

Feb. 10, 1959

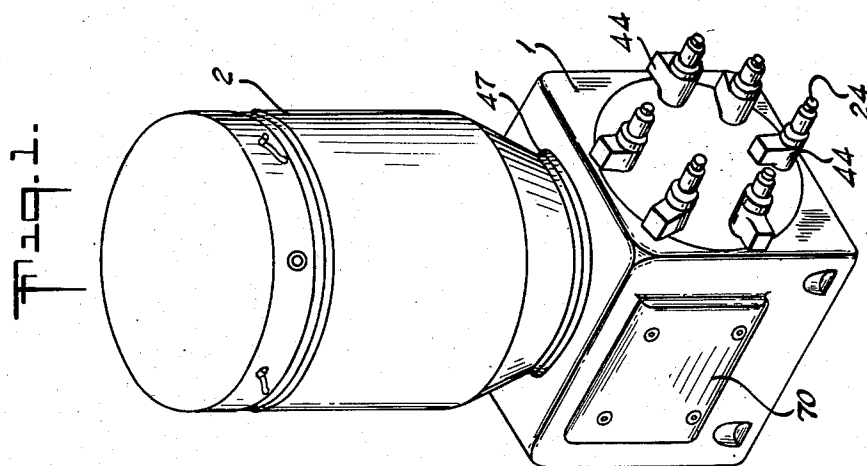
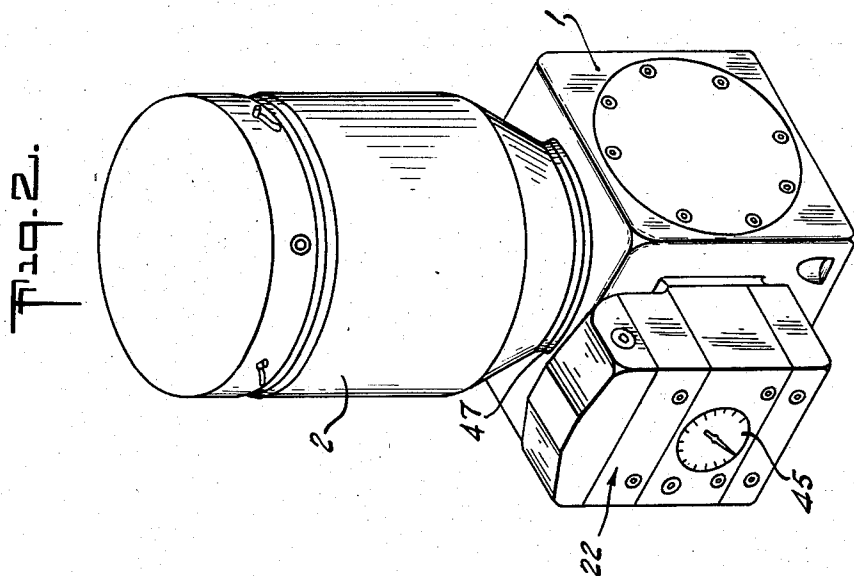
A. MEINELT

