April 13, 1954 J. J. COLBERT 2,674,954

FLUID PUMP

Filed May 18, 1949 2 Sheets-Sheet 1

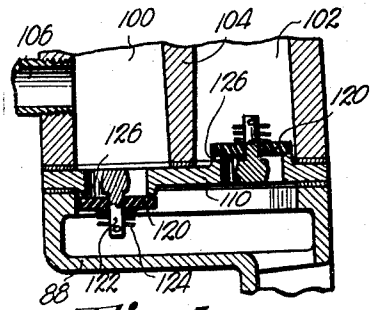


Fig. 5.

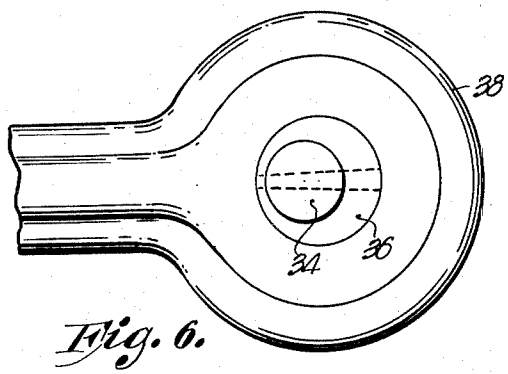


Fig. 6.

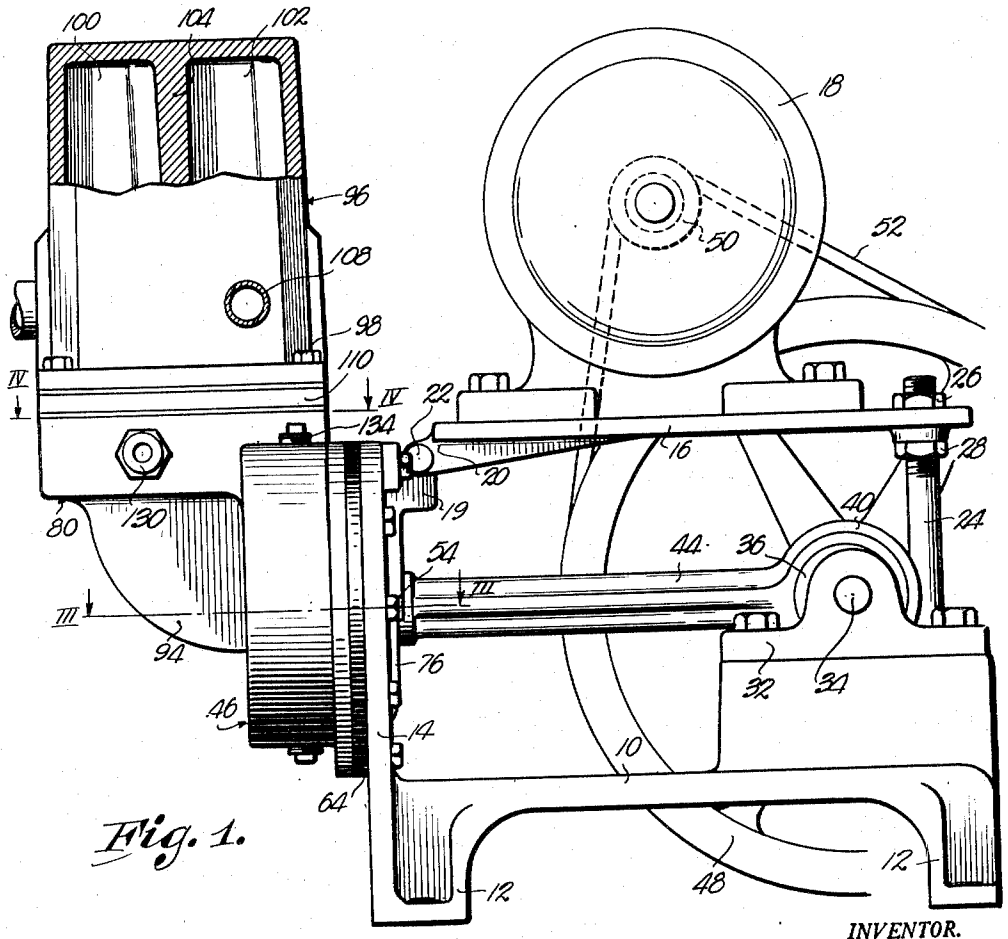


Fig. 1.

