

Aug. 3, 1954

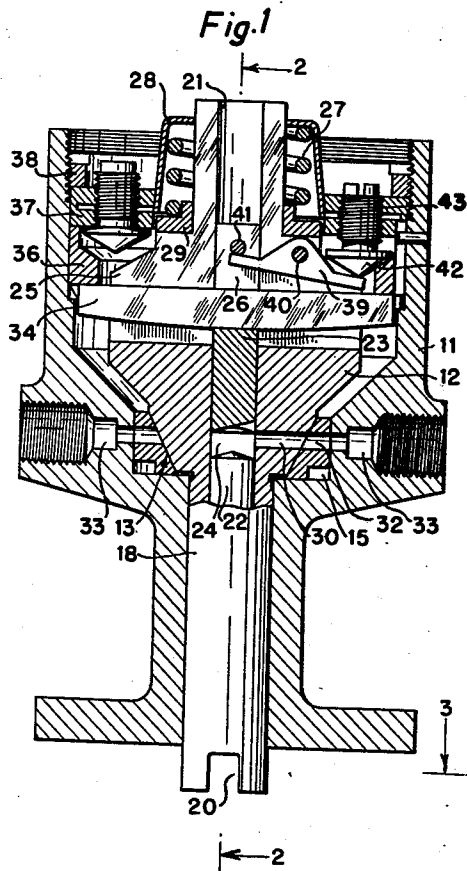
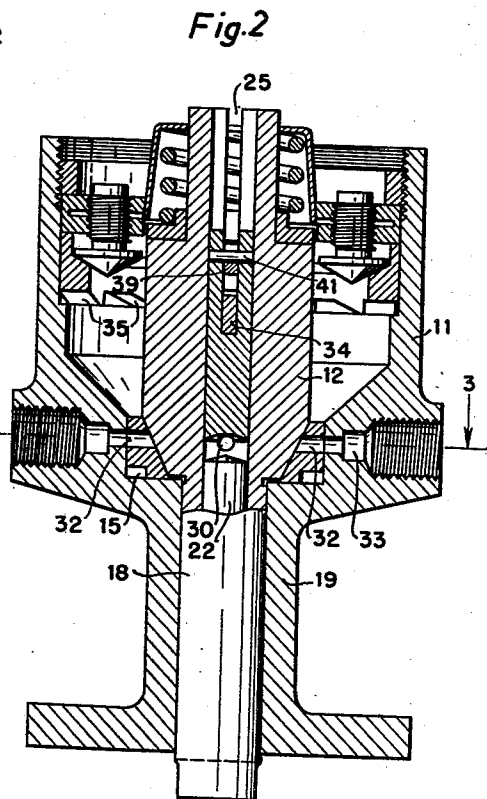
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MECHANICAL LUBRICATING PUMP

Filed Dec. 11, 1951

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

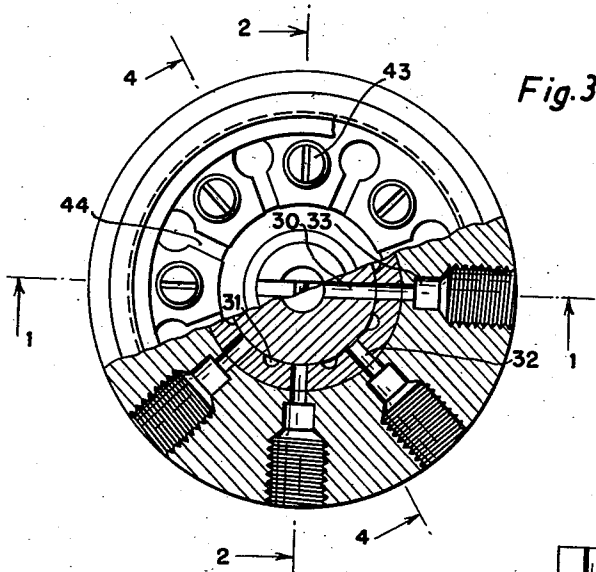
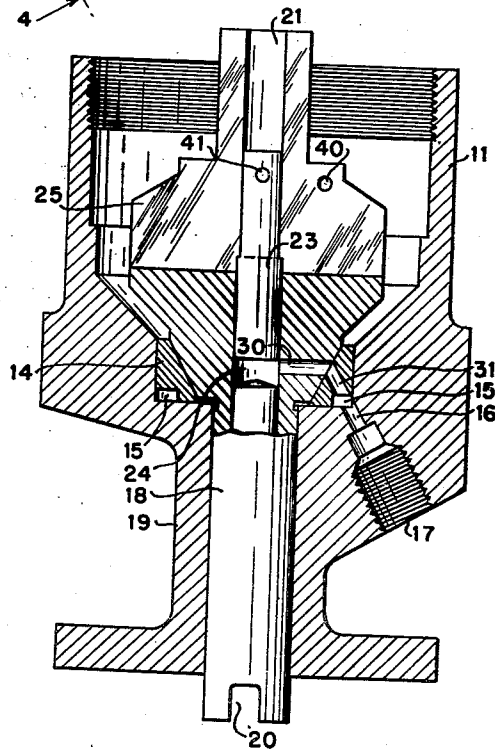


Fig. 4



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## UNITED STATES PATENT OFFICE

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## MECHANICAL LUBRICATING PUMP

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4 Claims. (Cl. 103—2)

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My invention relates to lubricating or fuel injection pumps and more particularly to that type of such pumps which have a plurality of discharge openings and which include a distributor rotatable in a stationary casing and a piston reciprocable in an axial boring of said distributor.

