Feb. 22, 1955 G. J. DOURTE 2,702,510

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Fig. 1

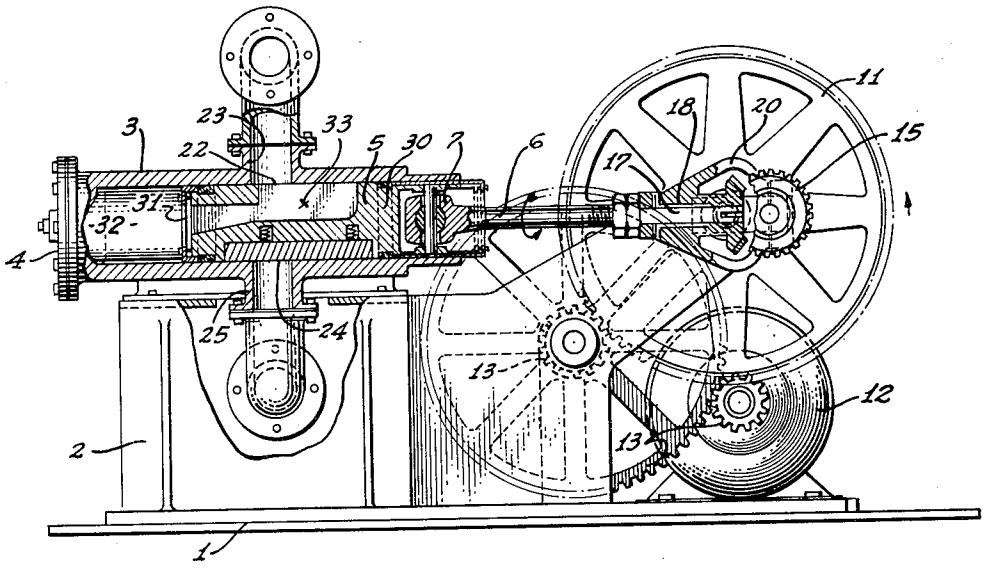
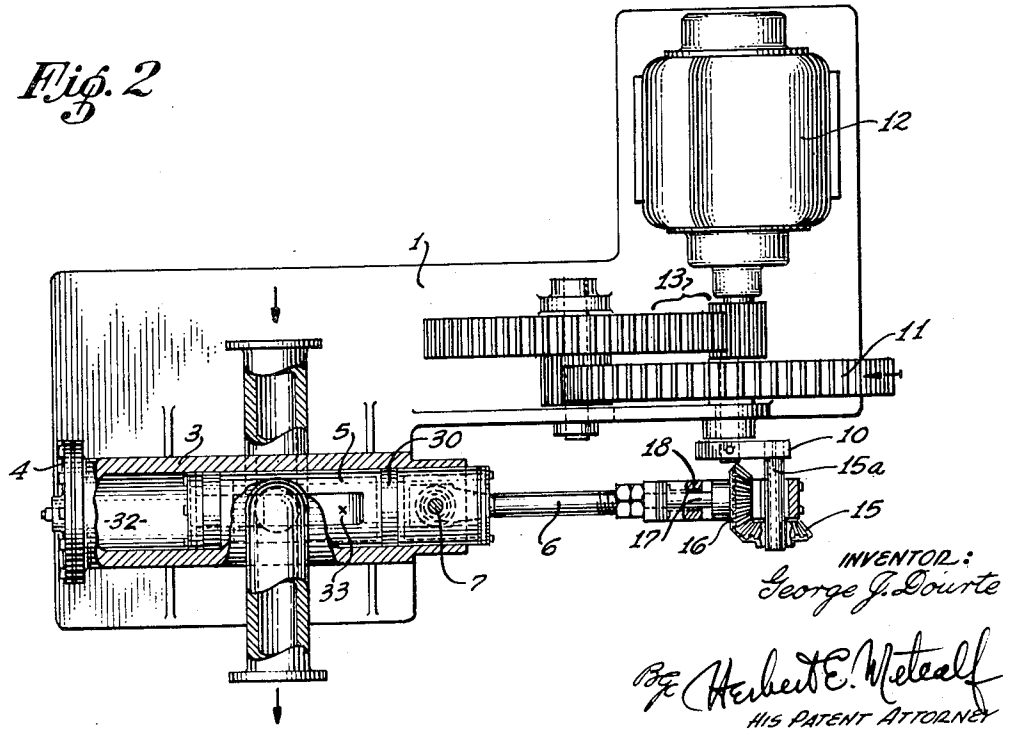


