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DIAPHRAGM PUMP

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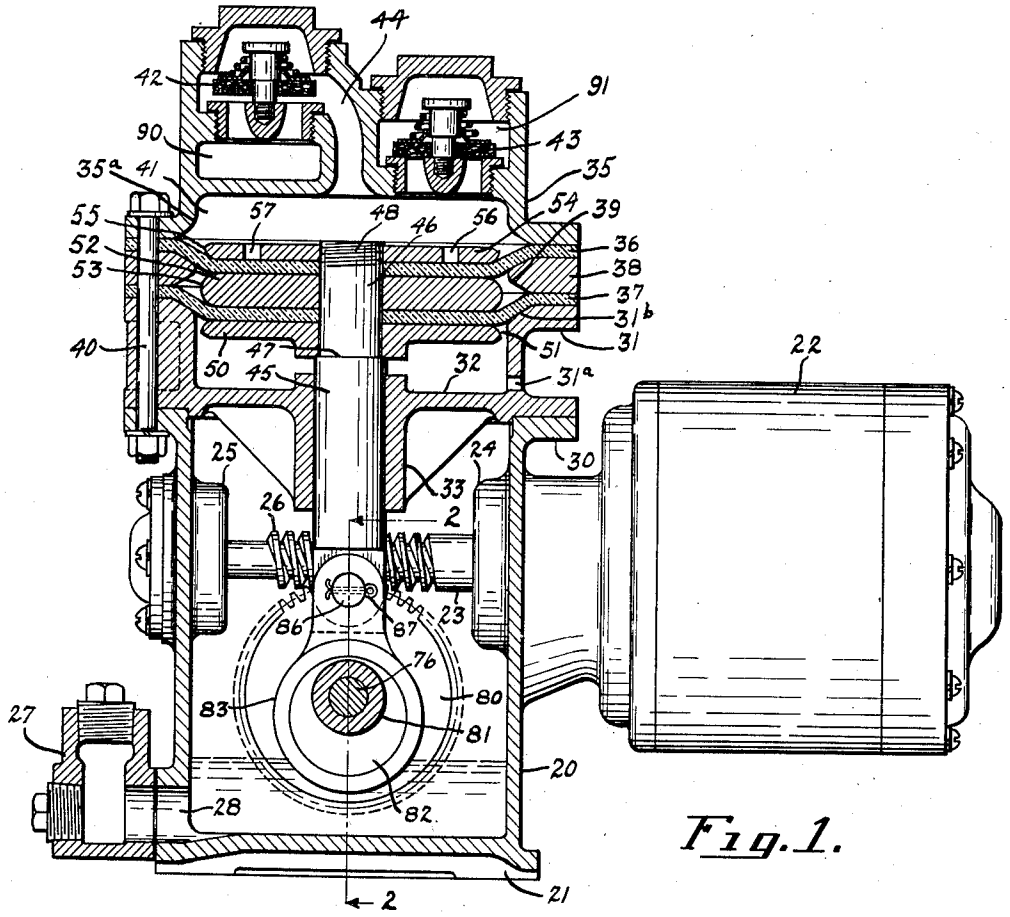

Fig. 1.

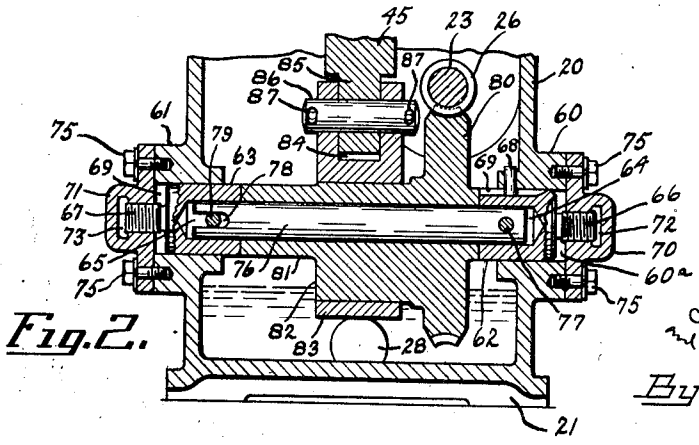

Fig. 2.

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UNITED STATES PATENT OFFICE.

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DIAPHRAGM PUMP.

