Aug. 31, 1926. 1,598,137

O. JACOBSEN

DOUBLE ACTING PLUNGER PUMP

Filed Dec. 16, 1925 2 Sheets-Sheet 1

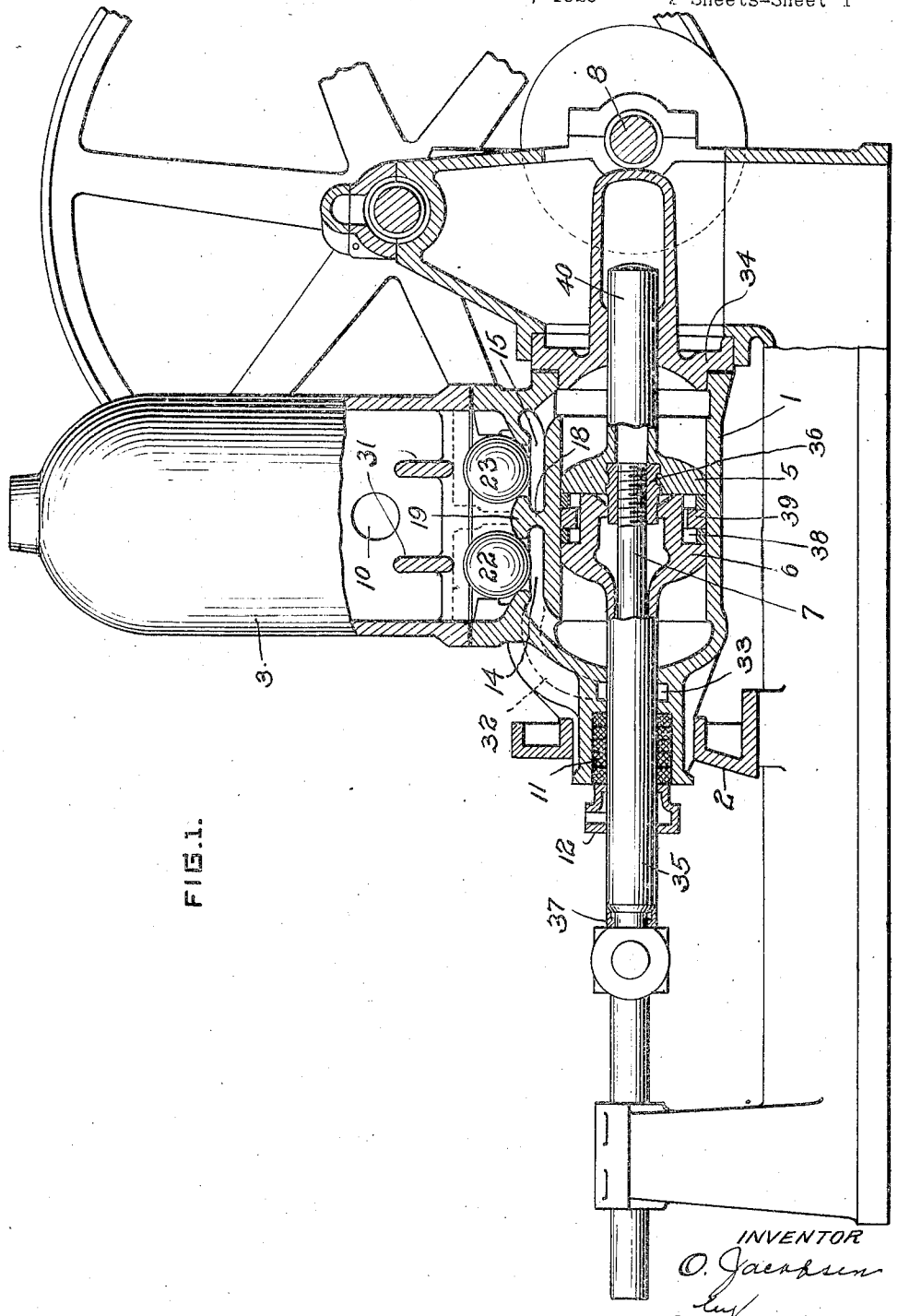


FIG. 1.