Fig. 2



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Fig. 3

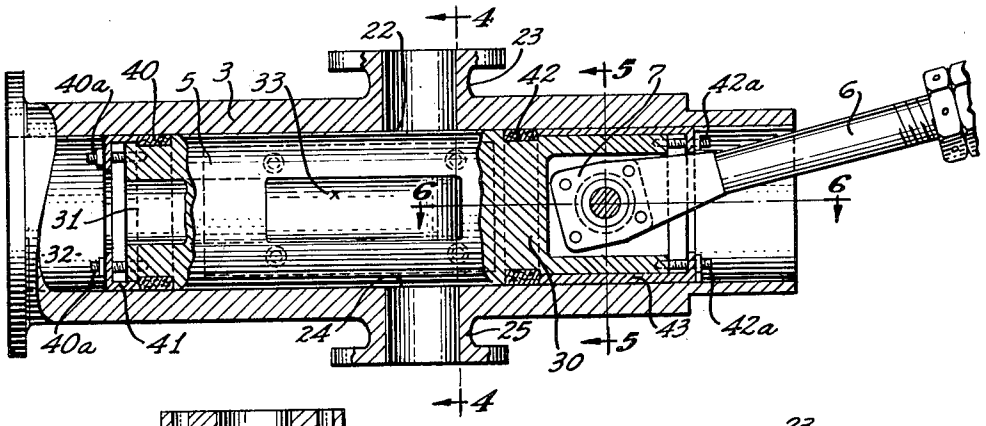


Fig. 4

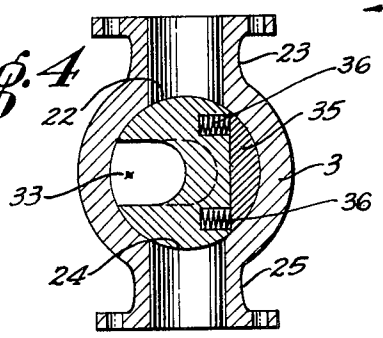


Fig. 5

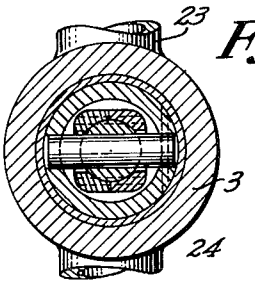
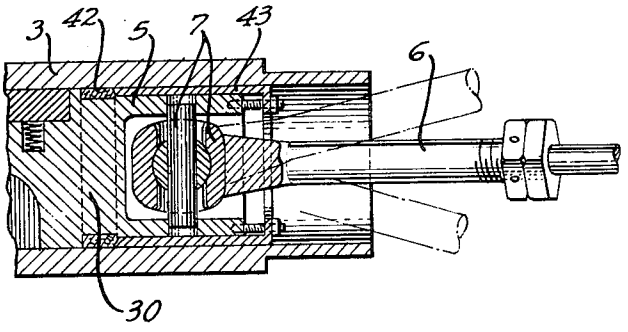


Fig. 6



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Application January 29, 1952, Serial No. 268,793

5 Claims. (Cl. 103—157)

The present invention relates to pumps and, more particularly to valveless pumps of the general type shown, described, and claimed in the United States Patents Nos. 1,010,604, 1,034,592, and 1,312,962.

These patents disclosed a valveless pump in which the piston is revolved as the pump operates, to cover and uncover inlet and outlet ports in the proper sequence to obtain efficient pumping action.

One of the problems in this particular type of pump is the sealing of the inlet and outlet ports and the piston seal. In my prior pumps the packings or glands for such sealing were carried by the pump cylinder. In the present improvement and simplification of my prior pumps, the sealing elements are carried entirely by the piston.

Among the objects of the present invention are:

To provide a valveless pump having efficient port and piston seals;

To provide a valveless pump in which all sealing elements are carried by the piston;

To provide a valveless pump in which the piston and seals can easily be replaced in case of wear in use;

To provide a valveless pump in which the sealing elements can readily be renewed; and

To provide a simplified valveless pump of the type shown in the above cited patents.

My present invention will be more readily understood by reference to the drawings in which:

Figure 1 is a vertical sectional view with parts in elevational view of a horizontal valveless pump embodying a preferred form of the present invention.

Figure 2 is a plan view with parts broken away, of the pump of Figure 1.

Figure 3 is a fragmentary sectional view, with parts shown in elevation, of the cylinder and piston of the pump of Figures 1 and 2.

Figure 4 is a sectional view taken as indicated by line 4—4 in Figure 3.

Figure 5 is a sectional view taken as indicated by the line 5—5 in Figure 3.

Figure 6 is a sectional view of the open end of the cylinder showing the universal joint connection to the piston.

Referring now to the figures, a base **1** is provided with a cylinder support **2** carrying a pump cylinder **3** extending horizontally. Cylinder **3** is closed by an end plate **4** at one end, and is open at the other end. A piston **5**, to be described later in detail, is mounted in cylinder **3** and is reciprocated by a piston rod **6** attached to piston **5** by a universal joint **7** and to a crank **10** mounted on a crank gear **11**. Crank gear **11** is driven by motor **12** through gear train **13**, all mounted on base **1**.

As the crank **10** is rotated to reciprocate the piston **5** in cylinder **3**, the piston is also rotated by a bevel gear **15** mounted on the end of a crank pin **15***a*, this bevel gear mating with a piston rod gear **16** on a piston rod pin **17**, extending through piston rod bearing **18** in rod end yoke **20** which is journalled on crank pin **15***a*. This arrangement, as shown in the above cited patents, will rotate the piston **5** as it reciprocates. Cylinder **3** is provided with an upper inlet port **22** connected with inlet pipe **23** and an opposite lower outlet port **24** connected to an outlet pipe **25**.

