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LIQUID PUMP

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Fig. 1.

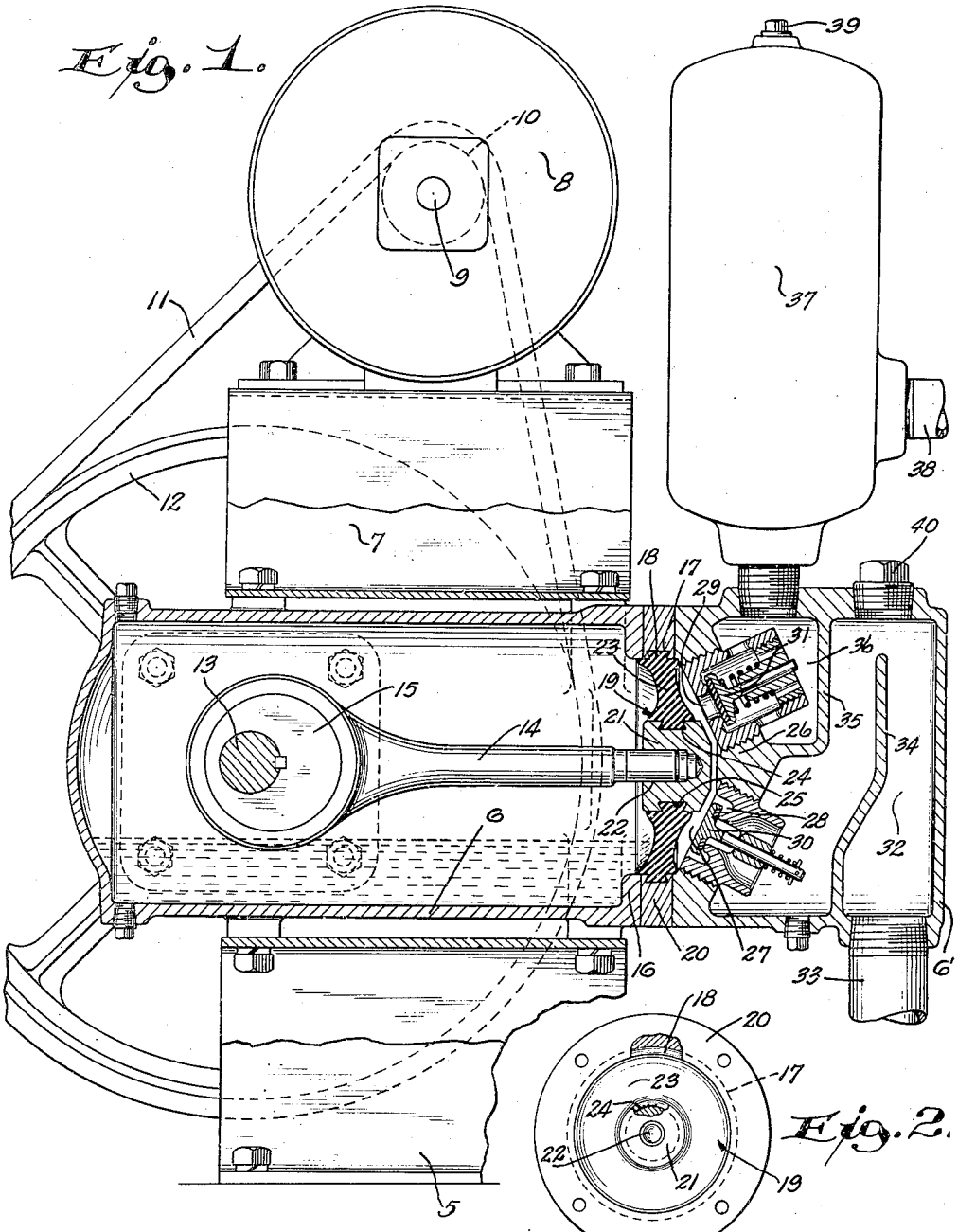


Fig. 2.

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LIQUID PUMP

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8 Claims. (Cl. 103—150)

This invention relates to improvements in liquid pumps, and more particularly to a pump suitable for a shallow well wherein the pumping mechanism may be exteriorly of the well.

One of the objects of the present invention is to provide a liquid pump wherein the pump pressure chamber is controlled by valves disposed in an angled head in conformity with the distorted shape of a flexible pumping diaphragm producing, when the diaphragm is in said flexed position, a very restricted pressure chamber which causes a relatively high compression ratio, making it possible to establish an excellent vacuum so that liquid may be drawn up a relatively long suction pipe without the necessity of priming.

A further object of the invention is to provide a shallow well pump wherein the chamber housing the moving motor-driven mechanical parts is sealed from the water containing suction chamber by a novel form of oil and water resistant pulsating diaphragm, whereby the first-mentioned chamber may be initially filled with lubricating oil and will never require replenishment.

A further object of the invention is to provide a shallow well pump having a minimum of moving parts which are oil covered and water sealed.