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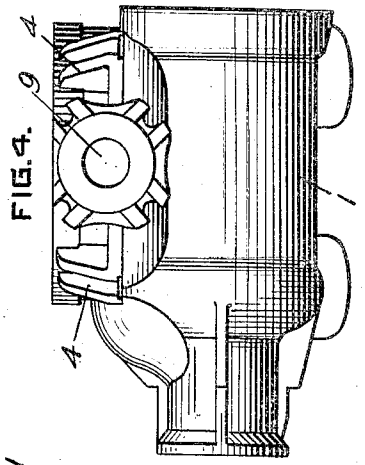


FIG. 4.

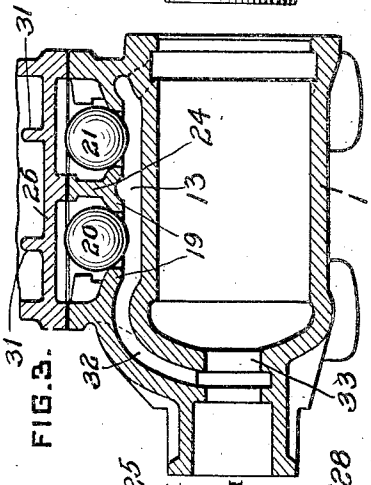


FIG. 3.

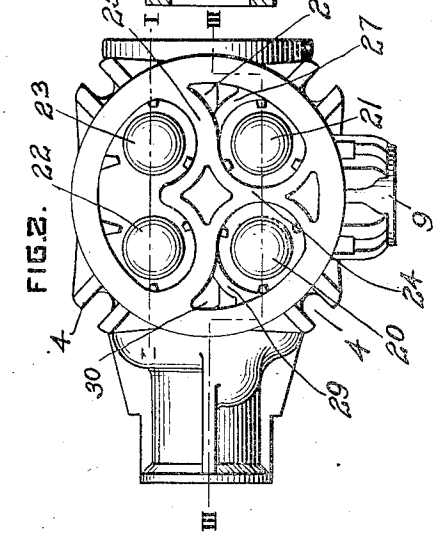


FIG. 2.

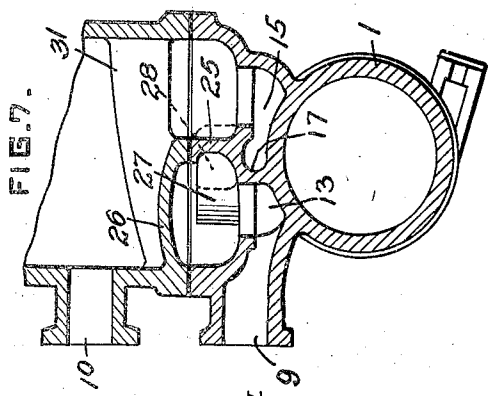


FIG. 7.

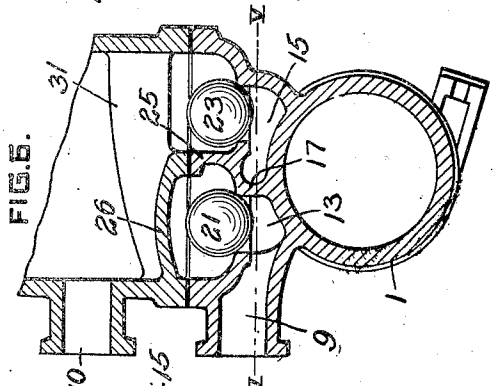


FIG. 6.

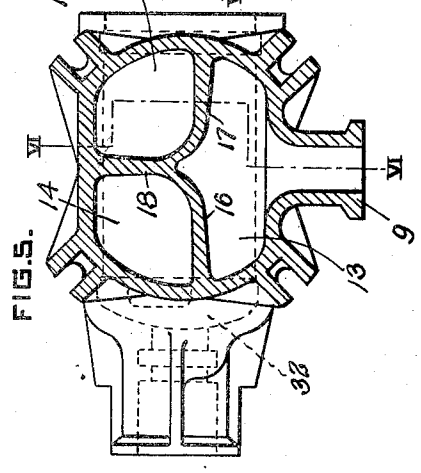


FIG. 5.