The known pumps of that type apart from being unsuitable for mass production were unreliable in their operation in view of the unpredictable oil pressure attained therein as a result of the varying play between the distributor and its casing.

The main object of my invention is to provide a pump of said type which avoids the said disadvantages and which will show a high degree of tightness between the rotatable distributor and its casing thus avoiding loss of pressure of the oil to be delivered from the pump. This is achieved according to my invention primarily by providing conical contacting surfaces in the distributor and in the casing, respectively, in such manner that the oil pressure in the pump increases the pressure between said surfaces and thereby also increases the tightness therebetween thus insuring a uniformity and constancy of oil pressure in all manufactured units.

The said and other objects of my invention will be more fully understood from the following specification taken with the accompanying drawing in which one embodiment is illustrated.

In the drawing:

Fig. 1 is an axial sectional view of the pump taken along line 1—1 in Fig. 3,

Fig. 2 is an axial sectional view taken along line 2—2 in Fig. 3,

Fig. 3 is a partial top view, and a partial sectional view along line 3—3 in Fig. 2, and

Fig. 4 is an axial sectional view of the distributor and its casing essentially along line 4—4 in Fig. 3, the said two parts, however, being mutually turned by one sixteenth of a full turn.

The same reference numerals indicate the same parts in all figures of the drawing.

As shown in the drawing my new lubricating or fuel injection pump comprises a stationary casing 11 which houses a distributor 12 rotatably resting with its conical surface portion 13 upon a bearing ring 14 secured in said casing 11. An annular collecting channel 15 is provided between said ring 14 and said casing 11 and this collecting channel communicates with a suction duct 16 which passes through the wall of the casing 11 (Fig. 4) and terminates in a threaded end portion 17 adapted to receive an adjoining suction pipe line (not shown in the drawing) delivering oil into the pump.

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The distributor 12 extends downward into a shaft 18 which is surrounded by a sleeve 19 forming the lower portion of the casing 11 and said shaft 18 is provided at its outer end with a slot 20 adapted to engage any suitable driving means for the distributor to rotate the same within the said casing. An axially extending cylindrical boring 21 in the distributor 12 which is closed at its lower end by a plug 22 serves as a pump cylinder and houses a reciprocable piston 23 leaving a pumping chamber 24 above said plug 22.

The upper portion of the distributor 12 and of the piston 23 are each provided with an axially extending slot 25 and 26, respectively. The distributor is held within the pump casing 11 and pressed against the bearing ring 14 by a spring 27 which is inserted between a domeshaped body 28 secured to said casing and a washer 29 resting upon a circular shoulder in the upper part of the distributor.

The distributor 12 contains a radially extending boring 30 which with its inner end opens into the pumping chamber 24 and with its outer end registers with two sets of alternating ducts 31, 32 arranged in the bearing ring 14. The ducts 31 of one set lead into the collecting channel 15 (see Fig. 4), and the ducts 32 of the other set extend radially in the bearing ring 14 (Figs. 1, 2, and 3) and lead into outlet ducts 33 in the casing 11 and into adjoining pressure pipe lines (not shown in the drawing) each of which is screwed into the outer end of one of said ducts 33.

A cross beam 34 extending within said slots 25 and 26 rests with its central portion upon the piston 20 and slides with its outer ends along an even number of cams 35 provided in regular intervals upon the base face of a cam ring 36 which is secured within the casing 11 by an intermediate ring 37 and a locking ring 38 screwed into the wall of the casing 11. The even number of said cams 35 corresponds to the number of ducts 32 and said cams 35 and ducts 32 are mutually so arranged that the cams acting upon the beam 34 effect a pressure that is a downward stroke upon the piston 20 at any time when one of the ducts 32 registers with the boring 30 in the distributor 12.

The suction that is the upward stroke of the piston 23 is effected by a double armed rocking lever 39 which is situated above said cross beam 34 within said slots 25 and 26 and is supported by a pin 40 mounted in the distributor 12. Said rocking lever 39 cooperates with its inner arm with a pin 41 bridging the slot 26 and with its outer arm with a series of adjustable cams 42 which form the heads of bolts 43 screwed into the

intermediate ring 37. The said cams 42 alternate circumferentially with the cams 35.

It will be well understood that the inner arm of said lever 39 acting upon the pin 41 will raise the piston 23 whenever the outer arm of the lever 39 is pressed down by one of the cams 42 during the rotation of the distributor 12 in the casing 11.