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LUBRICANT DISTRIBUTING PUMP

Filed Aug. 17, 1956

4 Sheets-Sheet 1



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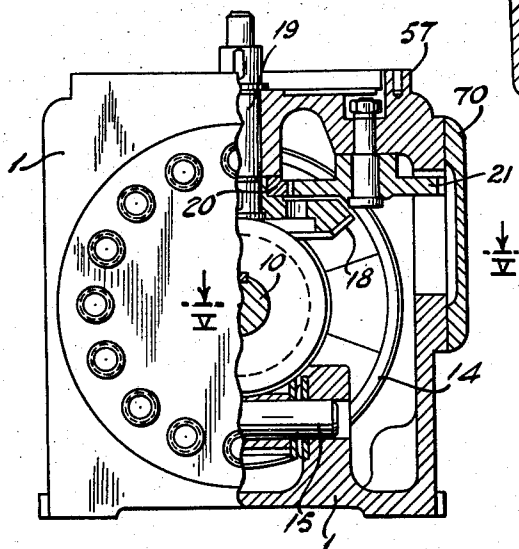
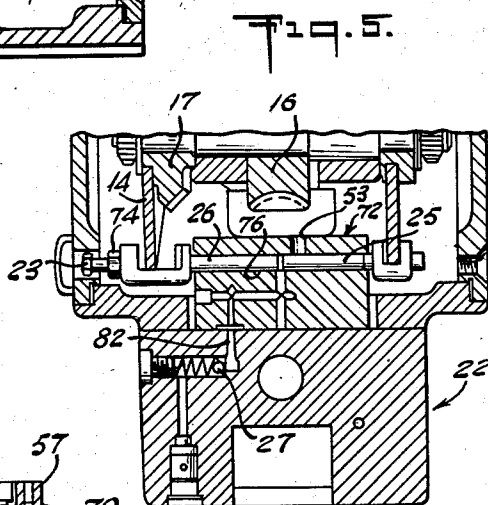
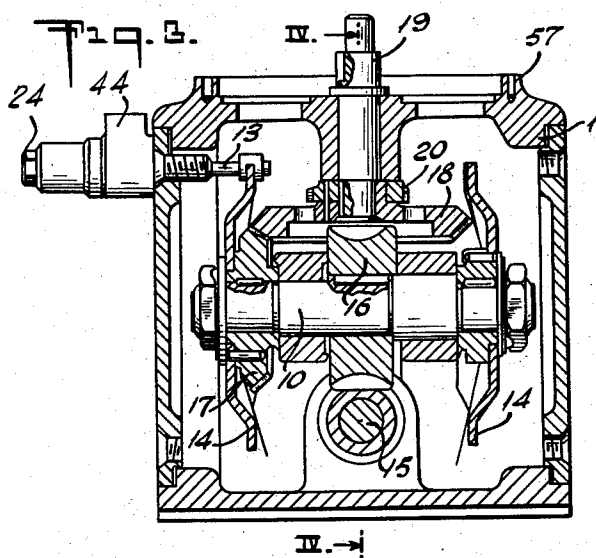
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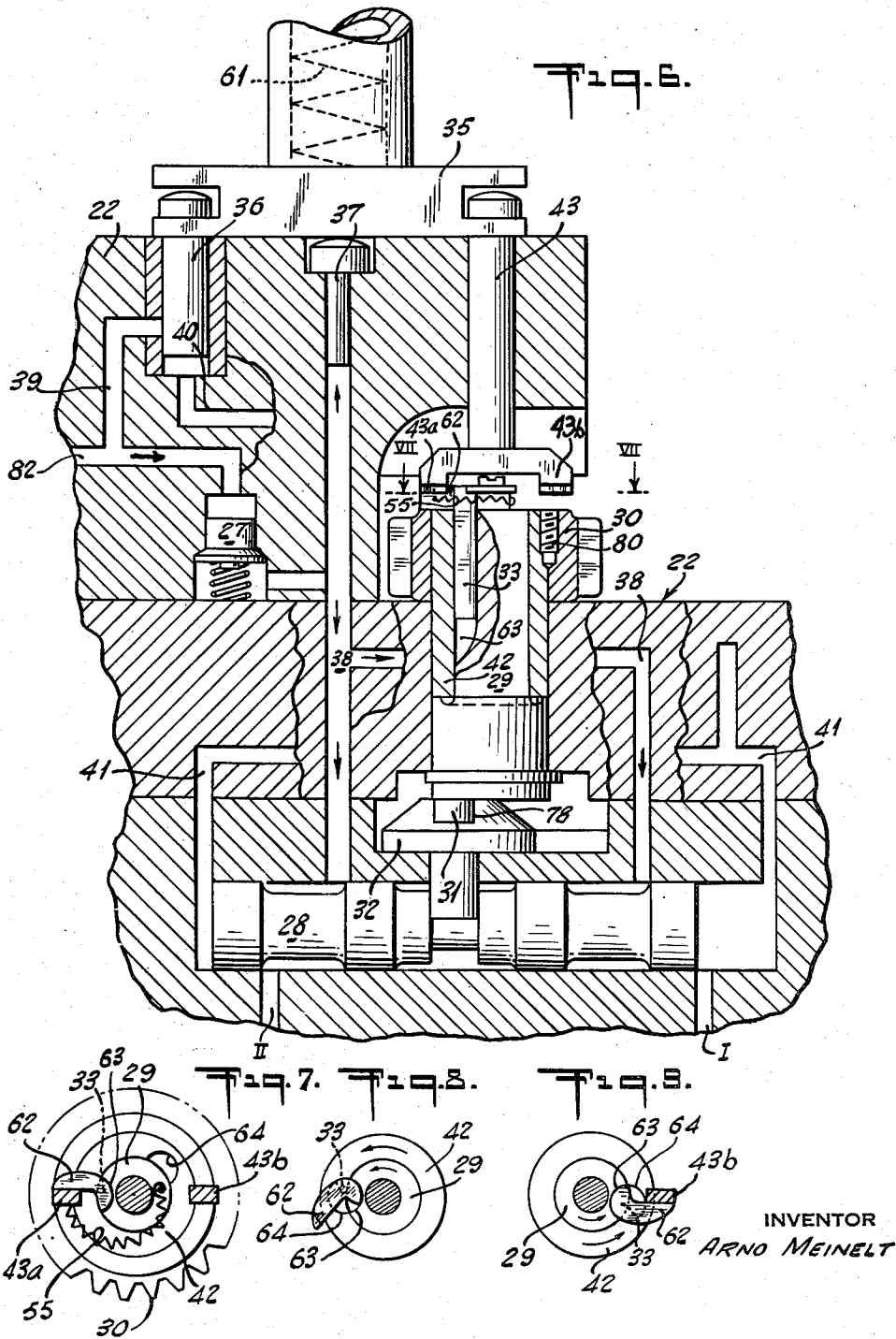
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4 Sheets-Sheet 3