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Patented Aug. 31, 1926. 1,598,137

UNITED STATES PATENT OFFICE.

OYSTEIN JACOBSEN, OF DAYTON, OHIO, ASSIGNOR TO THE DURIRON COMPANY, INC., A CORPORATION OF NEW YORK.

DOUBLE-ACTING-PLUNGER PUMP.

Application filed December 16, 1925. Serial No. 75,732.

The invention relates to pumps of the double acting plunger type and particularly to pumps for handling acids or other corrosive liquids, although not limited to use in handling such liquids. It constitutes an improvement over the pump shown and described in my Patent No. 1,531,616, issued March 31, 1925, and has for its principal objects the provision of a pump in which the number of casing parts, and consequently, the number of gaskets required, are reduced to a minimum; the provision of a construction which is particularly adapted for use in the handling of corrosive liquids; the provision of a construction in which the surface requiring fitting and machining or grinding is also reduced to a minimum; the provision of a valve chest and cylinder design which is simplified and reduced in cost; and the provision of an improved plunger construction involving a combination of corrosion resisting materials, and a reinforcing shaft of tougher material protected thereby wherein the parts may be readily fabricated and assembled and disassembled. One embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section through the pump partially on the center line, and partially on the line I—I of Fig. 2. Fig. 2 is a plan view with the air chamber casing removed. Fig. 3 is a vertical section on the line III—III of Fig. 2. Fig. 4 is a side elevation. Fig. 5 is a horizontal section on the line V—V of Fig. 6. Fig. 6 is a vertical section on the line VI—VI of Fig. 5. And Fig. 7 is a section similar to that of Fig. 6, but with the valves removed.

Referring to the drawings, 1 is the cylinder casing mounted upon the base 2, and carrying an air chamber casing 3, which is secured in position by means of bolts (not shown) extending through slotted lugs 4 (Fig. 2) on the cylinder casing and through similar lugs (not shown) at the lower end of the casing 3. A two part plunger 5, 6 provided with a piston rod 7 works in the cylinder, and is operated from the shaft 8 through suitable means, not shown. The fluid to be pumped is supplied to the cylinder through the inlet or suction passage 9 and is discharged from the air chamber casing 3 through the outlet 10. The piston rod is packed, as indicated at 11, and a suitable follower 12 is provided.

The top of the cylinder casing is cored out to provide the suction chamber or passage 13 and the outlet chambers or passages 14 and 15 separated from each other by the vertical ribs or walls 16, 17 and 18 (Figs. 1, 5 and 6) and above these chambers is a horizontal wall 19 (Figs. 1 and 3) provided with four ports or valve openings controlled by the ball check valves 20, 21, 22 and 23. Between the valves 20 and 21 is a vertical wall 24 (Fig. 3), and between the valves 20 and 21 and the balls 22 and 23 is a second vertical wall 25 (Figs. 6 and 2). The air chamber casing 3 is provided with a bottom wall 26 (Figs. 3 and 6), which acts as a closure for the chambers carrying the valves 20 and 21. Communication from the chamber carrying the valve 21 to the chamber 15 beneath the valve 23 is provided over the rib 27 (Figs. 7 and 2) and through the passage 28 (Figs. 7 and 2). Similarly, communication is provided from the chamber carrying the valve 20 to the chamber 14 beneath the valve 22 over the rib 29 (Fig. 2) and through the passage 30 (Fig. 2). The ribs 31 (Figs. 1 and 3), carried by the casing 3, serve as retainers for the valves 22 and 23.

A relief passage 32 (Figs. 3, 5 and 1) is provided between the suction chamber 13 and the groove 33 surrounding the piston rod 7, so that any liquid working along the piston rod is prevented from reaching the packing 11, being withdrawn to the suction chamber. The packing is thus largely protected from contact with the corrosive liquids which the pump is designed to handle.

