Nov. 17, 1953

F. L. CARSON

ROTARY PUMP

2,659,313

Filed May 31, 1949

2 Sheets-Sheet 1

Fig. 1

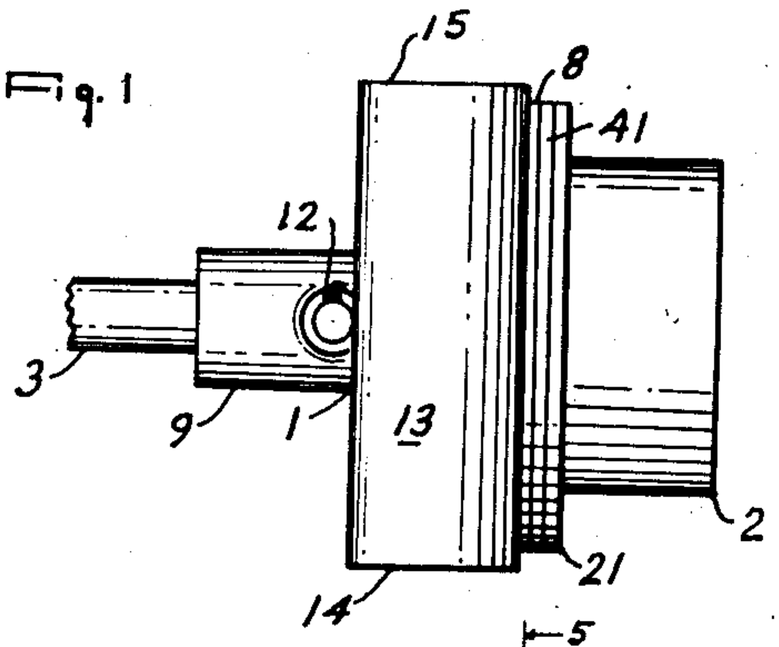


Fig. 2

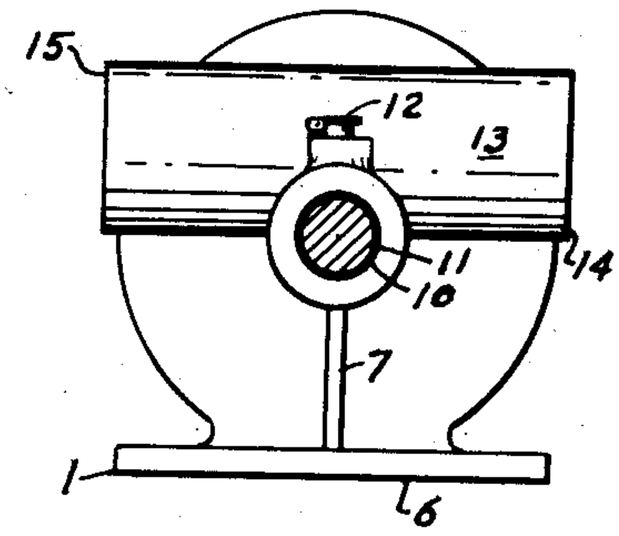