In order to prevent any unintentional displacement of the adjusted cams 42 in the ring 37 the same is preferably constructed as illustrated in the drawing. As shown therein the ring 37 is provided with an inner circular groove making its cross section U-shaped and with a radial slot 44 between each pair of bolts 43, thus leaving deformable and resilient tongs each safely holding a bolt 43 with its cam head 42.

My new fuel injection pump operates as follows:

The distributor 12 with the cross beam 34 mounted in its slot 25 is rotated in the casing by any convenient driving means. The piston 23 partakes in this rotation as said cross beam 34 extends also through the slot 26 thereof. The outer ends of said cross beam 34 slide along the cams 35, a pair of diametrically opposite cams 35 acting upon said beam 34 at any given time. Thus said beam 34 which rests with its middle portion in the slotted piston 23 will press the same downward effecting a pressure stroke in the pump chamber 24 whenever a pair of cams 35 acts upon said beam 34 and oil will be pressed from the pump chamber 24 through registering channels 30, 15 and 33 into the respective pressure pipe line. During this pressure stroke the oil pressure in the pumping chamber 24 will cooperate with the spring 27 and increase the tightness between the contacting conical faying surfaces 13 of the distributor 12 and of the bearing ring 14, respectively. When the pressure stroke of the piston 23 is completed and while the distributor 12 continues to rotate the outer arm of the tilting lever 39 will be actuated by a cam 42 and its inner arm acting upon the pin 41 will raise the piston 23 thus drawing oil from the collecting channel 15 into the pumping chamber 24 through the registering channels 30 and 31 (Fig. 4).

Although only one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

What I claim as my invention is:

1. In a lubricating or fuel injection pump including a stationary casing and a distributor rotatably mounted therein, the improvement comprising in combination a bearing ring set in said casing to support said distributor, an annular collecting channel between said bearing ring and said casing, a conical seat surface in said bearing ring and a conforming counter surface on the distributor, a bottom-closed axial cylindrical boring in the distributor forming a pump cylinder, a piston axially slidable therein, means to reciprocate said piston, an essentially radial distributing duct in said distributor leading into said pump cylinder closely above its bottom, the outer orifice thereof situated in said conical seat surface of the distributor, a first series of essentially radial discharge ducts registering with said outer orifice of the distributing duct and extensions thereof arranged in the bearing ring and in the casing, respectively, each of said extension ducts adapted for connection with a pressure pipe line, a second series of suction ducts in the bearing

ring, each of said suction ducts registering with one of its orifices with said outer orifice of the distributing duct and leading with its other orifice into said annular collecting channel, the ducts of said first series and of said second series being alternately arranged in the bearing ring, and a main suction duct in the casing leading into said annular collecting channel and adapted to connection with a suction pipe line.

2. A lubricating or fuel injection pump according to claim 1 comprising in combination a longitudinal slit in the distributor above the pump cylinder, a diagonally extending cross bar freely mounted in said slit and resting with its central portion upon said piston, a cam track arranged in the casing and cooperating with the outer ends of said cross bar to effect the pressure stroke of the piston, a longitudinal slit in the outer portion of the piston conforming to said slit in the distributor, a double arm lever arranged in said slit of the distributor, the fulcrum of said lever being mounted eccentrically to the longitudinal axis of the distributor, the inner arm of said lever extending into said slit in the piston, an abutment in this slit to cooperate with the end of said inner arm, and a plurality of adjustable abutments circularly arranged in the casing for cooperation with the outer arm of said lever to effect and to regulate the suction strokes of the piston.

3. A lubricating or fuel injection pump according to claim 1 comprising in combination a longitudinal slit in the distributor above the pump cylinder, a diagonally extending cross bar freely mounted in said slit and resting with its central portion upon said piston, a cam track arranged in the casing to cooperate with the outer ends of said cross bar to effect the pressure stroke of the piston, a longitudinal slit in the outer portion of the piston conforming to said slit in the distributor, a double arm lever arranged in said slit of the distributor, the fulcrum of said lever being mounted eccentrically to the longitudinal axis of the distributor, the inner arm of said lever extending into the slit in the piston, an abutment in this slit to cooperate with the end of said inner arm, a plurality of adjustable headed screws circularly arranged within the casing, the heads of said screws cooperating with the outer arm of the lever to effect and to regulate the suction strokes of the piston, a first ring-shaped disc mounted in the casing, circularly arranged threads in said disc to receive said screws, a second ring-shaped disc mounted in the casing close and parallel to the first disc, threads in the second disc conforming to the threads in the first disc, radial slits therein between each pair of threads to form bendable tongues permitting to incline the axis of the threads in the second disc relative to the axis of the threads in the first disc in order to secure the positioned adjustable screws.

4. A lubricating or fuel injection pump according to claim 3 wherein the two ring-shaped discs are circumferentially connected to form a single body.

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