As rotation of the piston provides the entire porting control in this valveless pump, the piston construction of the present invention will now be described, as all seals are carried by this piston.

The piston **5** is hollow, with a closed outer end **30** and with an inner end **31** opening into the cylinder space **32** inside of end plate **4**. An elongated port aperture **33** is cut through the piston wall and is the width of the diameter of inlet and outlet ports **22** and **24** and is as long as the stroke of the piston. Thus, as shown in Figure 1, the inlet port **22** can be opened, through port aperture **33** and the interior of piston **5** to the cylinder space **32** during the suction portion of the cycle, the piston **5** then turning to place the port aperture **33** in communication with the outlet port **24** on the pressure stroke of the piston.

As it is imperative that the port connections with the cylinder be airtight, and that wear between the periphery of the piston **5** and the cylinder wall be compensated for, I mount on the piston, opposite the port aperture **33**, a pressure plate **35** of piston periphery contour on the outside thereof, this plate **35** being forced outwardly against the cylinder wall by corner springs **36** as best shown in Figure 4. This pressure plate is preferably longer than the piston stroke and peripherally wider than the ports, and effectively presses the piston walls around port aperture **33** against the cylinder wall to seal the ports during the pumping cycle.

To seal the piston ends, I provide an inner piston packing **40** held in place by an inner end adjustable piston gland **41**, and an outer piston packing **42** held in place by an outer piston gland **43**. Both packings **40** and **42** are positioned on the piston so that they do not pass over the inlet or outlet ports during pump operation.

Outer piston packing **42** can readily be adjusted as by outer screws **42***a* and inner packing **40** can be adjusted by the use of inner screws **40***a* merely by removing end plate **4** from the cylinder. The entire piston, carrying all seals, can readily be removed by disconnecting the piston rod from crank arm **10**, for replacement of the packings, the pressure plate **35**, or for the installation of an entire new piston assembly.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

I claim:

1. In combination, a cylinder closed at one end and having oppositely disposed inlet and outlet ports spaced from the closed end, a hollow piston to simultaneously reciprocate and rotate in said cylinder, means attached at the other end of said piston for said reciprocation and rotation thereof, the interior of said hollow piston opening into the closed end of said cylinder, said hollow piston having an elongated aperture in the periphery thereof extending parallel of the axis of said piston to alternately connect the interior of said hollow piston with said inlet and outlet ports at determinate periods during the movement of said piston, a segmental portion of said piston being cut away intermediate the ends thereof and opposite said aperture to leave a cutaway on the periphery of said piston separated from the interior of said hollow piston and each end thereof by the remaining portion of said piston, said segmental portion being positioned in said cutaway to define a pressure plate, elastic means interposed between said cutaway and said pressure plate to urge said pressure plate into contact with the interior wall of said cylinder around said ports, said pressure plate alternately registering with and sealing one of said ports during movement of said piston so that when said aperture registers with one of said ports said pressure plate simultaneously registers with and seals the opposite port.

2. In combination, a cylinder closed at one end and having oppositely disposed inlet and outlet ports spaced from the closed end, a hollow piston to simultaneously reciprocate and rotate in said cylinder, means attached at the other end of said piston for said reciprocation and rotation thereof, the interior of said hollow piston open-

ing into the closed end of said cylinder, said hollow piston having an elongated aperture in the periphery thereof extending parallel of the axis of said piston to alternately connect the interior of said hollow piston with said inlet and outlet ports at determinate periods during the movement of said piston, a segmental peripheral portion of said piston being cut away intermediate the ends thereof opposite said aperture leaving a cutaway on the periphery of said piston separated from the interior of said hollow piston and each end thereof by the remaining portion of said piston, said segmental portion being positioned in said cutaway to define a pressure plate, elastic means interposed between said cutaway and said pressure plate to urge said pressure plate into contact with the interior wall of said cylinder around said ports, said pressure plate alternately registering with and sealing one of said ports during movement of said piston so that when said aperture registers with one of said ports said pressure plate simultaneously registers with and seals the opposite port, and adjustable circumferential seals positioned around said piston between each end thereof and said aperture and pressure plate.

3. Apparatus in accordance with claim 2 wherein said pressure plate is wider than the diameter of said ports and longer than the stroke of said piston.

4. Apparatus in accordance with claim 2 wherein said adjustable circumferential packing seals are spaced apart by a distance greater than the stroke of said piston to seal the interior ends of said cylinder therefrom and adjustable compression means for forcing said adjustable circumferential packing seals into fluid tight contact with the interior wall of said cylinder.

5. The combination in accordance with claim 4 wherein said adjustable compression means for said circumferential seals are sleeve glands at each end of said piston and adapted for controllable longitudinal movement axially against the outer edges of said adjustable circumferential packing seals to compress said seals into fluid tight contact with the interior wall of said cylinder, and wherein a set screw means is associated with each of said sleeve glands for said controllable movement and setting thereof to establish proper sealing relationship of said seals with the interior wall of said cylinder.

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