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This invention relates to pumping apparatus and more particularly to pumps of the suction type, wherein a motor actuated diaphragm is employed for creating a vacuum in the suction chamber of the pump and for forcing the fluid from the pump into suitable service pipes or elsewhere.

It is among the objects of the present invention to provide pumping apparatus of the above named type that will be simple and reliable and which will tend toward reduction in the number of parts.

Other and further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of one form of the present invention is clearly shown.

Fig. 1 is a view, partly in section and partly in elevation of the pumping apparatus embodying the present invention.

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 1.

Referring to the drawing, a gear casing 20 is provided with a suitable supporting base 21, and supports from one wall thereof an electric motor 22. Motor shaft 23 extends into the gear casing 20 and is journalled in bearings 24 and 25 supported by opposite walls of casing 20. A worm 26 is provided on motor shaft 23 substantially centrally of the casing 20. A combined lubricant filler and drain cock 27 registers with an opening 28 adjacent the base of the casing 20. Casing 20 is provided with a flange 30 which supports a flanged frame member 31 having beveled edge 31^b. Frame 31 includes a plate 32 which supports a guide bearing 33 substantially centrally within the casing 20, a vent 31^a is provided in the wall of frame 31. Located between the frame 31 and flanged valve head 35 are two diaphragms 36 and 37 of any suitable material such for example as a composition of rubber and cloth separated from each other by a spacing ring 38 provided with a beveled inner edge 39. Bolts 40 which pass through flange 30, frame 31, diaphragm 37, spacing ring 38, diaphragm 36 and valve head 35, hold these parts in assembled relation and tend to make the suction chamber 41 air tight. The valve head 35 is provided with beveled edge 35^a and supports inlet valve 42 and outlet valve 43 and includes duct 44 connecting the valve 42 with the suction chamber 41.

Connecting rod 45 is received by guide bearing 33 and is provided with a reduced portion 46 forming a shoulder 47 and is threaded at 48. A spacer 50, having beveled edge 51, is provided with a central opening for receiving the reduced portion 46, and is adapted to rest upon the shoulder 47, and bear against the lower face of diaphragm 37. Spacer 52, having a rounded edge 53 is provided with a central opening through which the reduced portion 46 passes, and is adapted to bear against the upper face of diaphragm 37 and the lower face of diaphragm 36. Nut 54 having a beveled edge 55, is provided with a central opening which is tapped for engagement with the threaded portion 48 of connecting rod 45. Through means of wrench holes 56 and 57 the nut 54 may be drawn upon the connecting rod 45, thus bringing the intermediate portion of diaphragm 36 and 37 into close contact with the spacer 52 so that the two diaphragms may be operated in unison. The purpose of providing the parts 50, 52 and 54 with beveled edges 51, 53 and 55 respectively, and beveled edges 31^b and 35^a on frame 31 and valve head 35 respectively is to reduce the liability of breakage of the diaphragms 36 and 37 upon being flexed.

The casing 20 is provided with apertured bosses 60 and 61 in opposite walls thereof, providing alined openings 60^a and 61^a respectively disposed at right angles to the axis of the motor shaft 23, and which are adapted to receive bearings on shoulder members 62 and 63 respectively. These shoulders are counterbored as at 64 and 65 respectively and are provided with reduced threaded end portions 66 and 67. Shoulder 62 is secured against rotary movement with respect to casing 20 by a key 68 carried by casing 20 and which engages a key-way 69 cut in bearing 62. End cover or nuts 70 and 71, provided with tapped recesses 72 and 73 respectively, for receiving the threaded ends 66 and 67 respectively of shoulders

62 and 63 respectively, are secured to the outer surface of casing 20 by screws 75. Therefore in order to effect endwise adjustment of the bearings 62 and 63, all that is necessary is to remove the screws 75 and revolve the end covers or nuts 70 or 71 the desired amount and then replace the screws 75. The opposite ends of the shaft 76 are received by the counterbores 64 and 65 in shoulders 62 and 63 respectively. Shaft 76 is secured to bearing 62 by a pin 77, and at its opposite end is provided with a notch 78 which receives a pin 79 carried by bearing 63. Thus since the bearing 62 is locked against rotary movement, the shaft 76 is secured to bearing 62, it will follow that the bearing 63 will also be held against rotary movement by the engagement of pin 79 with the notch 78.