Fig. 3

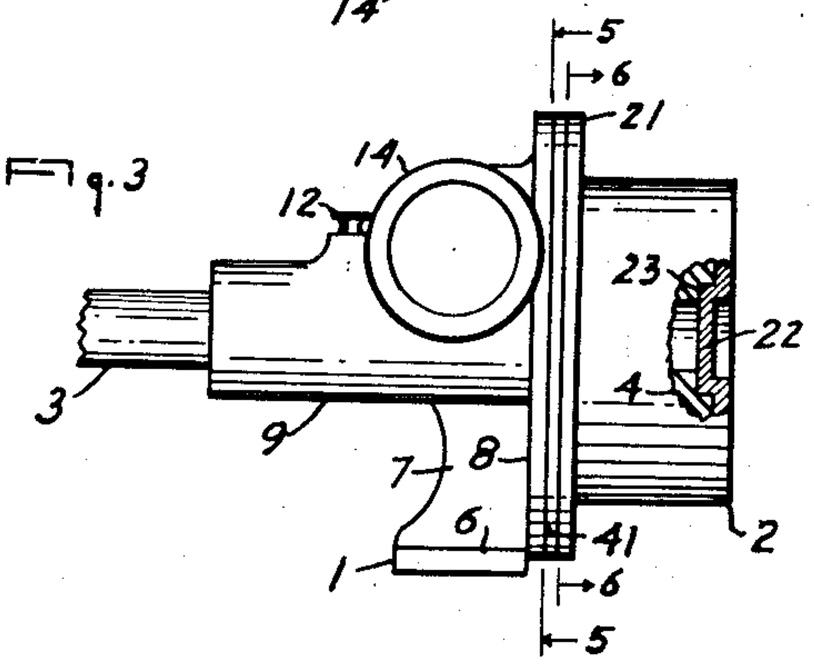


Fig. 4

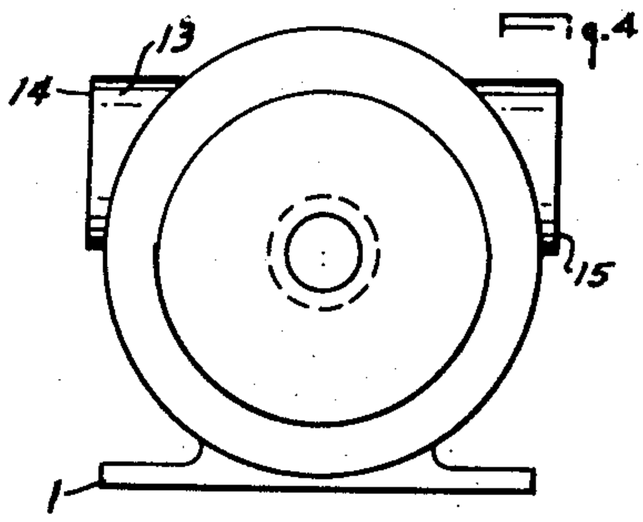


Fig. 5

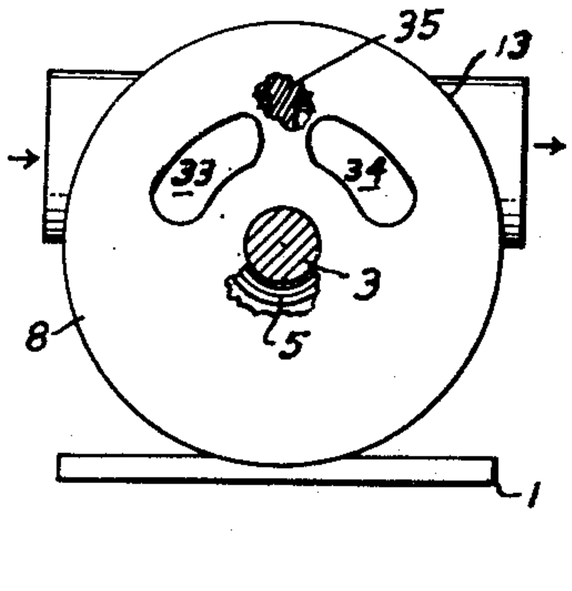
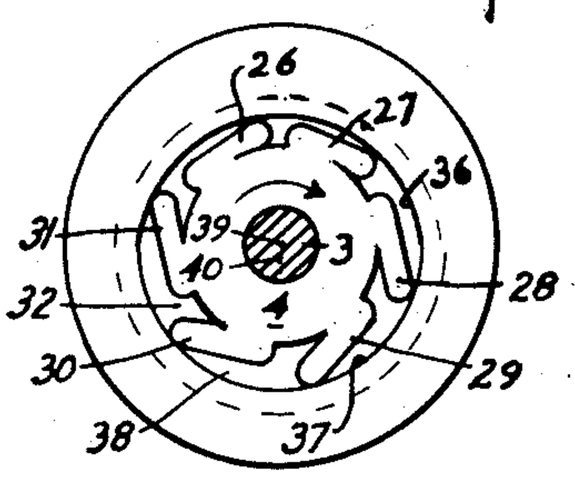