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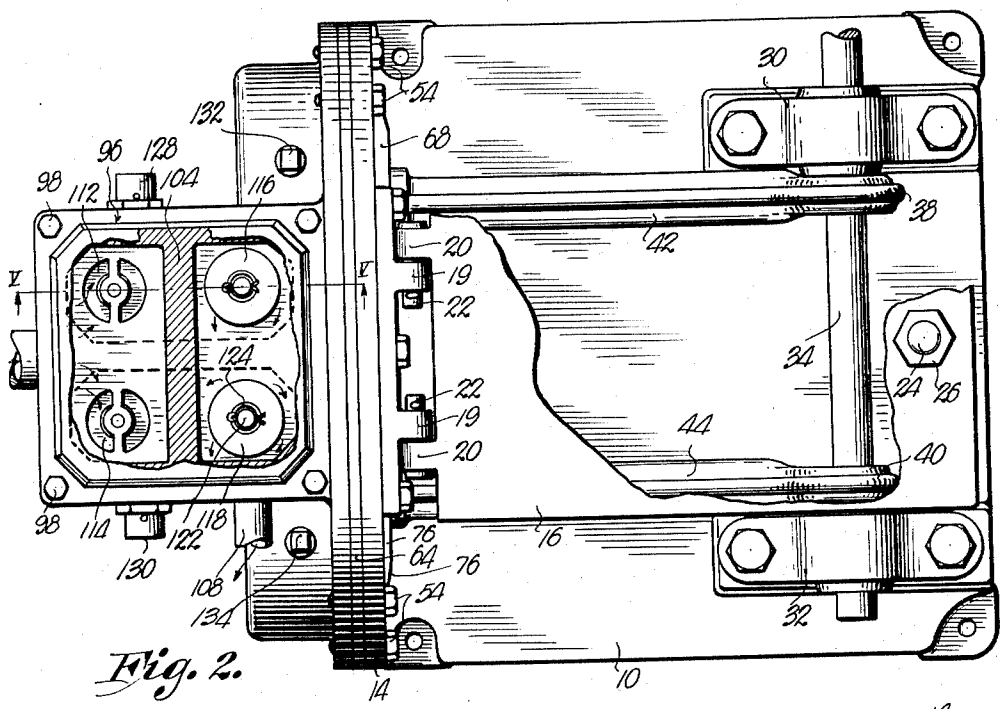


Fig. 2.

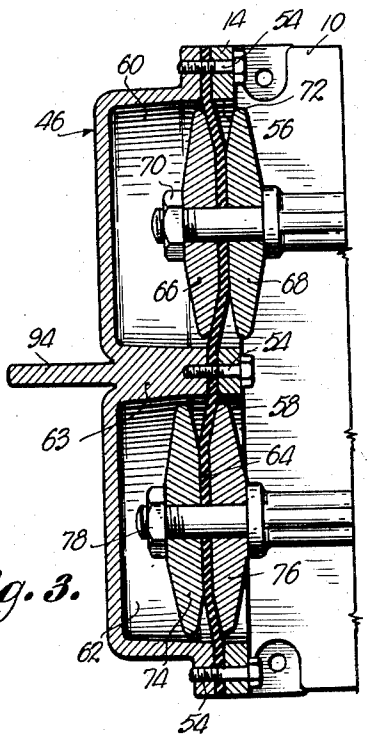


Fig. 3.

