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2,380,283

ROTARY PUMP

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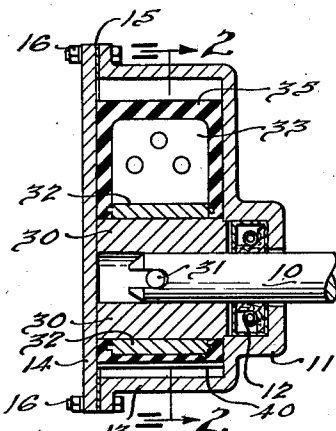


FIG. 1.

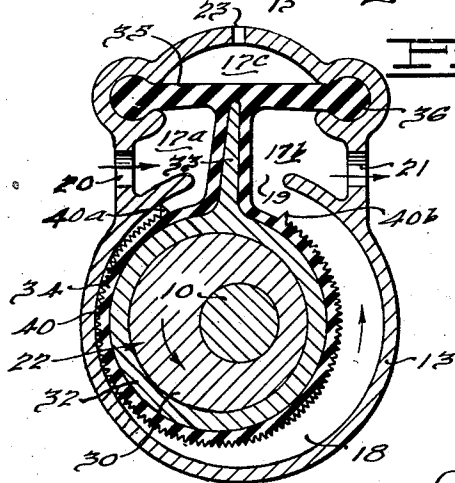


FIG. 2.

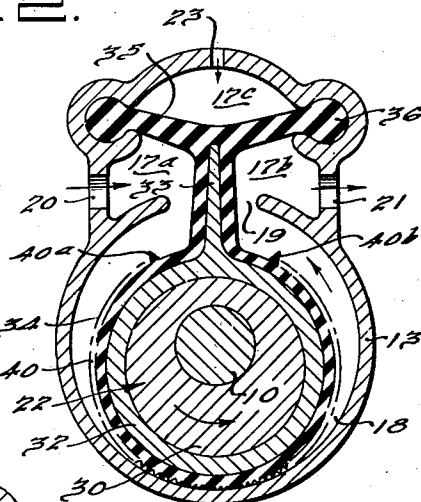


FIG. 3.

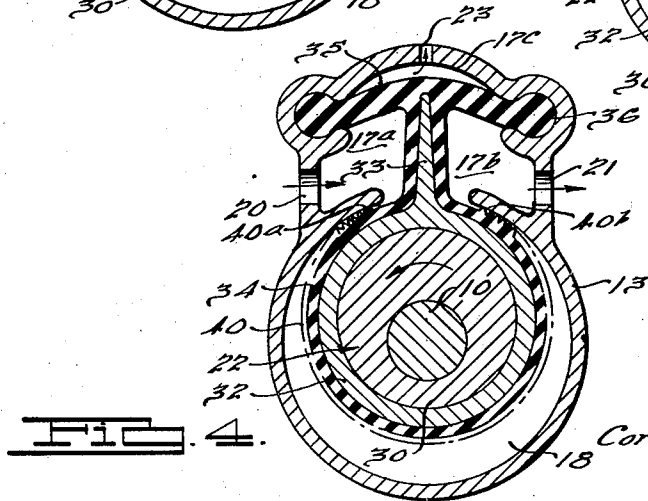


FIG. 4.

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## UNITED STATES PATENT OFFICE

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## ROTARY PUMP

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2 Claims. (Cl. 103-132)

The present invention relates to new and useful improvements in self-priming rotary pumps adapted for unsubmerged operation. In a particular embodiment of the invention described in detail hereinafter, the pump is particularly adapted for pumping liquid fuel to the carburetor of an internal combustion engine. However, the present improvements may be embodied in rotary pumps adapted to operate under other circumstances and for other purposes.

It is an object of the present invention to provide a rotary pump of novel and simplified design and construction and which is compact in structure and efficient in operation.

Another object of the invention is to provide a rotary pump suited to pump fluids including those in which solid particles are suspended. The novel construction of the working parts, especially the piston member, is such that the pump may operate at relatively high speeds with comparatively little wear or loss of efficiency due to abrasion, and thus possess a long life in service without substantial impairment of efficiency.

A further object of the invention is to provide a rotary pump which is self-priming and which in operation is substantially free from vapor locks.