The two casings 1 and 3, the cylinder head 34, and the two plunger sections 5 and 6, are all cast from corrosion resisting materials, while the piston rod 7 is of stronger, tougher metal, such as steel shafting. This shafting is protected by the tubular portion 35 of the forward plunger section 6 and is threaded at its rear end into a sleeve 36 also of steel which is rigid with the rear plunger section 5, the metal of such section being cast around the sleeve. A collar 37, swiveled on the shaft 7, bears against the end of the tubular portion 35, so that by turning the shaft, or the rear plunger section 5, the two plunger sections are tightly clamped together. A groove 38 in the forward plunger section carries one or more piston rings 39. The plunger section 5 is provided with a tubular extension 40 guided in the cylinder head 34.

The operation of the pump is as follows:—As the plunger moves to the left from the position of Fig. 1, a suction is created at this time on the right side of the plunger, and liquid entering the inlet 9 to the chamber 13 lifts the valve 21, passes over the rib 27 (Fig. 7) and through the passage 28 (Figs. 2 and 7) into the passage or chamber 15 (Fig. 1) and thence into the cylinder. At this time, the other inlet valve 20 is not lifted, since it is exposed to pressure on its upper side from the liquid which is being forced from the left hand end of the cylinder, the line of communication for applying this pressure including the passage or chamber 14 and the passage 30 (Fig. 2). The liquid forced from the left side of the plunger flows upward past the valve 22 (Fig. 1) and into the air chamber casing 3, from which it is discharged through the outlet 8.

On the reverse movement of the plunger to the right, the liquid to the right of the plunger flows upward past the valve 23 (Fig. 1) into the casing 3. At the same time, a suction is created to the left of the plunger, causing an inflow of liquid from the inlet 9 to the chamber 13 beneath the valve 20, which liquid flows upward past this valve, over the rib 29 (Fig. 2) through the passage 30 (Fig. 2) into the chamber 14 and thence into the cylinder.

It will be noted that all of the various passages, ports and partitions are formed in the body of the cylinder casing 1, and that the air chamber casing is all that is necessary as a closure, and as a valve retainer, so that only a single joint and gasket is required, which is an important consideration where corrosive liquids are to be handled. The valve construction, ports and passages are also made easily accessible by merely removing the casing 3. The corrosion resisting compositions are very hard and difficult to machine, except by grinding, and the present construction, because of its simplicity, and the limited number of joints, requires a minimum of grinding or machining. The reinforced plunger construction provides the necessary protection for the piston rod 7, and the two part arrangement lessens the difficulty involved in casting, and provides for ready assembling and disassembling, and for the replacement of piston rings. The foregoing and other advantages incident to the construction will be readily apparent to those skilled in the art.

What I claim is:—

1. In combination in a pump, a cylinder casing in the form of a casting having in one side a suction chamber with two passages leading therefrom to the opposite ends of the cylinder, and a pair of discharge passages also leading from the ends of the cylinder, a valve seat for each of said passages, also formed in said casting, an outwardly opening valve for each of said seats, and an air chamber casing having an outlet and fitting over said passages and valves and constituting a cover plate therefor and a retainer for said valves.

2. In combination in a pump, a cylinder casing in the form of a casting having in one side a suction chamber with two passages leading therefrom to the opposite ends of the cylinder, and a pair of discharge passages also leading from the ends of the cylinder, a valve seat for each of said passages, also formed in said casting, a cylinder head integral with said casing, an outwardly opening ball valve for each of said seats, and an air chamber casing having an outlet and fitting over said passages and valves and provided with means acting as retainers for said valves.

3. In combination in a pump, a cylinder casing in the form of a casting with an integral front head, and having in one side a suction chamber with two passages leading therefrom to the opposite ends of the cylinder, and a pair of discharge passages also leading to the ends of the cylinder, a valve seat for each of said passages, also formed in said casting, an outwardly opening valve for each of said seats, a plunger or piston working in the cylinder and provided with a piston rod working through said front head, packing carried by said head around the piston rod, and a relief passage in said head extending from said suction chamber to the piston rod inward of said packing.

In testimony whereof, I have hereunto subscribed my name this 11th day of December, 1925.

O. JACOBSEN