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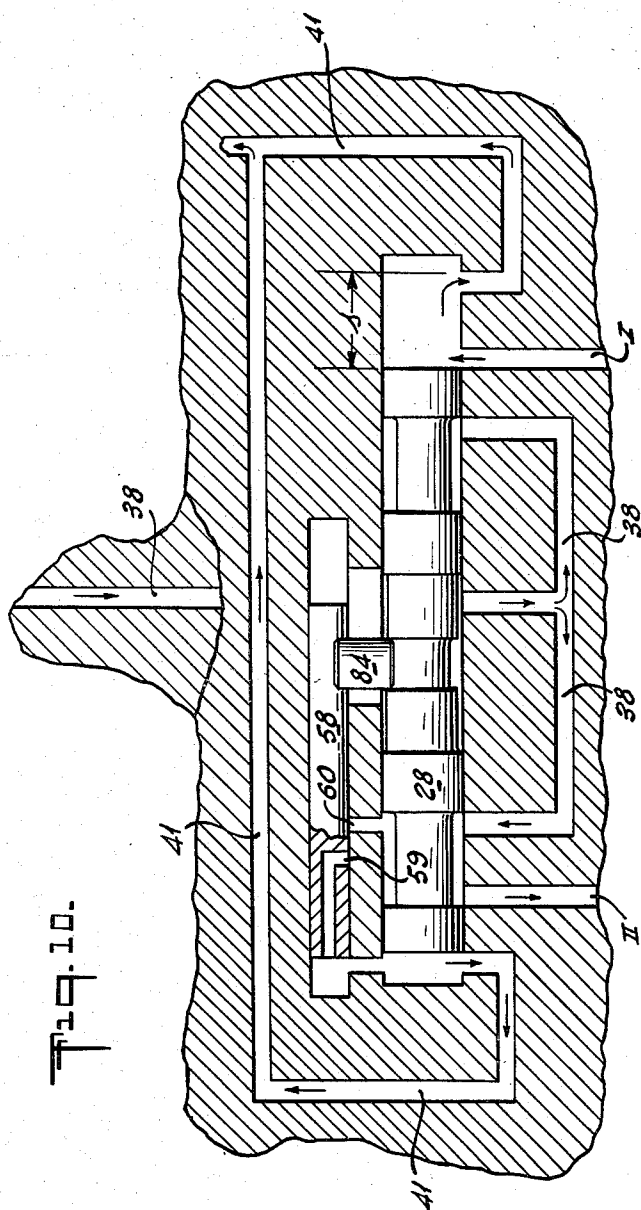


Fig. 10.

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1

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LUBRICANT DISTRIBUTING PUMP

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8 Claims. (Cl. 184—27)

This invention relates to the lubrication of several parts of a machine or device from a single place of supply and more particularly to a lubricant distributing pump for use in connection with a "single-line" lubricating system or a "twin-line" lubricating system.