It is still another object of the invention to provide an improved pump of the foregoing character which is relatively inexpensive to manufacture, and convenient to install, use and service.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawing:

Fig. 1 is a side elevation in central longitudinal section showing a rotary pump embodying one form of the present invention; and

Figs. 2, 3 and 4 are sectional views taken on the line 2-2 of Fig. 1 in the direction of the arrows and showing operating positions of the piston member.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawing, the reference numeral 10 designates a drive shaft which is mounted for rotation within a suitable housing 11, preferably formed as a portion of the enclosed pump chamber housing 13. The shaft 10 is adapted to be rotatably driven by any suitable source of driving power (not shown). The housing 11 may be of any suitable size and construction and the shaft 10 is mounted for rotation therein in any desired operative manner such as by means of the bearing 12. The pump chamber housing 13 is enclosed by a removable plate or cover 14 which is held in fluid-tight engagement with a gasket 15 by any suitable fastening means such, for example, as the bolts and nuts 16.

As best shown in Figs. 2, 3 and 4, the pumping chamber in the housing 13 consists of what in effect are two chambers 17 and 18 connected by an opening 19. The intake port 20 and the exhaust port 21 communicate with the chamber 17. The pump assembly designated generally by the numeral 22 is mounted in both the chambers 17 and 18 and extends through the communicating opening 19. The pump assembly 22 comprises an eccentric driving cam 30 which is keyed as at 31 to the end of the shaft 10 for rotation with said shaft. An annular body member 32 having an extending tongue 33 is pressed fit or otherwise secured to the cam 30 for movement therewith. A covering 34 of resilient material is secured to the body member 32 and the tongue 33 and is so formed as to provide a resilient diaphragm 35 having an enlarged peripheral bead 36 which is anchored in the housing 13 and serves to suspend the pump assembly 22 in the chambers 17 and 18. The pump assembly 22 thus divides the chamber 17 into three portions indicated as 17a, 17b and 17c, respectively. The intake port 20 communicates with the chamber portion 17a and the exhaust port 21 communicates with the chamber portion 17b. An air intake and exhaust port 23 communicates with the chamber portion 17c and allows the chamber to be emptied or filled with air as required by movement of the resilient diaphragm 35.

A novel feature of the present invention is that the resilient layer 34 of the pump assembly 22 is provided with serrations about its periphery, as indicated by the numeral 40. These serrations preferably extend across the lateral face and are spaced circumferentially around the periphery adjacent the generally circular portion of the member 32. The resilient layer of the pump assembly is preferably provided with a smooth or unserrated portion immediately adjacent the

sidewardly extending tongue portion 33 of the member 32. If desired, a shoulder portion, thicker than the other portions of the resilient layer, may be provided adjacent the tongue 33. If such a construction is desired, the shoulder is preferably dimensioned to cover the opening between the chambers 17 and 18 and therefore to act as a seal or closure between the chambers when the pump assembly 22 is in certain positions on its orbit, as indicated in Fig. 4. However, for most purposes, I prefer to accomplish much the same results by the provision of the enlarged serrations 40a and 40b which, as shown in Fig. 4, provide an effective seal when the pump assembly 22 is in the position there shown.

The operation of a pump embodying the novel improvements of the present invention will best be understood by reference to Figs. 2, 3 and 4 in which are shown the relative positions of the parts during various stages in one complete pumping cycle. In this description, it is assumed that the direction of rotation of the shaft 10 is in a counterclockwise direction.

Upon rotation of the shaft 10 in a counterclockwise direction the eccentric cam 30 connected thereto is likewise rotated in the same direction and imparts an eccentric motion to the annular body member 32 surrounding it. When the parts are in the position shown in Fig. 4 the pump is at the beginning of its pumping cycle. In this position the intake port 20 and the exhaust port 21 both are closed by the enlarged serrations 40a and 40b. Fluid is entrapped in the space between the outer surface of the pump assembly 22 and the wall of the pumping chamber 18. Upon rotation of the shaft 10, the parts assume the position shown in Fig. 2 and the entrapped fluid in the chamber 18 is pushed before the progressing pump assembly 22 and is forced out through the exhaust port 21.

In Fig. 3 the relative positions of the parts of the pump are shown in one stage of the pumping cycle. As there shown, the resilient covering of the pump assembly adjacent the high spot on the eccentric cam 30 is in fluid-tight contact with the surface of the wall of the chamber 18. As the rotation of the piston member continues, this point of contact progresses about the wall of the chamber 18 and the fluid is forced ahead of such moving point of contact toward the exhaust port 21. At the same time on the opposite side of this point of contact, fluid is drawn into the chamber 18 through the intake port 20. As the movement of the parts continues the parts resume the positions shown in Fig. 4 which completes the pumping cycle. The movement of the eccentric cam 30 and the member 32 is accommodated by distortion of the resilient diaphragm 35, as shown in Figs. 2, 3 and 4. The tongue 33 on the member 32 acts as a reinforcement for the resilient member and provides a rigid movable partition between the intake port 20 and the exhaust port 21 in the chamber 17.