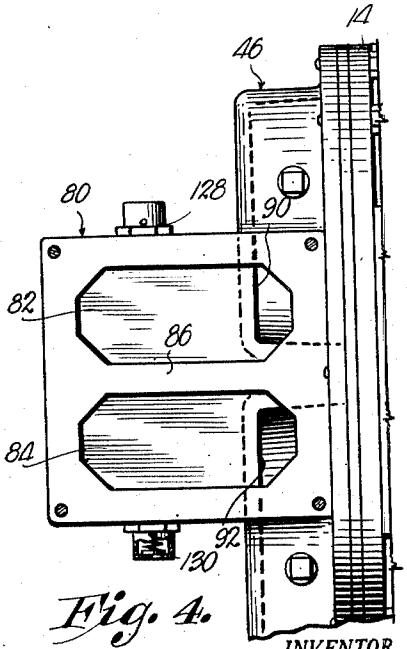


Fig. 4.

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UNITED STATES PATENT OFFICE

2,674,954

FLUID PUMP

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1 Claim. (Cl. 103—150)

1

This invention relates to a fluid pump including in combination the diaphragm principle utilized in conventional pumps, as well as the principle of piston action or drive commonly found in other types of similar constructions, and is a continuation in part of my co-pending application, Serial No. 689,157, filed August 8, 1946, and entitled "Pressure Water System," now abandoned.

It is the most important object of the present invention to provide a fluid pump that is relatively small yet compact and efficient in its operation in that the same is capable of producing a continuous flow of fluid and operates at a capacity that equals many more complicated, large and expensive pumps presently in use.

Another important object of the present invention is to provide a fluid pump having a compartmented, hollow body wherein one wall thereof constitutes a flexible diaphragm separated by a partition that presents the compartments of the body, the diaphragm having two means for flexing the same, one on each side of the partition and the two portions of the diaphragm flexing in alternating opposite directions when the pump is in use.

Another important object of the present invention is to provide a fluid pump of the above mentioned type, wherein the two compartments or cylinders covered by the diaphragm, receive fluid from a common inlet pipe and discharge such fluid through a common outlet pipe, there being provided a number of chambers and passageways, together with a plurality of check valves, all novelly arranged to permit such operation.

Another object of the present invention is to provide a fluid pump wherein the two cylinders of the pump head are each provided with an inlet and outlet valve, the two inlet valves communicating with an inlet pipe and the two outlet valves communicating with an outlet pipe whereby a continuous flow is established and once the pump is placed in operation, the same will not get out of prime.

Other more minor objects will be made clear or become apparent as the following specification progresses, reference being had to the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a fluid pump made in accordance with my present invention, parts being broken away for clearness.

Fig. 2 is a top plan view thereof, parts being broken away and in section to reveal details of construction.

Fig. 3 is a fragmentary, cross-sectional view

2

taken on line III—III of Fig. 1 looking in the direction of the arrows.

Fig. 4 is a fragmentary, cross-sectional view taken on line IV—IV of Fig. 1, looking in the direction of the arrows.

Fig. 5 is a fragmentary, detailed, cross-sectional view taken on line V—V of Fig. 2; and

Fig. 6 is an enlarged, elevational view showing one end of one of the piston rods per se.

A horizontal support 10, is illustrated in Figs. 1 and 2 of the drawings, having a plurality of legs 12. Support 10 is L-shaped to present an up-standing panel 14 upon which is mounted a base 16 for an electric motor or like prime mover 18.

The panel 14 has a pair of outwardly extending perforated lugs 19 at the uppermost edge thereof for receiving complementary lugs 20 on the proximal edge of the base 16.

Pivot pins 22 interconnect proximal lugs 19 and 20 for swingably mounting base 16 upon panel 14 of support 10. The base 16, therefore, overlies the support 10 in spaced relationship thereabove and that end of base 16 opposite to the hinged mounting therefor, is supported by an up-standing bolt 24 carried by the support 10, bolt 24 slidably receiving the base 16 itself and it being provided with a pair of opposed nuts 26 and 28 for adjustably receiving base 16.

Support 10 carries a pair of spaced apart bearings 30 and 32 for rotatably receiving an elongated shaft 34. Shaft 34 in turn receives a pair of spaced apart eccentrics, one only of which is illustrated in Fig. 6 of the drawing and designated by the numeral 36. The eccentrics 36 receive heads 38 and 40 of a pair of spaced piston rods 42 and 44 respectively. Rods 42 and 44 extend toward the plate 14 in perpendicular relationship to the shaft 34 and terminate within a hollow body, broadly designated by the numeral 46.