The term "single-line" lubricating system is deemed to define a lubricating system wherein each pump element is directly connected with a place to be lubricated. The term "twin-line" lubricating system is deemed to indicate a lubricating system, wherein the pump discharges the lubricant into two main lines, from each of which a plurality of individual lines branch off and connect the respective main line with the places to be lubricated.

An object of the invention is to provide a lubricant distributing pump which may be used either for a single-line or for a twin-line lubricating system or for a single-line system and a twin-line system simultaneously.

Another object of the invention is to provide a lubricant distributing pump by means of which all places to be lubricated may be reliably supplied with lubricant of any kind.

A further object of the invention is to provide a lubricant distributing pump which may be manufactured at low costs.

Still another object of the invention is to improve on the art of lubricant distributing pumps as now ordinarily made.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings forming part of this specification, wherein:

Fig. 1 is a perspective view of a high pressure lubricant distributing pump according to the invention for use in connection with a single-line system,

Fig. 2 is a perspective view of a high pressure lubricant distributing pump according to the invention for use in connection with a twin-line system,

Fig. 3 is a vertical sectional view of the casing of the pump shown in Fig. 1 and the mechanism arranged therein,

Fig. 4 is partly a side elevational view of the casing of the device shown in Fig. 3 and partly a sectional view taken on line IV—IV of Fig. 3,

Fig. 5 is a sectional view of the device shown in Fig. 4 taken on line V—V of Fig. 4, wherein, however a controlling mechanism is attached to the casing for making the pump ready for use in connection with a twin-line system,

Fig. 6 is a somewhat diagrammatical sectional illustration of the hydraulic-mechanical distribution control arrangement used when the pump is to be used for a two line system,

Fig. 7 is a sectional view taken on line VII—VII of Fig. 6,

Figs. 8 and 9 illustrate elements of the detail shown in Fig. 7 in different positions, and

Fig. 10 is a diagrammatical sectional view of a pre-setting control used in connection with the hydraulic-

2

mechanical lubricant distribution control arrangement of the pump when the latter is used for a twin-line system.

Referring now to Figs. 1–5, the lubricant distributing pump comprises a casing 1 closed on all sides and accommodating the pump mechanism proper. A lubricant-holding container or reservoir 2 is carried by the casing 1. The container 2 is secured to the casing 1 from the inside and has a flange portion 47 (Figs. 1 and 2) overlapping a rim-shaped flange 57 (Figs. 3 and 4) of the casing 1. The lubricant contained in the container 2 is conveyed from the latter into the casing 1 by means of a screw conveyor having affixed thereto suitable stripping or scraping means of conventional construction (not shown). The mechanism of the pump for use in connection with a single-line system comprises a number of pistons 13 for the individual pump elements 44 (only one being shown in Fig. 3, a plurality of pump elements 44 being shown in Fig. 1) which pistons 13 are driven by means of cam plates 14, one on each side of the pump (see Fig. 3). The cam plates 14 are in turn driven by means of a worm 15 meshing with a worm gear 16. A bevel gear 17 keyed to the worm gear shaft 10 meshes with another bevel gear 18 mounted on a vertical shaft 19. Said shaft 19 extending into the lubricant container 2 turns the screw conveyor (not shown) previously referred to. Furthermore, a gear 20 is keyed to the vertical shaft 19. Said gear 20, which is in mesh with an intermediate gear 21 (see Fig. 4), may be used for driving a pinion 30 (see Fig. 6) of a hydraulic-mechanical distribution control arrangement generally indicated by 22, when the pump is to be used for a twin-line system. Upon removal of the cover 70 (see Figs. 1 and 4) said distribution control arrangement 22 is attached to the casing 1 and the gear 21 (Fig. 4) is brought into engagement with said pinion 30 (Fig. 6). The amount of lubricant discharged by the several exchangeable pump elements 44 may be adjusted by adjusting means 24 provided thereon. The adjusting means 24 are easily accessible from the outside.

