

Aug. 17, 1965

S. M. CURIONI

3,200,759

FRITIONLESS PISTON PUMP

Filed Nov. 30, 1962

2 Sheets-Sheet 1

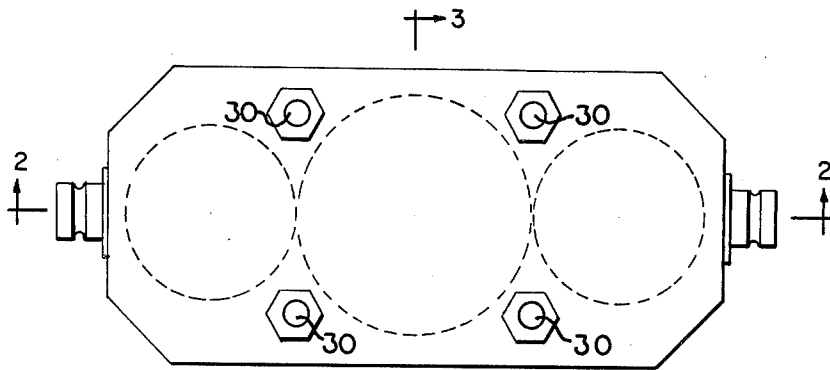


FIG. 1

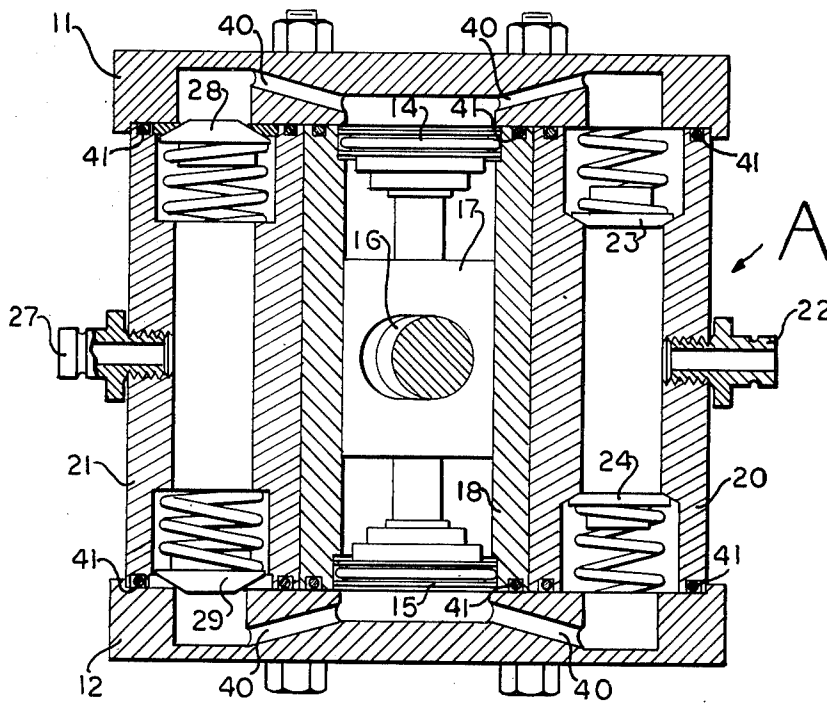


FIG. 2

INVENTOR.
SALVATORE M. CURIONI

Aug. 17, 1965

S. M. CURIONI

3,200,759

FRICTIONLESS PISTON PUMP

Filed Nov. 30, 1962

2 Sheets-Sheet 2

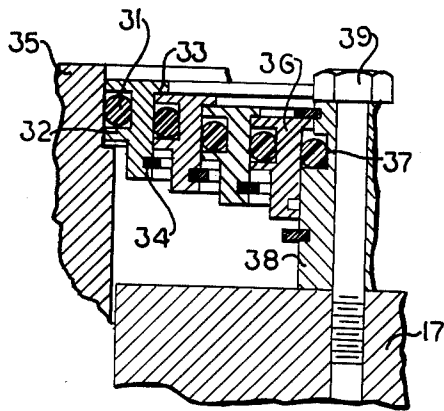


FIG. 4

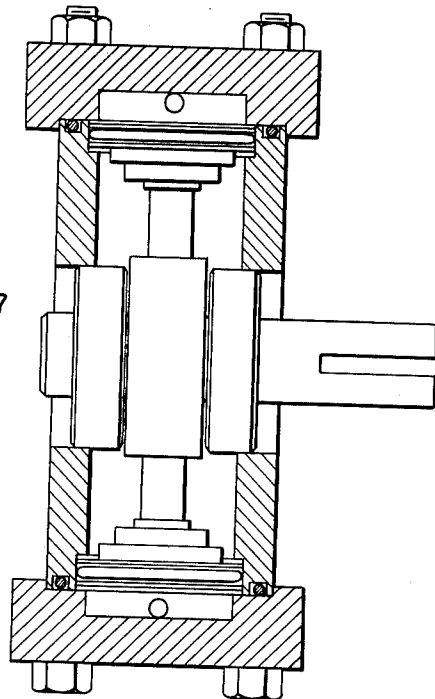


FIG. 3

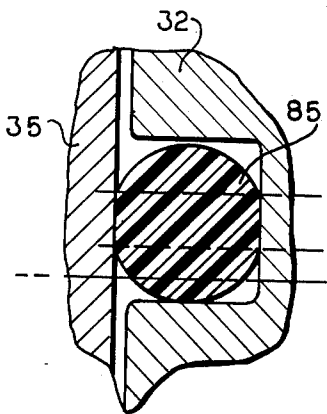


FIG. 5

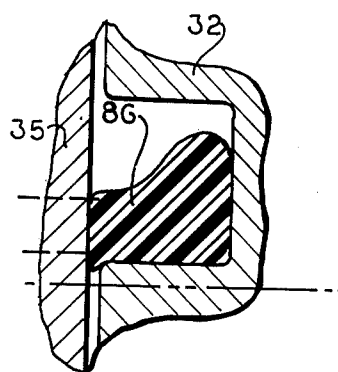


FIG. 5A

INVENTOR.
SALVATORE M. CURIONI

1

3,200,759

FRICTIONLESS PISTON PUMP

Salvatore M. Curioni, 151 S. Sunset, Haysville, Kans.

Filed Nov. 30, 1962, Ser. No. 241,387

4 Claims. (Cl. 103-153)

This invention relates to pumps and more particularly to piston pumps of high pressure and/or high volume, and it is a general object of the invention to provide various improvements and simplifications in construction and arrangement of parts in a device of this character.

Piston pumps, generally used, at the present time, due to their basic design, absorb a great percentage of the total power necessary to make the pump functional, to overcome the friction induced by the sliding, or rubbing of the piston (or piston's seals) against the cylinder's wall.

It is the principal scope of this invention to eliminate, or greatly reduce, this frictional resistance between the piston and the cylinder and, consequently, obtaining a better, more economical and more efficient pump and one which is capable of producing higher pressures and/or greater volume than reciprocating pumps produced in the present art.

Another important object of this invention is the basic change in design of this pump; the simple design of the unit, and relative components, will greatly facilitate the manufacturing and assembly of the pump.

Another object of this invention is to provide a pump in which the majority of the components are made from standard bar stock; this will reduce machining and relative cost to a minimum.

Another object of this invention consists in the elimination of parts requiring costly inspection and machining techniques such as castings; and such other components as would require rigorous quality controls to insure compliance with known safety procedures and additionally to preclude failures associated with use of such marginal components. This is accomplished only by the use of acceptable milled, rolled or extruded material known in the art as bar stock.

Another object of this invention is to make a pump light in weight and compact; this is accomplished in this design by the use of materials that have been extruded or rolled or forged, permitting the use of thin but strong walls.

A further object of this invention is to provide a pump that is readily accessible and that each part can be replaced, if necessary, quickly and independently from other parts.

A further and related object of this invention is the simplification and reliability of the sealing system, so designed as to have each unit separately sealed and permitting the use of elastic rings in their original circular shape; this design offers also the advantage of a quick and economical substitution of each seal.

