Oct. 16, 1945. J. J. HENNESSY 2,386,794

PUMP VALVE STRUCTURE

Original Filed March 23, 1942

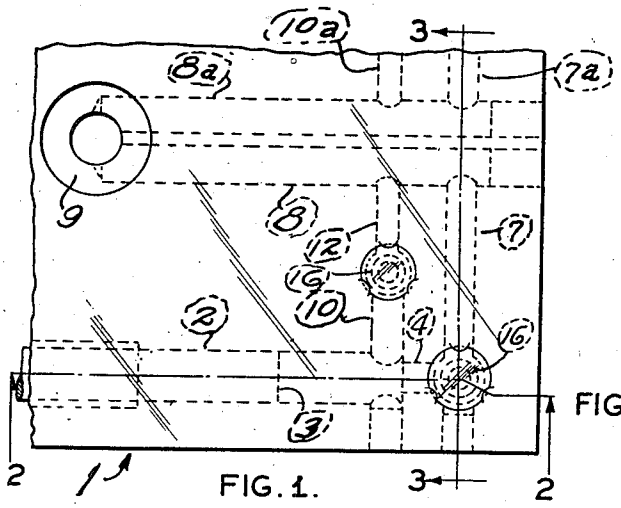



FIG. 1.

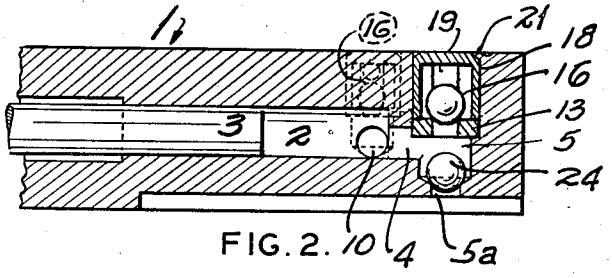



FIG. 2.

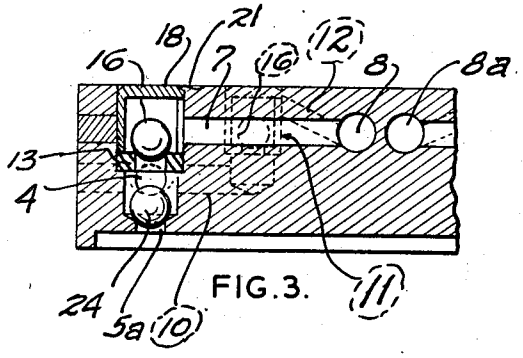



FIG. 3.

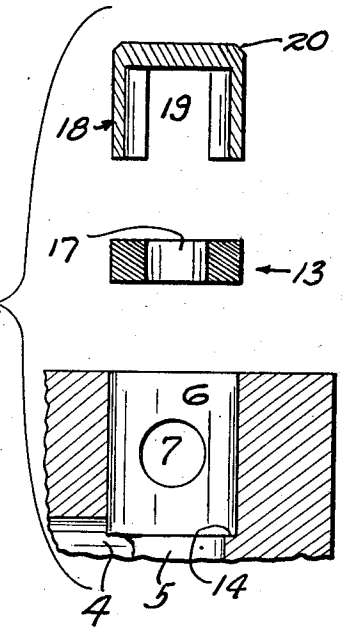



FIG. 4.

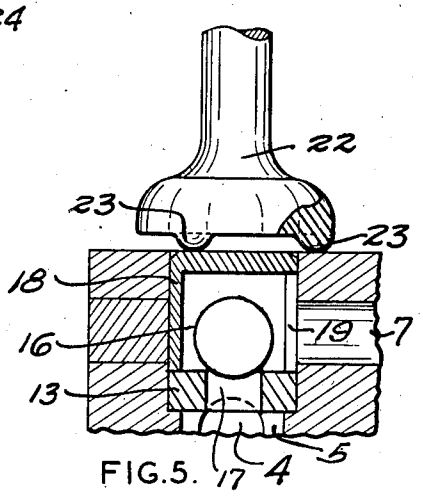



FIG. 5.