If it is desired to make the pump ready for use in connection with a twin-line system, as mentioned above, the cover 70 (Figs. 1 and 4) is removed and a complete hydraulic-mechanical distributing control device 22 including a feeding arrangement generally indicated by 72 (Fig. 5) and to be described hereinafter is attached to the casing 1 as shown in Figs. 2 and 5. If the pump elements 44 are not removed from the casing 1, the pump may be used for a single-line system supplied with lubricant by the pump elements 44 and for a twin-line system supplied with lubricant by the devices 72 and 22. The controlling piston 25 (Fig. 5) and the feed piston 26 of the feeding arrangement 72 are actuated by the same cam plates 14 as those described above in connection with Fig. 3 for actuating the pistons 13 of the pump elements 44 for the single-line system. When the control attachment 22 is arranged as shown and the pump is used for a twin-line system, the amount of lubricant to be conveyed to the lines of the system is adjusted by the screw 23 (Fig. 5). The cam plates 14 are arranged relative to each other in such a manner that at first the control piston 25 is actuated in right hand direction for opening an inlet bore 53. Thereafter the feed piston 26 is actuated in left-hand direction for sucking in the lubricant into the bore 76. For the purpose of discharging or conveying the lubricant, likewise at first the control piston 25 is actuated in left-hand direction so as to close the inlet 53. The lubricant discharged by the feed piston 26 upon a displacement thereof in right-hand direction is conducted through the check valve 27 (Figs. 5 and 6) to a control valve 28 reciprocal in a suitable valve bore (see lower portion of Fig. 6). Depending on the position of the control valve 28, the lubricant may enter the main line I or the main line II for delivery to the lubricant

distributors (not shown) arranged in said main lines I and II. The pressure of the lubricant can be read on a manometer 45 (see Fig. 2). In Fig. 6 the position of the control valve 28 is such that the lubricant is discharged through the main line II.

The pinion 30 (see Fig. 6), being in mesh with the intermediate gear 21 (Fig. 4) upon connection of the distribution control device 22 with the casing 1 and idling on the eccentric shaft 29 (Fig. 6), is continuously driven through said intermediate gear 21 by the gear 20 (Fig. 4) arranged on the vertical shaft 19. The pinion 30 (Fig. 6) rotates in uniform manner. A pin 31 eccentrically mounted on the eccentric shaft 29 is in slidable engagement with a slot 78 of a sliding block 32 which in turn is in engagement with the control valve 28 for reciprocating same in linear direction. As best shown in Figs. 6 and 7, the eccentric shaft 29 is provided with a semi-circular longitudinal keyway or groove 63, wherein a spring-loaded key 33 is rotatably mounted. A hub or sleeve 42 rigidly connected with the gear 30 by a screw 80 is provided with a similar semi-circular keyway or groove 64. The rotatable key 33 has a projection or nose 62. When the key 33 is disengaged from the groove 64 of the hub 42 as shown in Fig. 7 its nose 62 is urged by the spring 55 against the left-hand projection 43a of the holding member 43. Said member 43 being prevented from rotation by suitable means may be displaced in axial direction by a controlling member 35 arranged above the body of the device 22 for controlling the distribution of the lubricant. The member 35 being subjected to the variable action of a spring 61 is actuated by a pressure piston 37. The before mentioned holding member 43 and a compensating piston 36 are slidably engaged with said controlling member 35. Thus, the various gears, the key or coupling element 33, the eccentric shaft 29 and the elements associated therewith constitute mechanical transmission means, while the holding member 43, the controlling member 35, the pistons 36 and 37, and the associated elements constitute hydraulic means responsive to pressure changes in the feed line 38—82 for alternately rendering the transmission means operative and inoperative to thereby alternately connect the pump drive means to and disconnect the same from the control valve 28.

The following explanation is given with regard to the mode of operation of the feeding arrangement 72 and the mechanical-hydraulic distribution control 22 of the twin-line system:

After all of the lubricant distributors in line II have been active, the pressure increases in the line 38 whereby the pressure piston 37 is moved upwardly. This results in an upward movement of the member 35 whereby at the same time the holding member 43 and the compensating piston 36 are carried along. Owing to the upward displacement of the holding member 43, the nose 62 of the rotatable key 33 becomes disengaged from said holding member 43, whereby said key 33 is released for engagement with the groove 64 of the hub 42 of the pinion 30 under the action of the spring 55, when during the rotation of the pinion 30 said groove 64 comes into register with the groove 63 of the eccentric shaft 29. As soon as during the uniform rotation of the pinion 30 said two grooves 64 and 63 come into register, the spring 55 may rotate the key 33 to a predetermined extent whereby said key 33 engages both grooves 64 and 63 as shown in Fig. 8. Thus the pinion 30 and the eccentric shaft 29 are positively connected with each other, so that now, during the continuation of the rotation of the pinion 30, the control valve 28 is displaced in opposite direction by the pin 31 and the sliding block 32.

