

May 18, 1943.

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2,319,604

PUMP STRUCTURE

Filed March 23, 1942

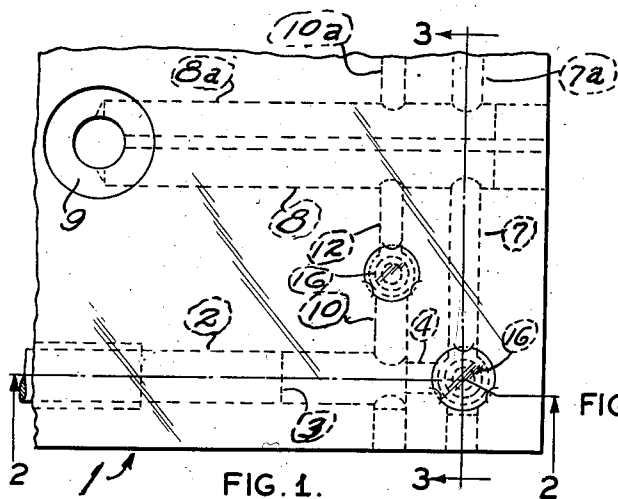


FIG. 1.

FIG. 4.

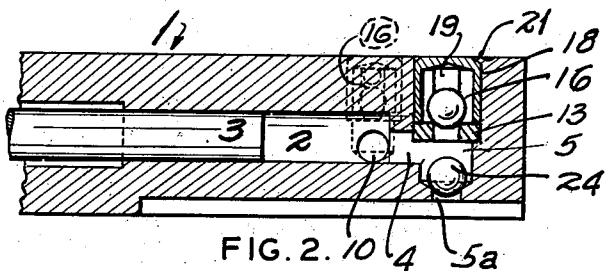


FIG. 2.

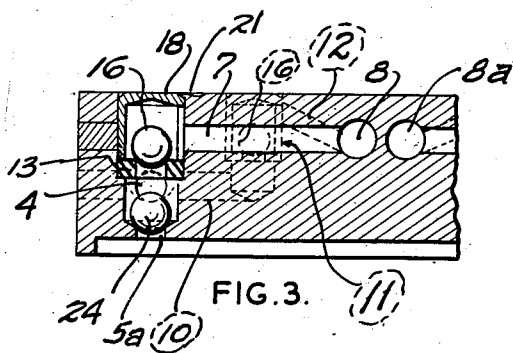


FIG. 3.

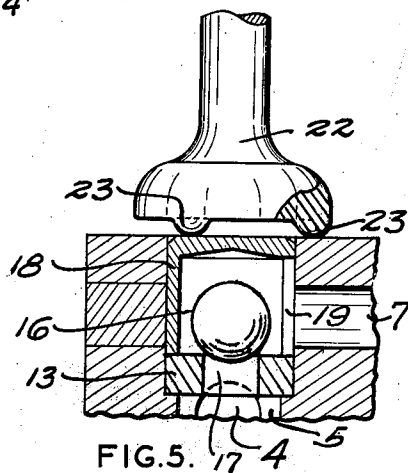
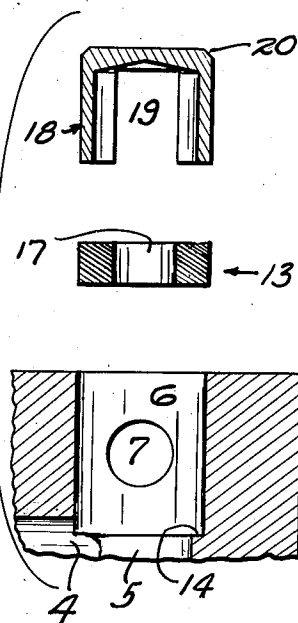


FIG. 5.

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2,319,604

PUMP STRUCTURE

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Application March 23, 1942, Serial No. 435,769

5 Claims. (Cl. 103—2)

The invention relates to the construction of inlet and discharge valves and passageways in a simple plunger type pump and consists in all of the novel structure described below.