A further object of the invention is to provide a liquid pump utilizing a pulsatable, flexible diaphragm of a novel design so formed and connected with its actuating crank that the flexing of the diaphragm is confined to a limited inner area thereby prolonging the life of the diaphragm in minimizing the strain between it and the connection with the casing wall and with the crank.

A further object of the invention is to provide a liquid pump which is of simple, compact and inexpensive construction, which is easy to install and service, which is strong and durable, which is highly efficient in operation, and which is well adapted for the purposes described.

With the above and other objects in view the invention consists of the improved liquid pump and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in both of the views:

Fig. 1 is a side view of the improved shallow well pump with part broken away and in longitudinal section; and

Fig. 2 is a face view of the flexible pumping diaphragm, on a reduced scale, shown detached from its mounting and from the crank, and with portions broken away and in section.

Referring now more particularly to the drawing it will appear that the improved shallow well pump includes a support 5 adapted to be bolted to convenient stationary means adjacent a shallow well, but exteriorly thereof. The upper portion of the support 5 carries an elongated cylindrical casing or housing 6 on the upper portion of which is bolted a support 7 which carries a conventional electric motor 8. The motor shaft 9 carries a small pulley 10 engaged by an endless belt 11 which in turn engages and drives a large grooved wheel 12. The latter is carried fast by a crank shaft 13 which extends into the casing 6, through a suitable bushing, and has keyed thereto the eccentric or cam end of a crank 14.

The interior of the casing or housing 6, remote from the shaft 13, is formed with an annular restriction 16 to which is bolted a removable metal ring 20 formed with a dovetail groove 17 in which is tightly engaged a complementary dovetail projection 18 on the periphery of a flexible diaphragm, designated generally by the numeral 19. A metal disk 21 forms the center of the improved diaphragm 19, said disk being of substantial breadth and being formed with a socket 22 in which the outer end portion of the crank 14 is secured. Outwardly of the metal disk 21 the diaphragm includes a flexible ring 23 which is formed of rubber, neoprene, synthetic rubber, or Buna S. The material of the ring 23 is such that it may flex or pulsate under the action of the crank 14 and it is not only waterproof but is also oil resistant to withstand the oil within the mechanism housing portion of the main casing 6. The diaphragm flexible ring 23 is shaped as best shown in Fig. 1, being somewhat thinner than the metal central disk 21 and also having constricted or narrowed midportions for the purpose of taking the majority of the pulsations to relieve strain on the peripheral portions of the flexible ring 23 which are connected with metal ring 20 and with the central metal disk 21 respectively. Respecting the latter it will be noted that the disk 21 is formed with a dovetail groove 24 in which is tightly engaged a complementary dovetail projection 25 on the resilient ring 23.

The main casing or housing 6 is formed with an extension 6' having an angular head 26 providing on one side thereof a pressure chamber 27 whose other side is formed by the pulsatable diaphragm 19. Angularly separated inlet and outlet ports 28 and 29 respectively are provided in the angular head 26 and are controlled by automatic pressure actuated inlet and outlet valves 30 and 31 respectively.

The casing extension 6' also encloses a relative-

ly large fluid inlet chamber 32 entered by a relatively long suction pipe 33. The latter extends into the shallow well and is for the purpose of having water drawn from the well into the pump housing. Within the inlet chamber 32 there is a baffle 34. The casing extension 6' also has therewithin a wall 35 spaced from the valve head 26 and from the outlet valve 31 providing a fluid outlet chamber 36.

Mounted on the top of the extension portion 6' of the housing and in communication with the fluid outlet chamber 36 is an expansion tank 37 having a discharge outlet pipe 38 leading therefrom, said pipe being extended into the building or dwelling which is to be supplied with water from the well. The expansion tank 37 is for the porpose of equalizing the outflow of liquid through the pipe 38 and the upper portion of the tank is equipped with a conventional pressure switch 39.

In the operation of the improved shallow well pump a switch (not shown) in the main power line leading to the electric motor 8 must first be closed, putting into operation the electric motor which can be equipped with conventional means to control its speed. Through the pulleys 10 and 12 and the belt drive 11 the crankshaft 13 extending into the housing 6 is revolved at a substantially reduced rate of speed. Due to the fact that the inner end portion 15 of the crank 14 which is attached to the crankshaft 13 is eccentric, the crank 14 will be oscillated in an eccentric path. The outer end of the crank 14 is attached to the diaphragm central disk 21 and the movement of the crank will cause back and forth pulsations of the diaphragm. Only the ring portion 23 of the diaphragm is flexible and its peripheral portions are anchored as at 17 and 25 to the metal members 20 and 21. Hence the flexing of the diaphragm will be restricted to the rubber ring portion 23 and such movements will be localized to the narrowed midportions thereof, relieving strain on the peripheral portions of the ring which are anchored to the metal members. The pulsating action of the diaphragm 19 is effective to create alternate suctions and pressures within the pump pressure chamber 27 and by means of the automatic pressure valves 30 and 31 water from the well is drawn through the suction pipe 33 into the inlet chamber 32, over and about the baffle 34, into the suction chamber 27 and then out through the valve port 29 into the outlet chamber, from whence the liquid is forced into the expansion chamber and then through the discharge outlet pipe 38 to the source of use.