Owing to the continued operation of the feeding arrangement 25, 26 (see Fig. 5), the pressure increases in the line 38 (Fig. 6), whereby the piston 37 and thus the controlling member 35 are lifted still further. The increase of the pressure in the line 38 continues until the

compensating piston 36 lifted by the controlling member 35 clears the channels 39 and 40, whereupon lubricant supplied by the feeding arrangement through the line or conduit 82 to the check valve 27 may branch off from said line 82 through the line 39 and will be returned through the return line 40 to the supply container 2.

Lubricant which has been displaced by control valve 28 during the controlling operation for changing the feeding of the lubricant from line II to line I is likewise pressed back into the supply container 2 of the pump through additional return lines 41. As best shown in Fig. 10, the control valve 28 is positively connected with a pre-setting piston 58 by means of an element 84, so that upon a movement of the control valve 28 to the other side, for example in right hand direction (as viewed in Fig. 10) said pre-setting piston 58 likewise is moved towards said other side. Now, as soon as after the performance of half of the stroke of the control valve 28 the passage 59 of said pre-setting piston 58 connects the channel 60 with the return channel 41, the pressure in the line 38 drops immediately, so that the controlling member 35 (see Fig. 6), and with the latter the holding member 43 and the compensating piston 36 are suddenly lowered under the action of the spring 61. This, further, results in a downward displacement of the downwardly extending projections 43a and 43b of the holding member 43. As shown in Fig. 9, now the projection 43b is in the path of the nose 62 of the rotatable key 33, so that upon abutment of said nose 62 against said projection 43b, the key 33 is completely returned into the groove 63 of the eccentric shaft 29, whereby now the shaft 29 is disengaged from the pinion 30. Meanwhile, the control valve 28 has been displaced to such an extent to the right that now only the other main line I is in communication with the feed line 38.

The eccentric shaft 29 has made one half of a revolution during this working step. The nose 62 of the rotatable key 33 now bears against the right hand projection 43b of the holding member 43 (see Fig. 9) and the spring 55 is again tensioned. As mentioned above, the shaft 29 is disengaged from the pinion 30 and the latter idles again about the eccentric shaft 29. As soon as, subsequently, the pressure in the main line I is increased the cycle starts anew and the control valve 28 is again moved in the opposite direction.

From above description of a preferred embodiment of the invention, it may be gathered that the construction of the mechanism and the outer form of the pump casing are designed in such a manner, that the feeding devices may be provided and operated either for the single-line system alone or the twin-line system alone or for both systems together.

I have described a preferred embodiment of my invention but it is understood that this disclosure is for the purpose of illustration and that various changes in shape and proportion as well as the substitution of equivalent elements for those, herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. In a lubricant pump constructed for connection to both a single-line lubricating system and a twin-line lubricating system, and having lubricant-displacing piston means, cam plate means operatively connected to said piston means for driving the same, and drive means connected to said cam plate means for actuating the latter; means provided with two spaced main ducts of a twin-line system and with a lubricant feed line arranged to have lubricant forced therethrough by at least a part of said piston means, a control valve operable when in a first position to establish communication between said feed line and only one of said main ducts, and operable when in a second position to establish communication between said feed line and only the other of said main ducts, mechanical transmission means connecting said

5

drive means to said control valve to enable said drive means to displace said control valve back and forth between said first and second positions thereof, and hydraulic means responsive to predetermined lubricant pressure conditions in said feed line for alternately and hydraulically at said first and second positions of said control valve rendering the connection of said transmission means to said control valve operative and inoperative in the transfer to the latter of the driving action of said drive means.

2. In a lubricant pump constructed for connection to both a single-line lubricating system and a twin-line lubricating system, and having a plurality of lubricant-displacing pistons, cam plate means operatively connected to said pistons for driving the same, and drive means connected to said cam plate means for actuating the latter; means provided with two spaced main ducts of a twin-line system and with a lubricant feed line arranged to have lubricant forced therethrough by at least one of said pistons, a control valve operable when in a first position to establish communication between said feed line and only one of said main ducts, and operable when in a second position to establish communication between said feed line and only the other of said main ducts, mechanical transmission means driven by said drive means and drivingly connected to said control valve for effecting displacement of the latter between said first and second positions thereof, and means responsive to predetermined conditions of lubricant pressure in said feed line due to operation of said cam plate means for alternately and hydraulically rendering said transmission means operative and inoperative to thereby alternately connect said drive means to and disconnect the same from said control valve.

