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F. S. CASS

FORCE PUMP

Filed Feb. 23, 1924

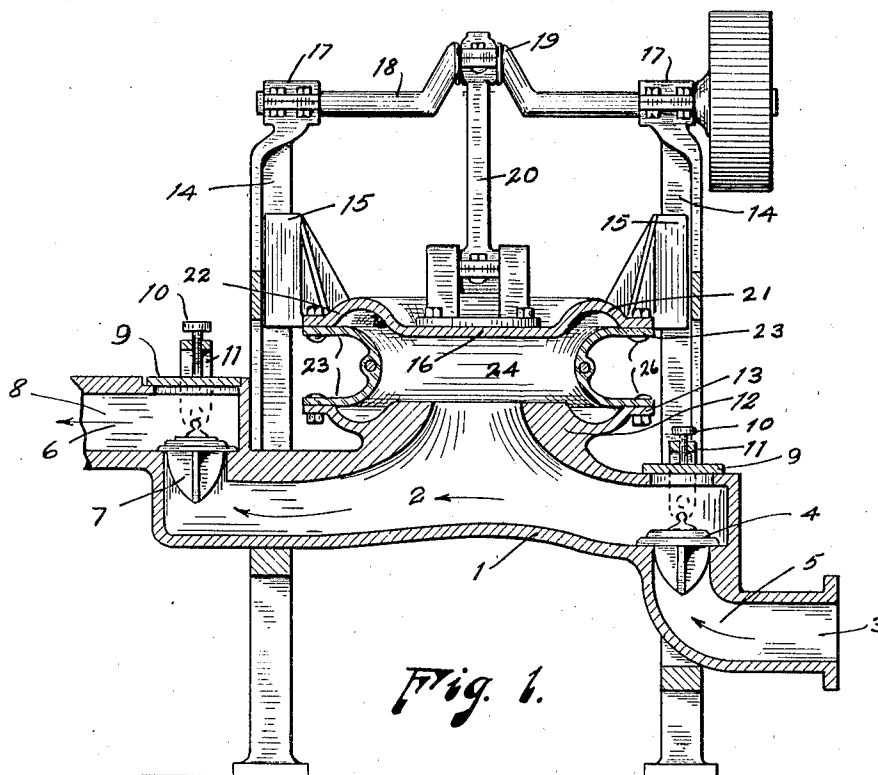


Fig. 2.

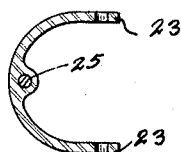
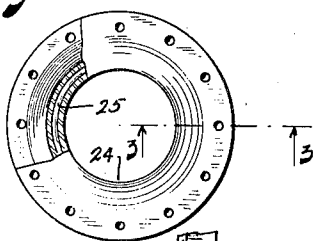


Fig. 3.

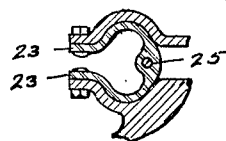


Fig. 4.

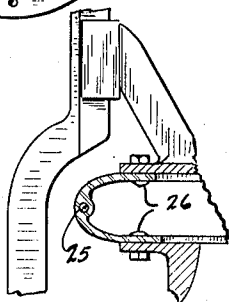


Fig. 5.

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FORCE PUMP.

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To all whom it may concern:

Be it known that I, FRED S. CASS, a citizen of the United States, residing at Denver, county of Denver, and State of Colorado, have invented certain new and useful Improvements in Force Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in force pumps of the type extensively employed for pumping dirty water.

In mines and in irrigation works, as well as in many other places, it is often necessary to raise a large amount of water that contains a high percentage of dirt, sand and gravel. It is perfectly evident that the ordinary pump employing a piston that reciprocates within a cylinder, is unsuited for handling this sand-laden liquid, as the sand and grit would cause excessive wear between the piston and the cylinder.

For the purpose of successfully handling dirty, muddy or sand-laden water, pumps, of what is known as the diaphragm type, have been invented. These pumps have a chamber whose cubical contents is alternately increased and reduced by means of a plunger connected to the walls of the chamber by a flexible diaphragm. The chamber has an intake and an exhaust valve, both of which permit the liquid to flow freely in one direction. When the plunger is operated, the liquid will be set into motion. As an example of this type of pump, attention is called to Patent No. 1,447,074, granted to Gorman, Jr., February 27, 1923.

It is the object of this invention to produce a pump of the general character outlined above, in which the flexible member, which has heretofore been formed from an annular member cut from a flat sheet of suitable material, is constructed in such a manner that a diametrical section will have a substantially U-shape and the whole member will have an appearance resembling an automobile tire casing made to fit on the inside of a rim instead of on the outside.

In order more clearly to describe my invention, I shall have reference to the ac-

companying drawing in which the preferred embodiment thereof is shown, and in which:

Fig. 1 shows a section taken through a pump provided with my improved flexible member;

Fig. 2 is a plan view of the flexible member with a part thereof broken away;

Fig. 3 is a section taken on line 3—3, Fig. 2, and shows the U-shaped cross-section;

Fig. 4 is a fragmentary section showing the movable member in its lowermost position; and

Fig. 5 is a fragmentary section showing a modification.