It will be observed that the valve head 26 is of angled formation so that its contour on the side adjacent the pressure chamber 27 conforms substantially to the contour of the adjacent face of the diaphragm 19 when it is in its outwardly flexed condition. This results in a situation where the suction chamber 27 is of extremely reduced capacity in one position of the diaphragm and is of substantially increased capacity in the opposite position of the diaphragm. The differences in volume or capacity of the suction chamber 27 promote on the suction strokes a rarified condition of the air therewithin to create a very effective vacuum which enhances the self-priming attributes of the pump. The high compression ratio thus established within the suction chamber makes it possible to draw water up a relatively long pipe extending to the well. Should it become necessary at any time to prime the pump, a removable plug 40 in the casing extension 6' enclosing the inlet chamber 32 may be removed for priming purposes.

The construction of the improved shallow well pump is such that the interior of the casing 6 which houses the moving mechanical parts is water-tight, with the diaphragm 19 serving as a seal. The construction also permits the initial introduction of a large body of oil for lubricating purposes within said housing chamber and the oil will not require replacement. The material of the flexible ring 23 of the diaphragm is oil resistant. The pump has a minimum of moving parts and said parts are oil covered and water sealed. The improved pump is extremely simple and inexpensive in its construction and may be installed and serviced with a minimum of effort. The pump is, additionally, highly efficient and effective in its operation, permits the use of a long suction pipe, and is well adapted for the purposes set forth.

What is claimed as the invention is:

1. In a pump construction, a chambered pump casing, a pulsatable diaphragm within a chamber of the casing, and a movable member for imparting pulsations to the diaphragm, said diaphragm including an outer rigid ring section removably anchored to the casing, a central rigid disc section anchored to the movable member, and an intermediate resilient section detachably and replaceably secured to both of said rigid sections.

2. In a pump construction, a chambered pump casing, a pulsatable diaphragm within a chamber of the casing, and a movable member for imparting pulsations to the diaphragm, said diaphragm including an outer rigid ring section removably anchored to the casing, a central rigid disc section anchored to the movable member, and an intermediate resilient ring section having peripheral dovetail connections with both of said rigid sections.

3. In a pump construction, a chambered pump casing, a pulsatable diaphragm within a chamber of the casing, and a movable member for pulsating the diaphragm, said diaphragm including an outer rigid ring section anchored to the casing, an inner rigid disc section anchored to the movable member, and an intermediate resilient section having its peripheries secured to said rigid sections, said resilient section having its intermediate portion of reduced thickness to localize the pulsations in that area and remote from the peripheral connections between the resilient section and the rigid sections.

4. In a pump construction, a chambered pump casing, a pulsatable composite diaphragm within a chamber of the casing, and an oscillating crank for pulsating the diaphragm, said diaphragm including an outer metallic ring removably anchored to the casing, an inner metallic disc anchored to an end of the crank, and an intermediate resilient ring section having peripheral dovetail connections with both of said metallic sections, said resilient section being centrally dished and of reduced thickness to localize the pulsations in that area and remote from the dovetail connections.

5. In a pump construction, a casing divided into a water chamber having inlet and exhaust ports therein and an oil-containing crank chamber, valves controlling said ports, a pulsatable diaphragm between the crank and water chambers and sealing each from the other, and a crank movably mounted in the crank chamber and extending to said diaphragm, said diaphragm

comprising a metal outer section anchored to the casing, a metal central section anchored to the crank, and a resilient intermediate section of reduced thickness, said intermediate section being formed of an oil and water resistant material.

6. In a pump construction, a casing having therein a fluid chamber, a pulsatable diaphragm within the casing and forming a deformable wall of said chamber, said diaphragm having an angularly shaped outer face, means connected to a central portion of the diaphragm for flexing portions thereof to cause deformations of the diaphragm in opposite directions, a rigid wall within the casing spaced from the diaphragm and forming another wall of the fluid chamber, the inner face of said rigid wall being of angled shape to conform to the shape of the diaphragm when it is deformed in one direction, and inlet and exhaust valves mounted in angularly separated portions of said rigid wall, deformations of the diaphragm toward and away from the rigid wall serving to vary the volume of the fluid chamber for establishing therein a relatively great vacuum.

7. In a pump construction, a chambered pump casing, a pulsatable diaphragm within a chamber of the casing, and a movable member for imparting pulsations to the diaphragm, said diaphragm including an outer peripheral portion removably anchored to the casing, a central rigid disc section anchored to the movable member, and a resilient section outwardly of the central rigid disc section, said resilient section being of tapering formation and reduced in thickness away from the central section to localize the pulsations in that area and remote from the connections of the resilient section with the central section.

8. In a pump construction, a chambered casing, a pulsatable diaphragm within the casing and sealing one interior portion of the casing from another, and a movable member for imparting pulsations to the diaphragm, said diaphragm comprising a metal outer section cooperating in forming a wall portion of the casing, a metal central section anchored to said movable member, and a resilient intermediate section of reduced thickness, said intermediate section being formed of an oil and water resistant material.

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