3. In a lubricant pump including a casing constructed for connection to both a single-line lubricating system and a twin-line lubricating system and having a lubricant reservoir, a plurality of lubricant-displacing pistons reciprocal in said casing, cam plate means operatively connected to said pistons for reciprocating the same, and drive means connected to said cam plate means for actuating the latter; means connected to said casing and provided with two spaced main ducts of a twin-line system, with a bore communicating at spaced portions with both said main ducts, and with a lubricant feed line communicating with said bore, said feed line being arranged to have lubricant forced therethrough from said reservoir by at least one of said pistons, a control valve reciprocal in said bore and operable when in a first position to establish communication between said feed line and only one of said main ducts, and operable when in a second position to establish communication between said feed line and only the other of said main ducts, mechanical transmission means operatively connected to both said drive means and said control valve for effecting reciprocation of the latter between said first and second positions thereof in said bore, and hydraulic means responsive to predetermined changes in pressure of lubricant in said feed line due to operation of said cam plate means for alternately rendering said transmission means operative and inoperative to thereby alternately connect said drive means to and disconnect the same from said control valve.

4. In a lubricant distributing pump as claimed in claim 3; said transmission means comprising a rotatable eccentric shaft coupled with said control valve, a driving element rotatably mounted on said eccentric shaft and operatively connected with said drive means, and automatic coupling means for operatively connecting and disconnecting said driving element and said eccentric shaft in response to operation of said hydraulic means under the influence of said changes of pressure in said feed line.

5. In a lubricant distributing pump as claimed in claim 4; said drive means comprising means for rotating said driving element at a uniform speed.

6

6. In a lubricant distributing pump as claimed in claim 4; said automatic coupling means including a spring-loaded coupling element movably mounted on one of said driving elements and said eccentric shaft, said hydraulic means comprising a movable holding member normally holding said coupling element in disconnecting position, and a movable controlling member operatively connected with said holding member and responsive to said changes in the pressure in the feed line for disengaging said holding member from said coupling element to permit movement of the latter so as to effect a positive coupling connection between said driving element and said eccentric shaft and for subsequently engaging said holding member with said coupling element to permit movement of the latter so as to effect a disconnection of said driving element from said eccentric shaft.

7. In a lubricant distributing pump as claimed in claim 6; said spring-loaded coupling element comprising a key, said driving element having a first longitudinally extending groove, said eccentric shaft having a second longitudinally extending groove, said key being rotatably mounted in said second longitudinally extending groove and normally held therein by said movable holding member, whereby upon movement of said controlling member in response to a first change of pressure in said feed line so as to disengage said holding member from said key, the latter is rotated under the action of its associated spring so as to enter said first groove when the same comes into registry with said second groove during the rotation of said driving element, thus effecting said positive connection between said driving element and said eccentric shaft, while upon subsequent movement of said controlling member in response to a second change of pressure in said feed line so as to cause engagement between said holding member and said key, the latter is rotated so as to exit from said first groove to effect said disconnection of said driving element from said eccentric shaft.

8. In a lubricant distributing pump as claimed in claim 6; said hydraulic means further comprising a check valve in said feed line, means defining a first passage for return of lubricant to said reservoir, said first return passage communicating with said feed line at a point between said reservoir and said check valve, a movable compensation piston connected to said controlling member and arranged for controlling the opening and closing of said first return passage, spring means acting on said controlling member and normally maintaining said compensation piston in its passage-closing position, said controlling member upon being moved in response to an increase of pressure in said feed line effecting displacement of said compensation piston to its passage-opening position for limiting the extent of increase of pressure in said feed line, a pre-setting control piston connected to said control valve for movement therewith, and means defining a second passage for return of lubricant to said reservoir, said second return passage communicating with the opposite ends of said bore, said pre-setting control piston being provided with a passage way constructed for connecting said feed line with said second return passage after the performance of approximately half the stroke of said control valve in each direction of reciprocal movement thereof, whereby upon connection of said feed line to said second return passage the pressure in said feed line drops suddenly to move said controlling member so as to cause a reengagement of said holding member with said spring-loaded coupling element for effecting said disconnection of said driving element from said eccentric shaft.

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