Another object of importance of this invention consists in the balanced distribution of stresses in the design comprising the dual system of opposed sealed bearings supporting the shaft on each side of the eccentric; at one end this shaft is extended and connected with the power source.

Another object of this invention is the incorporation of a simple system of communication between the intake port and the pressure chamber, and the outlet port and the pressure chamber. This ingenious design permits the use of circular elastic ring seals to be independent of each other and to maintain the original circular shape, in the sealing status, between the upper and lower caps and the valves and piston cylinders.

With the above and other objects in view, the inven-

2

tion consists in the novel and useful provision, formation, construction, association and relative arrangement of parts, members and features, all shown in certain embodiments in the accompanying drawings, described generally and more particularly pointed out in claims.

While this invention has been described in connection with a preferred specific embodiment thereof, it will be understood that this description is intended to illustrate and not to limit the scope of the invention which is defined by the claims, and that the various materials and/or means of assembly of the various units can be varied in the light of this discussion and description without departing from the spirit of the disclosure.

Various other objects, advantages and features of the invention will become apparent to those skilled in the art from the following description taken in connection with the accompanying drawing in which:

FIGURE 1 is a plan view of the pump.

FIGURE 2 is a cross section taken along a longitudinal line 2-2 of FIGURE 1, showing the sectional view of the pump.

FIGURE 3 is a cross section taken along the transversal line 3-3 of FIGURE 1, showing the sectional view of the cylinder.

FIGURE 4 is an enlarged cross section view of the piston shown in FIGURE 2 and FIGURE 3.

FIGURE 5 is a greater enlarged detail of a cross section of a seal showing the ring in an active position.

FIGURE 5A is a greater enlarged detail of a cross section of a seal showing the ring in an inactive position.

Referring now specifically to FIGURES 1 and 2, a pump A made in accordance with the present invention is shown to include an upper cap or cover 11 and a lower cap or base 12, a central cylinder 18 in which two (2) opposed pistons 14 and 15 are located and an eccentric shaft 16 which rotated will impart a linear motion to the cylindrical connecting rod 17. The connecting rod is guided in its linear motion by the wall of the cylinder 18 and is attached, at each end, by bolts to the pistons as clearly shown also in FIGURE 4.

Located at the right of the central cylinder 18 is another cylinder 20. The cylinder 20 is the inlet cylinder to which the hose carrying the fluid to be pumped or pressurized is connected to the inlet fitting 22. The two (2) opposite valves 23 and 24 are directional valves and permit fluid to enter only during the suction cycle.

Located at the left of the central cylinder 18 is another cylinder 21; this cylinder is the outlet cylinder to which an outlet fitting 27 is attached. At each end of the cylinder are located the valves 28 and 29; these valves are directional and permit for the fluid to exit.

The cover 11 has two (2) internal passages, oppositely located; the one shown on the right goes from the inlet cylinder 20 to the chamber of the central cylinder 18, and the passage on the left goes from the outlet cylinder 21 to the chamber of the central cylinder 18.

The base 12 is identical to the cover 11.

The passages or tunnels 40 located in the upper and lower caps bridge the zone between the seals 41 permitting each individual cylinder 18, 20 and 21 to be sealed separately; this is a definite advantage in case of necessary replacement of the seals or of the cylinders. This design, also, facilitates the assembling of the pump.

The four (4) bolts 30 will keep the caps 11 and 12 properly placed and tight against the ends of the cylinders 18, 20 and 21, with the necessary pressure; between the caps and the cylinder are inserted the O ring seals 41 in the relative grooves, consequently, accomplishing the sealing between the cylinders and the caps.

The pistons 14 and 15 are made of a series of hollow cylindrical sections; each section consists of a sealing ring 31 and a groove 32 in the shape of a horizontal U in

3

which the sealing ring is inserted in the outer hollow of the U section, as clearly shown in FIGURE 4.

These hollow cylindrical sections are made in different sizes and they fit inside each other in such fashion to keep the proper pressure between the inside wall and the sealing ring contacting it and, therefore, being hermetically sealed from each other.