In view of the foregoing it will be understood that due to the position and dimensions of the enlarged serrations 40a and 40b, the intake port 20 and the exhaust port 21 never communicate directly with each other. If both the intake and the exhaust ports are open, as shown in Fig. 3, the point opposite the high point of the eccentric cam 30 contacts the wall of the pumping chamber 18 to cut off direct communication between the intake and exhaust ports. If this high point does not contact the wall of the pumping chamber, as shown in Fig. 4, the intake and ex-

haust ports both are closed by the enlarged serrations 40a and 40b, which in this position contact the wall of the chamber 18. Due to this novel construction of the enlarged serrations 40a and 40b and the serrations 40 on the rotor assembly 20, fluid cannot by-pass the piston member. Since fluid is pumped through the fluid chamber by being forced ahead of the moving piston member, it is sucked through the intake port 20 and forced out of the exhaust port 21.

In view of the foregoing it will be understood that a pump embodying my novel improvements is self-priming. If desired, however, a system of check valves, held open by the constant flow of fluid through the pump, may be provided so that upon stopping of the pump assembly, the suction will be cut off and the check valves will close and fluid will be retained in the pump until the pump assembly is operated.

It will be seen that the present construction of the serrated resilient member is particularly adapted to operate successfully in the pumping of fluids in which solid particles are suspended. Such serrations permit ready distortion of the resilient element and thus permit the passage of suspended solid particles between the surface of the chamber 18 and the pumping assembly 22. Also, the fluid trapped between adjacent serrations provides a fluid seal as well as a lubricant.

The serrations on the outer surface of the piston member also provide a relatively small surface area of contact between the resilient covering and the wall of the pumping chamber. This smaller area of contact decreases friction between the moving piston member and the wall of the pumping chamber. As the ends of the serrations are depressed during movement of the pump assembly 22, as indicated, it will be seen that such depressing of the ends of the serrations prevents distortion of the entire resilient coating. The depression of a portion of the serrations offers much less resistance to movement than does the entire resilient covering. Consequently, a piston member made in accordance with the present invention may be operated at higher speeds because less resistance is offered to it and, in addition, is much less subject to wear. It should be noted in particular that in the present invention each serration 40, after it has contacted the wall of the chamber 18, returns to its normal position before it again contacts that wall of the chamber. This is possible because only few of the serrations contact the wall at any given time. Therefore, in the present invention the resilient covering is not more or less permanently distorted or strained as it would be if a flat surfaced coating were used. This feature, in addition to permitting operation of the pump assembly at relatively high speeds without damaging results, also increases the life of the covering. It has been found that the contact of relatively few of the serrations 40 with the wall of the chamber provides an effective seal between the pump assembly and the pumping chamber for pumping purposes.

I claim:

1. A rotary pump, comprising a body having a pumping chamber provided with intake and exhaust ports, a revoluble eccentric member mounted in said chamber, a piston member having a series of closely spaced radially disposed flexible ribs extending throughout a major portion of its exterior circumferential wall surface, said ribs extending completely across such wall surface and the ribs at each end of said series

being of increased radial extent, said piston member being concentrically mounted on said eccentric member for eccentric motivation therewith to provide throughout each revolution of the eccentric member a moving resilient contact between some of the intermediate flexible ribs of the piston member and the interior wall surface of the pumping chamber, one of the end ribs of said piston member preventing the movement of fluid through said inlet port at predetermined times in the pumping cycle and the other of said end ribs preventing the movement of fluid through said exhaust port at other predetermined times in the said cycle, thereby to prevent the by-passing of fluid from said inlet port to said exhaust port.

2. A rotary pump, comprising a body portion having a pumping chamber and another body portion having a supplemental chamber, the two chambers being in communication and the last mentioned body portion being provided with opposed intake and exhaust ports for said supple-

mental chamber, a revolvable eccentric member mounted in said pumping chamber, a piston member having the major portion of its exterior circumferential wall surface provided with closely spaced radially extending flexible ribs transversely disposed with respect to such wall surface, said piston member being mounted on said eccentric member for eccentric motivation therewith to maintain a moving substantially fluid-tight surface contact between said piston member ribs and the interior wall of said pumping chamber, said piston member having an arm extending radially therefrom into said supplemental chamber between said intake and exhaust ports and connected to an intermediate portion of a flexible web having its ends anchored to the body portion of said supplemental chamber, said ports lying on that side of said web which is toward said pumping chamber, and an air vent for that portion of the supplemental chamber which lies on the opposite side of said web.

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