and a spring urged wiper blade coacting with the periphery thereof and manually operable means for moving said wiper blade to non-wiping position to thereby render said second stage pump inoperative to pump lubricant when desired.
5. In a lubricant dispensing structure, a discharge nozzle, first and second stage pumps for discharging lubricant therefrom, means for continuously and simultaneously operating said pumps, said second stage pump including a rotor and a wiper blade coacting with the periphery thereof and means to move said wiper blade to a non-wiping position to render said second stage pump inoperative to pump lubricant, said means being automatically controlled dependent upon the pressure of the lubricant being dispensed.
6. In a lubricant dispensing structure, a discharge nozzle, a primary and a secondary pump for dispensing large and small volumes of lubricant therethrough at low and high pressures respectively, said primary pump being normally operable to pump lubricant without said secondary pump imparting high pressure thereto, said secondary pump including a rotor and a wiper blade coacting with the periphery thereof and pressure operated means responsive to pressure in said discharge nozzle to move said wiper blade to non-wiping position and thereby render said primary pump inoperative to pump any lubricant and said secondary pump operative to pump lubricant at high pressure.
7. In a lubricant dispensing structure, a discharge nozzle, first and second stage pumps for discharging lubricant therefrom, said second stage pump being of rotary type, power means for continuously operating movable elements of said pumps and means to move one of the movable elements of said second stage pump to inoperative position to thereby render the pump inoperative to pump any lubricant and thereby eliminate the need of any power being expended to overcome inertia or momentum of lubricant when the second stage pump is rendered inoperative even though one of the movable elements thereof is still being operated by said power means, said means being responsive to pressure in said discharge nozzle.
8. A lubricant dispensing structure comprising primary and secondary pumps, power means to simultaneously operate said pumps, said secondary pump being of reciprocating type including a cylinder and a plunger, said plunger, during a portion of its reciprocating movement allowing flow of lubricant from the space around said plunger into said cylinder, said primary pump normally pumping lubricant into said cylinder during the time when the plunger traverses such portion of its reciprocating movement, movable means to render said primary pump ineffective as a pump and said secondary pump effective to discharge lubricant from said discharge nozzle under higher pressure than said primary pump can produce and pressure operated means to move said movable means, said pressure operated means being hydraulically connected with said discharge nozzle and thereby automatically operated from pressure built up in said discharge nozzle.
9. A lubricant dispensing structure comprising first, second and third stage pumps, a discharge nozzle, means for normally causing dispensation of a large volume of lubricant therethrough at low pressure by said second stage pump, said third stage pump being operative to pump a small volume of lubricant through said discharge nozzle at high pressure upon the lubricant encountering a predetermined resistance during dispensation from said discharge nozzle and means for rendering said second stage pump ineffective as a pump and operable only as a movable element in the lubricant flowing from said first stage pump to said third stage pump upon such operation of said third stage pump.
10. In a greasing apparatus, a large volume low pressure pump, an intermediate volume intermediate pressure pump and a small volume high pressure pump, said pumps being hydraulically connected in series, a nozzle at the discharge end of the third pump, said third pump including a cylinder and a plunger, said plunger in one position permitting the second pump to pump grease past the plunger and into and through the cylinder and means to permit the first pump to pump grease through the second pump directly to the third pump and the third pump only to pump said grease from said nozzle at low volume high pressure.
11. In a greasing apparatus, a large volume low pressure pump, an intermediate volume intermediate pressure pump and a small volume high pressure pump, said pumps being hydraulically connected in series, a nozzle at the discharge end of the third pump, said third pump including a cylinder and a plunger, said plunger in one position permitting the second pump to pump grease past the plunger and into and through the cylinder and means responsive to pressure in said nozzle to permit the first pump to pump grease through the second pump directly to the third pump and the third pump only to pump said grease from said nozzle at low volume high pressure.
12. In a greasing apparatus, a large volume low pressure pump, an intermediate volume intermediate pressure pump including a rotor and a wiper and a small volume high pressure pump, said pumps being hydraulically connected in series, a nozzle at the discharge end of the third pump, said third pump including a cylinder and a plunger, said plunger in one position permitting the second pump to pump grease past the plunger and into and through the cylinder and means to render said wiper ineffective and thereby to permit the first pump to pump grease through the second pump directly to the third pump and the third pump only to pump said grease from said nozzle at low volume high pressure.

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