Numeral 1 represents the body member of my pump which may be formed of cast-iron or any other suitable material. Member 1 has a chamber 2 which I may refer to as the suction chamber. An inlet opening 3 extends from the chamber and is provided with a check-valve 4 that permits water to flow into the chamber in the direction of the arrow 5, but not in the reverse direction. An exit opening 6 is likewise connected to the chamber and is provided with a check-valve 7 that permits the water to flow outwardly from the chamber in the direction of the arrow 8, but not in the opposite direction. Directly over the check-valves 4 and 7 are openings which permit the valve to be introduced and removed. Each opening is provided with cover 9 which is held in place by screws 10 that pass through the U-shaped yoke 11. The upper wall of the suction chamber has an opening whose walls are formed by the part of the wall indicated by numeral 11. The outer surface of wall 11 has a concave portion designated by the numeral 12 and outside of this a flange 13. Secured to the body member 1 are guides 14 which cooperate with the parts 15 of the reciprocating top member 16. Journaled in bearings 17 is a crank shaft 18, to the crank 19 of which is connected one end of a connecting rod 20, the other end of which is pivotally connected to the reciprocating member 16. When the crank shaft is rotated, the member 16 will be reciprocated in the direction of the guides 14 in the manner evident from the drawing. Member 16 has an annular portion 21 of its under surface concave as shown in Fig. 1. The outer edge 22 of member 16 is flat. Bolted to flanges 13 and 22

are the edge portions 23 of the flexible member 24, which is constructed somewhat in the same manner as a cord tire from a plurality of layers of cords, in which the cords are angularly related to each other and the whole bound together by means of properly cured rubber composition. The flexible member is annular as shown in Fig. 2 and has a transverse section which may be loosely described as horse-shoe or U-shaped (Fig. 3). A reinforcing core 25 consisting of a number of metal wires is embedded in the material of the flexible member in the manner shown in the drawings.

The operation of the pump is as follows:— Let us assume that the inlet opening 3 is connected by a hose or pipe with a supply of water and that the shaft 18 is being rotated by some suitable means. The member 16 will be constantly reciprocated and when in its extreme upper position (Fig. 1), the volume of the suction chamber, which includes all the spaces in communication with chamber 2, will be a maximum. Let us assume that with the parts in the position shown in Fig. 1, the suction chamber is full of water. As the member 16 is moved downwardly, the parts will gradually assume the position shown in Fig. 4 in which position the volume of the suction chamber is a minimum. During the change from maximum to minimum volume, water will be forced out past valve 7 and as the volume is again increased, water will enter the chamber past the valve 4. As the shaft 18 continues to rotate the chamber 2 will continue to vary in capacity and water will be pumped in the direction of the arrows. The cable 25 prevents the flexible member from buckling. If a suitable opening is provided through which a person in assembling may put his hand while inserting bolts 26, the flexible member may be constructed and secured in place in the manner shown in Fig. 5, although this construction is not advocated at this time.

It will be noted that the principle upon which my pump operates, corresponds closely to that of the ordinary diaphragm pump, but I obviate many of the objectionable features of the latter. Where the flexible member is cut from a flat sheet or made in the shape of a washer, it is short lived owing

to the fact that it is subjected to very severe strains, due to the manner in which it has to flex. With a member like that shown and described in this application, the material is merely subjected to an easy flexure, which does not cause severe strains and the member therefore lasts longer. Owing to the peculiar shape of the flexible member, the variations in the volume of the suction chamber will be greater for a given size and length of stroke, thereby increasing the capacity. The flexible member can be made in the same manner as an automobile tire, either from fabric or cord. The latter is considered preferable, as it lasts longer when subjected to repeated flexures.

Having now described my invention, what I claim as new is:

1. A flexible member for pumps comprising a flexible ringlike member of fabric and rubber having a U-shaped cross-section, and provided intermediate its edges with a non-elastic reinforcing member.

2. A ringlike flexible member composed of cord and rubber composition intimately associated and cured for connecting two relatively movable parts of a pump, said member having a U-shaped cross-section with the open side outward, and a non-elastic reinforcing member imbedded in the material of said member intermediate its edges.

3. A pump comprising, in combination, an elongated body member having a suction chamber extending therethrough, an inlet valve in one end and an outlet valve in the other, said suction chamber having a portion thereof extending through the side of the body member, a circular flange surrounding said side opening, the upper surface of said flange being concave, a support for said body member, spaced guides on said support, a cross-head slidable on the guides, said cross-head comprising a circular member having an upwardly curved annular depression in its lower surface, an annular flexible member having a U-shaped transverse section secured to the circular flange and to the outer portion of said circular member, and means for causing said circular member to be reciprocated.

In testimony whereof I affix my signature.

FRED S. CASS.