Shaft 34 is provided with a sheave 48 that is in turn operably connected with drive pulley 50 of motor 18 through the medium of a continuous belt 52. The hollow body 46 is elliptically-shaped as is a portion of the panel 14 to which body 46 is secured through the medium of a plurality of bolts 54.

The panel 14 is provided with a pair of openings 56 and 58 for clearing the rods 42 and 44 respectively. Hollow body 46 is divided into a pair of compartments 60 and 62 in alignment with openings 56 and 58 respectively by a partition 63, the two compartments 60 and 62 being circular as shown in Figs. 1 to 4 inclusive. The open face of the compartments 60 and 62 proxi-

mal to the panel 14 is covered by a continuous flexible diaphragm 64 that is interposed between the hollow body 46 and the panel 14, thereby also closing the openings 56 and 58 in panel 14. Accordingly, the diaphragm 64 is held in place through the medium of the bolts 54.

Piston rod 42 is provided with a pair of spaced apart discs 66 and 68 disposed on opposite sides of the diaphragm 64, the disc 66 being within compartment 60 and the disc 68 being exteriorly thereof. Discs 66 and 68 are threadably received by the proximal end of the rod 42 and are held in tight clamping relationship with respect to the diaphragm 64 by a nut 70.

It is to be noted that the diameters of discs 66 and 68 are slightly less than the diameters of compartments 60 and the adjacent opening 56 in panel 14. The circumferential edges 72 of discs 66 and 68 are rounded and the sides of these discs 66 and 68 converge as the edge 72 is approached. Thus, as is particularly clear in Fig. 3 of the drawings, the identical discs 66 and 68 have substantially dome-shaped innermost and outermost faces and these faces each consist of a flat, central surface and a beveled, marginal surface that surrounds the flat surface thereof. The two beveled surfaces of each of the discs 66 and 68, converging as the rounded edge 72 is approached, present a working or flexing space for the diaphragm 64 between the discs 66 and 68 as is clear in Fig. 3. The innermost flat surfaces of the discs are clamped tightly against the diaphragm 64 when the nut 70 is drawn tightly against the disc 66, and the diaphragm 64 engages the proximal marginal edges of the discs alternately as the piston rod 42 reciprocates. Accordingly, when the piston rod 42 reciprocates through rotation of shaft 34 and by virtue of the eccentric 36, that portion of the diaphragm covering compartment 60 and opening 56, will flex to afford the pumping action. The particular formation of the discs 66 and 68 afford protection for the diaphragm 64, rendering the same long-lasting and not likely to wear at the points of flex.

Obviously, the piston rod 44 is likewise provided with a pair of discs 74 and 76 of identical formation to discs 66 and 68 and held in place by a nut 78 adjacent compartment 62 and opening 58.

A hollow member, broadly designated by the numeral 80, is formed integrally with the hollow body 46 and disposed in partial overlying relationship thereto. The hollow member 80 is divided into a pair of passages 82 and 84 by a portion 86 of the partition 63, and bottom wall 88, common to the passages 82 and 84 is provided with a pair of openings 90 and 92.

Opening 90 places the passage 82 into direct communication with the compartment 60 on one side of the partition 63—86 and opening 92 places the passage 84 in register with the compartment 62 on the opposite side of partition 63—86.

An external arcuate web 94 integral with the partition 63—86 provides supporting means for that part of the hollow member 80 that extends outwardly beyond the hollow body 46.

A hollow case broadly designated by the numeral 96 overlies the hollow member 80 and is secured directly thereto through the medium of a plurality of bolts 98. Case 96 is divided into a pair of air chambers 100 and 102 by a vertical dividing wall 104 that is disposed in a plant that is perpendicular to a plane through the partition 63—86 and the web 94. The air chamber 100 of case 96 is provided with an inlet pipe 106 adapted to connect with a source of fluid to be pumped (not shown).

The air chamber 102 has an outlet pipe 108 that may lead to a point of delivery of the fluid to be pumped.