These hollow cylindrical sections are limited in their relative motion by a shoulder 33 in the section upper part and an inserted retaining ring 34.

The sealing ring 31 of the first section (the largest) will be in contact with the wall of the cylinder 35 and the last or smallest section 36 will be in contact with the sealing ring 37 of the tube 38 in which the bolt 39 is inserted.

From what is above described and illustrated can be readily seen that the composite piston can be made to operate in such fashion that the total motion of the stroke imparted to the rod 17 can be divided proportionally, or as desired, to each section, comprising the piston, and that this motion imparted to each section, depends on the proper clearance provided by the shoulder 33 and the retaining ring 34.

The displacement induced to the sections composing the piston, can be made to be sufficiently small to avoid any sliding action between the sealing ring and the wall with which it is in contact. This displacement can be absorbed by the fiber of the sealing ring 85 and by inducing a deformation as in sealing ring 86. Hence this deformation will permit the composite piston to produce the required compression action without the sliding or rubbing action and, therefore, eliminating or reducing greatly the energy required to accomplish the cycling, as shown in FIGURES 5 and 5A.

While this invention has been described with particular reference to the construction shown in the drawing and while various changes may be made in the detailed construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

Having thus completely and fully described the invention, what is now claimed as new and desired to be protected by Letters Patent of the United States is:

1. In a reciprocating pump having a body, an inlet for said body, an outlet for said body, an inlet chamber communicating with said inlet, an outlet chamber communicating with said outlet, a pressure chamber, valve means for controlling the flow of fluid between said inlet chamber and said pressure chamber and between said pressure chamber and said outlet chamber, a cylinder, the improvement comprising a piston slidably mounted for reciprocal movement in said cylinder and partially defining said pressure chamber, said piston being operative upon reciprocation to vary the volume of said pressure chamber thus drawing fluid from said inlet chamber and dis-

4

charging said fluid under pressure into said outlet chamber, said piston being comprised of a plurality of telescopically nested sections each movable a predetermined limited extent with respect to adjacent sections.

2. In a reciprocating pump having a body, an inlet for said body, an outlet for said body, an inlet chamber communicating with said inlet, an outlet chamber communicating with said outlet, a pressure chamber, valve means for controlling the flow of fluid between said inlet chamber and said pressure chamber and between said pressure chamber and said outlet chamber, a cylinder, the improvement comprising a piston slidably mounted for reciprocal movement in said cylinder and partially defining said pressure chamber, said piston being operative upon reciprocation to vary the volume of said pressure chamber thus drawing fluid from said inlet chamber and discharging said fluid under pressure into said outlet chamber, said piston being formed of a plurality of hollow cylindrical sections mounted in telescopic relation for limited relative movement and means for sealing the sections with respect to each other and to said cylinder.

3. In a reciprocating pump having a body, an inlet for said body, an outlet for said body, an inlet chamber communicating with said inlet, an outlet chamber communicating with said outlet, a pressure chamber, valve means for controlling the flow of fluid between said inlet chamber and said pressure chamber and between said pressure chamber and said outlet chamber, a cylinder, the improvement comprising a piston slidably mounted for reciprocal movement in said cylinder and partially defining said pressure chamber, said piston being operative upon reciprocation to vary the volume of said pressure chamber thus drawing fluid from said inlet chamber and discharging said fluid under pressure into said outlet chamber, said piston being formed of a plurality of hollow cylindrical sections mounted in telescopic relation, each of said sections being recessed for reception of an annular elastic seal.

4. A pump in accordance with claim 3 in which said seal takes the form of an O-ring of rubber, neoprene or the like.

References Cited by the Examiner

UNITED STATES PATENTS

1,095,926	5/14	Powell	92—53
1,468,897	9/23	Beaupre	103—175 X
1,717,485	6/29	Wirz	92—53
2,139,178	12/38	Stevens	92—52 X
2,771,037	11/56	Johnston	103—171 X
2,919,652	1/60	Fay	103—53

DONLEY J. STOCKING, *Primary Examiner*.

WARREN E. COLEMAN, LAURENCE V. EFNER,
Examiners.