It has been customary in constructing one type of pump to use a check valve comprising a ball movable towards and away from a seat to alternately close and open the valve inlet port. The structure may be formed by drilling a hole in the pump body, inserting the ball into the hole, and then driving a pin or stud transversely of the hole and at the side of the ball opposite the port, thereby retaining the ball in the hole and limiting its movement away from the port. The effectiveness of the pump may depend upon the movement of the ball to and from its seat and this is determined by the depth of the drilling of the hole and the positioning of the retaining member relative to the end of the hole. It is difficult to provide initially the desired accuracy in the drilling and positioning of the retaining member and, even though the initial setting is accurate, it is unlikely it will be maintained for an extended useful life of the pump.

One of the main objects of the present invention is to simplify the assembly of the ball with the pump or valve housing and another object is to facilitate the maintenance of accurate relations between the ball and associated parts.

The features of the invention described above are particularly well adapted for a lubricator device to be used in a railway axle box beneath the journal for pumping lubricant to the journal. In such installation, the insertion and removal of the pump into and from the restricted space beneath the journal presents difficulties in pump construction which require a substantially shallow pump body. Another object of the invention is to construct a pump which will have adequate volume under the conditions mentioned.

These objects are attained by the structure shown in the accompanying drawing illustrating a selected embodiment of the invention and in which—

Figure 1 is a top view of a portion of a pump body casting adapted to be inserted in the bottom of a railway journal axle box.

Figure 2 is a longitudinal vertical section taken approximately on the line 2—2 of Figure 1 and illustrating the end portion of the pump cylinder and piston, the inlet port and discharge ports including ball check valves controlling the ports.

Figure 3 is a transverse vertical section taken on the line 3—3 of Figure 1.

Figure 4 is an exploded section illustrating the

details of the pump body and valve cage parts before assembly, the section being on the same plane as that indicated in Figure 2.

Figure 5 illustrates the manner in which the valve cage is secured to the pump body.

The body 1 of the pump may consist of a shallow casting having a longitudinal bore 2 forming a cylinder for the pump piston or plunger 3. The inner end of the plunger receiving portion of cylinder 2 merges with an extension bore 4 of reduced diameter. Body 1 is bored and counterbored vertically to intersect extension 4 and to form valve chambers 5 and 6 and an inlet port 5a leading from the exterior of the body into chamber 5. An outlet passageway 7 leads to a discharge conduit 8 terminating in a seat 9 for a distributor (not shown) as disclosed, for example, in my Patent No. 2,272,199, issued February 10, 1942.

Another outlet passageway 10 leads laterally from the plunger receiving portion of cylinder 2 to the bottom of a vertically disposed valve chamber 11 corresponding to valve chamber 6. A downwardly inclined drilling 12 leads from the top of chamber 11 to discharge conduit 8.

Each valve chamber 6 and 11 is fitted with a valve structure which includes a valve seat 13 inserted in the valve chamber and resting on the shoulder 14 at the lower end of the chamber. A ball 16 is then inserted in the chamber and normally contacts with the annulus formed at the upper edge of the hole 17 through the seat. A valve cage 18 is then inserted in the chamber with its lower edge resting upon the top face of seat 13. Cage 18 has a recess 19 in its side disposed to align generally with the end of passageway 10.

Preferably the upper corner of cage 18 is beveled, as indicated at 20, and the adjacent metal of body 1 is crimped or deformed, as indicated at 21, to retain the cage, ball 16 and seat 13 in assembled position. The crimping may be effected by a tool 22 with a plurality of prongs 23, as indicated in Figure 5, or by any other suitable tool, such as an ordinary punch, applied at intervals about the beveled edge of cage 18.