A valve plate 110 is interposed between the case 96 and the member 80, forming the bottom wall of the former and the top wall of the two passages 82 and 84 of member 80. The plate 110 is provided with four openings, two of which communicate with the chamber 100 and the other two of which communicate with the chamber 102. These openings are provided with check valves 112, 114, 116 and 118 respectively. The valves just mentioned are of identical character in that the same are provided with a resilient disc 120, reciprocably mounted on a stem 122 and yieldably held in the closed position through the medium of a spring 124 coiled about the stem 122. Furthermore, the plate 110 has an air vent slot 126 adjacent each disc 120 respectively.

The two valves 112 and 114 are disposed in the manner illustrated in Fig. 5 showing valve 112 only. In other words, the discs 120 of valves 112 and 114 are within the passages 82 and 84 respectively. Fig. 5 also illustrates valve 116 and the manner in which both valves 116 and 118 have their discs 120 within the chamber 102. It is clear therefore, that the check valves 112 and 114 will permit passage of liquid in only one direction, i. e. from chamber 100 to the member 80. In the same manner, check valves 116 and 118 will permit passage of fluid only from the member 80 to the chamber 102.

The passageways 82 and 84 are provided with check valves 128 and 130 respectively in the usual manner for admittance of air under pressure. For priming purposes, plugs 132 and 134 are provided for the comparts 60 and 62 of the hollow body 46.

In operation, when motor 18 is energized to drive shaft 34 through belt 52, the piston rods 42 and 44 will be reciprocated because of their respective eccentrics 36. The eccentrics 36 are disposed on shaft 34 in such manner as to reciprocate the rods 42 and 44 in opposite directions. In other words, when the disc 66 is at the outermost end of its path of travel, proximal to the panel 14, as shown in Fig. 3, the disc 74 will be at the opposite end of its path of travel remote from the panel 14. On such suction stroke of the piston rod 42 and its corresponding portion of diaphragm 64, fluid will be drawn in through inlet 106 into air chamber 100. The fluid will flow downwardly through valve 112 into passageway 82 through opening 90 and into compartment 60. On the pumping stroke, piston rod 42 will move that part of diaphragm 64 associated therewith inwardly of the compartment 60 to force such liquid in the compartment 60 outwardly through opening 90 and into the chamber 102 by way of valve 116 for ultimate flow to a point of use by way of outlet 108.

The portion of diaphragm 64 joined to rod 44 operates in the same manner utilizing inlet check valve 114 and outlet check valve 118.

It is clear from the foregoing that a continuous flow of fluid from inlet 106 to outlet 108 takes place once the fluid pump is placed in operation and that priming will take place only to initially start the pumping action. The stroke of the pistons 42 and 44 need only be relatively short as illustrated and the speed of shaft 34 may be adjusted by use of the support 24 and

through proper selection of pulleys 48 and 50. Through use of a single diaphragm 64 there is a more positive assurance that the same will stay in place between the body 46 and the panel 14 since any pulling action will be compensated by opposite portions of diaphragm 64 corresponding to rods 42 and 44 respectively.

The entire pump is easily manufactured and is extremely compact and arranged in a manner to provide balance and symmetry not only in appearance but in operation and handling.

While only one modification of the pump has been illustrated and described, the same is manifestly subject to many changes and modifications and those that fairly come within the scope of the appended claim, are contemplated hereby.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

In a fluid pump, a hollow body having a compartment provided with a pair of opposed walls, a flexible diaphragm forming one of said walls of the compartment, and a fluid opening communicating with the compartment; a reciprocable piston rod extending through the diaphragm; and means attaching the piston rod to the diaphragm including a pair of opposed discs

mounted on the piston rod and having the diaphragm clamped therebetween, said discs each having a transversely rounded circumferential edge and a pair of opposed, substantially dome-shaped faces, presenting a pair of opposed, flat central surfaces and a pair of opposed, beveled, marginal surfaces surrounding the flat surfaces and converging as said edges thereof are approached, each disc having one of its flat surfaces engaging the diaphragm.

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