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## PUMP VALVE STRUCTURE

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Original application March 23, 1942, Serial No. 435,769, now Patent No. 2,319,604, dated May 18, 1943. Divided and this application March 19, 1943, Serial No. 479,693

2 Claims. (Cl. 251—121)

The invention relates to the construction of inlet and discharge valves in a simple plunger type pump and consists in all of the novel structure described and claimed below. This application is a division of an application filed by the present inventor March 23, 1942, Serial No. 435,769, now Patent No. 2,319,604, granted May 18, 1943.

It has been customary in constructing one type of pump valve to provide a chamber and a ball movable therein towards and away from a seat to alternately close and open an inlet or outlet port. The ball chamber may be formed by drilling a hole in the pump body for receiving the ball, drilling an intersecting hole at right angles to the ball-receiving holes and, after the ball is inserted, inserting a pin or stud through the second-mentioned hole for retaining the ball in the hole and limiting its movement away from the port which it closes. Another arrangement may include a cap threaded or bolted onto the pump body for retaining the ball. Either of these arrangements may include a ball cage inserted in the pump body and retained by the above-mentioned pin or cap elements.

The effectiveness of the pump may depend upon predetermining the movement of the ball to and from its seat and accurately restricting the ball movement as determined. Hence the depth of the drilled hole and the positioning of the retaining member relative to the end of the hole may be of substantial importance. It is relatively difficult and expensive to provide initially the desired accuracy in the drilling of the valve chamber and in the 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. These conditions are accentuated if the body structure is part of an inexpensive pump device produced with simple machine tools and by workmen who are not experienced in precision work or when it is required to produce the pump under conditions which do not make for precision manufacturing.

The main object of the present invention is to simplify the assembly of such a ball valve element in its chamber with the valve body and another object is to facilitate the maintenance of accurate relations between the ball and associated parts.

These objects are attained by the structure shown in the accompanying drawing illustrating the invention embodied in a shallow pump body adapted for insertion into a railway journal box beneath the journal and forming part of a pump for supplying lubricant to the journal. In the drawing—

Figure 1 is a top view of a portion of the pump body casting.

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 cylindrical recess forming a 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 ring-like seat member 13 inserted in the valve chamber and resting on the shoulder 14 at the lower end of the chamber. A ball 16 is then placed in the chamber and normally contacts with the annulus formed at the upper edge of the hole 17 through the seat member. 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 cage 18 has a press fit in the chamber forming recess. Preferably the upper outer 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 form a lip or tongue which will retain the cage, ball 16 and seat 13 in assembled position irrespective of the press

fit or rough handling of the body member. 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 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.

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. Members 13, 16 and 18 may be produced separately in quantity if desired, and of accurate dimensions, irrespective of the production of the pump and valve body member. 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 vary substantially 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 valve structure, a body having a recess extending inwardly from one face of the body, there being an inlet port and an outlet port at the inner end of the recess and in a side of the recess respectively, a cage inserted axially through the open end of the recess and fitting against the sides thereof, and a movable element in said cage for controlling at least one of said ports, the cage having an inner end open to receive said element and having an imperforate outer end forming a closure for the outer end of said recess substantially flush with said body face, the corner formed by the side and outer end of the cage being bevelled, and a portion of the metal of the body at the side of the open end of the recess being displaced over the bevelled corner of the cage to form a cage-retaining projection inwardly of the outer face of the body.

2. In a valve structure, a body having a cylindrical recess extending inwardly from one outer face thereof and having an inlet port and an outlet port opening into and from said recess respectively, the side of said recess having an outwardly facing shoulder spaced from said face, a member fitting against said shoulder and forming an annular seat about one of said ports, an element movable onto and off said seat to close and open said one port, and a cylindrical cage for said element having an open inner end and a closed outer end, the cage being pressed into position in said recess with its insertion into the recess being limited solely by contact of its open inner end with said member and with its closed outer end limiting the movement of said element away from said member and forming a continuation of the outer face of said body, there being an opening in the side of the cage to the other of said ports.

JAS. J. HENNESSY.