Located between bearings 62 and 63 and mounted on shaft 76 as its axis is a worm gear 80 cooperating with worm 26 provided with an elongated hub 81, forming integrally therewith an eccentric 82. An eccentric strap 83 is attached to the eccentric 82 and is provided with a slot 84 for receiving tongue portion 85 of the connecting rod 45. A pin 86 connects the eccentric strap 83 with the tongue 85 of the connecting rod 45 and is held in position by cotter pin 87.

The operation of the pumping apparatus will be as follows:

When the motor 22 is operated, thus rotating the motor shaft 23, the worm 26 will drive the worm gear 80 and eccentric 82, which through eccentric strap 83 will reciprocate the connecting rod 45 in guide bearing 33. As the connecting rod 45 is reciprocated the diaphragms 36 and 37 will be flexed. Upon the downward stroke of connecting rod 45, a vacuum will be created in the suction chamber 41, whereby fluid will flow from the source of supply through port 90, through inlet valve 42, duct 44 into the suction chamber 41, during which time the outlet valve 43 is closed. On the upward stroke of connecting rod 45, the pressure within the suction chamber 41 will tend to open outlet valve 43 and valve 42 will be closed. The fluid flowing through valve 43 will pass through port 91 which may be connected with any suitable service pipes or elsewhere. This operation will continue as long as the motor 22 is operated. The gearing within the casing 20 will be sufficiently lubricated inasmuch as the worm gear 80 is running continuously in oil, as well as the eccentric 82 and eccentric strap 83. Sufficient oil will be carried to the worm 26 by gear 80, and the splashing of lubricant will lubricate the bearing 33.

A decided advantage is secured in the use of more than one diaphragm, in that should one diaphragm become broken, the operating mechanism will not be flooded and the pump will continue to function as long as the remaining diaphragm remains intact.

The feature of adjusting the shoulders 62 and 63 endwise with respect to the casing 20, makes it a very simple matter to adjust the worm gear 80 with respect to the worm 26 in order to take up lost motion. The shaft 76 and shoulders 62 and 63 may also be easily removed through the alined openings 60^a and 61^a, after the covers 70 and 71 have been removed.

While the form of mechanism herein shown and described constitutes a preferred embodiment of one form of invention, it is to be understood that other forms might be adopted and various changes and alterations made in the shape, size, and proportion of the elements therein without departing from the spirit and scope of the invention.

We claim—

1. A pump comprising, in combination, a frame member provided with a flange having its inner edge beveled; a valve head for said frame member, said valve head having a flange provided with a beveled inner edge; a spacer ring between the valve head and the frame member, said spacer ring being of wedge-shaped cross section so as to have the converging surfaces at its inner edge; a mechanically-operated reciprocating member in the frame member, including diaphragms transversely mounted thereon in spaced relation, the outer portion of the one diaphragm being interposed between the frame member and spacer ring and the other diaphragm between the spacer ring and valve head; and means for tightly clamping together the valve head, spacer ring, frame member and the diaphragms therebetween.

2. A pump comprising, in combination, a frame member including a guide bearing; a mechanically-operated reciprocating member arranged in said guide bearing and including a reduced end portion forming a shoulder on said member; a supporting disc mounted on the reduced portion of the reciprocating member and engaging with the shoulder thereon, said disc having its edge beveled on the side opposite said shoulder; a diaphragm of greater diameter than the disc surrounding the reduced portion of the reciprocating member and superposed on the disc; a spacer ring surrounding said reduced portion and superposed on the diaphragm, said ring being of substantially the same diameter as the supporting disc and having a rounded, convex edge; a diaphragm similar to the first-mentioned diaphragm superposed on the spacer ring; a beveled-edge clamping nut superposed on the second diaphragm so that the beveled edge is adjacent the diaphragm, and having screw-threaded engagement with the reduced portion of the reciprocating member

adjacent the end thereof; a valve head; a spacing ring between the valve head, said ring being wedge-shaped in cross section so that the converging surfaces are at the inner edge thereof, and being interposed between the outer portions of the diaphragm; and means for tightly clamping the diaphragms and spacing ring between the valve head and frame member.

In testimony whereof we hereto affix our signatures.

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