Preferably the sum of the cross sectional area of passageways 7 and 10 approximates the cross sectional area of cylinder 2 and of discharge conduit 8. The use of two outlet passages 7 and 10 of relatively small diameter and the use of correspondingly small size valves facilitate the operation of the pump because of the resulting light weight of the individual valve balls, which are raised by the fluid, and because of the re-

duced pressure on the oil in the outlet passageways. The construction also facilitates the insertion of the pump into a restricted space (such as beneath the bottom of an axle box and the journal to be lubricated) because of the reduced height of the body which, in turn, is effected by the disposition of the discharge outlets 7 and 10.

Preferably valve cages 18 and seats 13 are formed of brass to facilitate their manufacture and their insertion into the pump body, which ordinarily would be of cast iron, but if desired the inserted parts may be made of hardened steel to better withstand wear. The pump body is shown arranged for duplication of the described structure at the opposite side of the body, as is indicated by the passageways 7a and 10a and conduit 8a, thus providing increased capacity in a shallow pump structure which may be inserted beneath a railway axle journal without changing the construction of the axle box which receives the pump and forms the reservoir for the oil.

Operation: When piston 3 moves to the left, gravity causes elements 16 to close the ports leading into the outlet passageways 7 and 12, and the atmospheric pressure on fluid in which inlet port 5a is immersed raises ball 24, permitting fluid to flow into valve chamber 5 above port 5a and into cylinder 2. Upon the return stroke of piston 3, gravity seats ball 24 to close inlet port 5a, and the pressure in cylinder 2 and chamber 5 raises elements 16 from their seats to permit fluid to enter passageways 7 and 12 and be discharged through conduit 8.

With this construction, the range of movement of balls 16 and the extent of the opening of the ports to the outlet passageways may be controlled accurately and economically. Difficult, expensive and unreliable machining of the pump or valve body is avoided. The retention of the cage by crimping the metal of the body eliminates threading, pinning, welding or other more difficult operations and prevents fluid pressure from loosening the cage and permitting undesired movement of the ball.

Obviously the relation between port 5a, cylinder 2 and passageways 7 and 10 may be substantially different from the arrangement shown. The cage structure could be inserted from the side, bottom or end of the body.

The details of the parts illustrated may be otherwise varied without departing from the spirit of the invention, and the exclusive use of

such modifications as come within the scope of the claims is contemplated.

What is claimed is:

1. In a pump of the class described, a cylinder, a plunger reciprocating therein, an inlet port at the inner end of said cylinder, an outlet port located substantially abreast of the inlet port, another outlet port spaced from the first-mentioned port, and individual passageways leading from said ports to a common discharge conduit of cross sectional area approximately equal to the sum of the cross sectional areas of said passageways.

2. A pump as described in claim 1 in which the diameter of the pump cylinder between the two discharge ports corresponds in cross sectional area to the second-mentioned discharge passageway and the cross sectional area of the remaining portion of the cylinder in which the plunger travels is equivalent to the sum of the cross sectional areas of both of the discharge passageways.

3. In a pump of the class described, a cylinder, a plunger reciprocating therein, said cylinder having an extension at its inner end of smaller diameter than its plunger receiving portion, an inlet passageway to said extension, an outlet passageway from said extension and an outlet passageway from the larger diameter plunger-receiving portion of the cylinder, said passageways leading to a common discharge conduit having a cross sectional area corresponding to the sum of the cross sectional areas of said outlet passageways, each of said outlet passageways having an individual return check valve.

4. A pump as described in claim 3 in which the outlet passageways extend substantially horizontally from the cylinder and its extension but include vertically disposed portions and the check valves are positioned in said vertically disposed portions and operate by gravity.

5. A pump as described in claim 3 in which the check valve for the outlet passageway leading from the cylinder extension is disposed immediately above the same and includes a vertically disposed valve cage and a ball valve element therein, and the outlet passageway leading from the plunger receiving portion of the cylinder includes vertically offset horizontal portions with a connection between them including a vertically disposed valve cage and a ball check valve therein.

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