Fig. 6



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2 Sheets-Sheet 2

Fig. 7

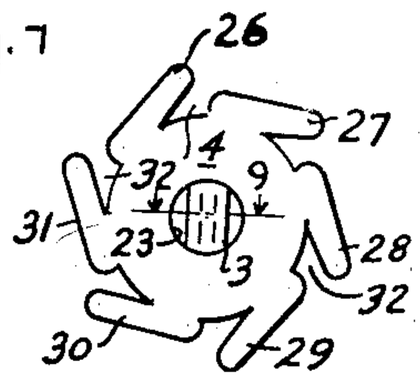


Fig. 8

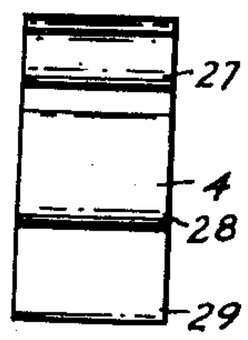


Fig. 9

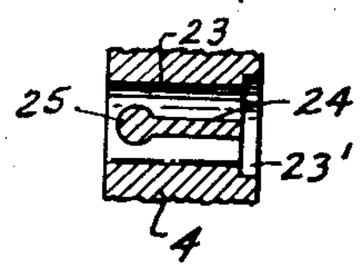


Fig. 11

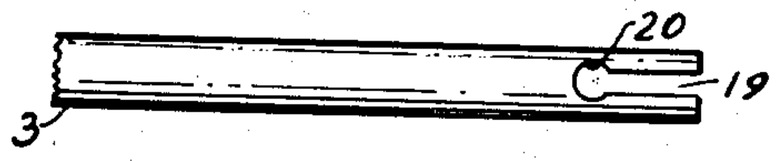


Fig. 10

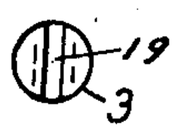


Fig. 13

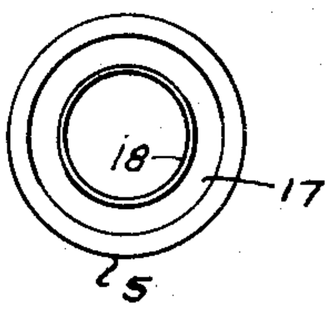


Fig. 12

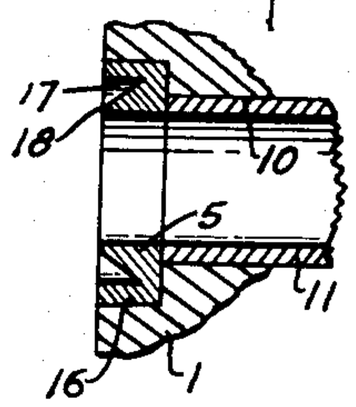
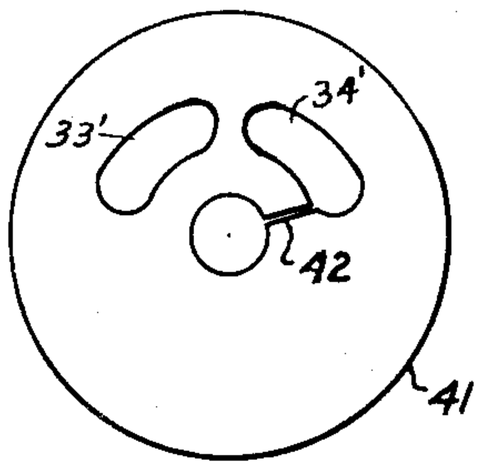


Fig. 14



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ROTARY PUMP

Frank L. Carson, Los Angeles, Calif.

Application May 31, 1949, Serial No. 96,330

2 Claims. (Cl. 103—117)

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This invention belongs to that general class of devices known as rotary pumps and relates particularly to that type of pump which employs resilient vanes upon its impeller or rotor and which successively flex during each revolution so as to constantly vary the chamber spaces about the hub beneath the impeller vanes and thus force the ingress and egress of the medium to be pumped which is generally a liquid, but can be a gas.

All inlet and outlet ports of this pump are located at one side thereof so that the other side can be easily and completely removed for impeller inspection, adjustment or replacement, without in any way disturbing other parts of the pump including its connections to fluid lines, etc. The impeller housing can be fabricated in any suitable way and can be stamped and/or die cast so as to leave all machining operations to be performed upon the main body casting only.

A reversible wear plate is provided for positioning between the main body casting and the annular securing flange of the impeller housing. This disc type wear plate performs a twofold purpose and one of them is the provision of a wearing surface to protect the otherwise wearing surface of the main body casting, and the other purpose is to provide a fluid conducting slot or passage between one of the ports through the wear plate and the bearing bore of the shaft for the purpose of maintaining a vacuum around the shaft when the reversible wear plate is set to aline the slot with the suction side of the pump. The vacuum created about the shaft prevents leakage of fluid via the shaft. thus greatly improving the efficiency of this type of pump.

The movement of the vanes on the impeller is accomplished by the curvature of the housing wall and particularly the curvature of the upper wall; that is, the impeller is placed in a recessed portion of its housing that has a substantially circular wall, each half wall having the same radius but their center points being slightly spaced apart in the same locus so that the impeller shaft is in an offset position relative to the upper wall so that this wall is in closer proximity with the rotating axis of the impeller; all rotating parts and bearings being concentric with the lower wall.

In the case of the ordinary eccentric pump, the space between the impeller vanes does not reach its maximum until the preceding vane has travelled to the dead center of the bottom of the pump and this particular feature has been found to lessen the vacuum on the intake to a

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point where the pump is not self-priming on any appreciable lift. With my pump, however, in which the wall is somewhat elliptical-like in shape, the intake is complete on a one-quarter revolution of the impeller, and on the discharge side the flexing vanes work gradually with the ease of an eccentric pump and the suction efficiency of a cam pump. Because of the shape and flexibility of the vanes of this invention, they are held snugly against the wall of the impeller case or housing by centrifugal force and especially by the pressure of the fluid against the vanes as the fluid is pumped, and in this way there is no dependency on the resiliency of the material itself for regaining the open positions of the vanes. Constant flexing in this particular case, because of the shape of the vanes, is not a real tax on the service duration of the material itself.

One of the principal objects of this invention is to produce a pump means of the type described that is simple, durable, dependable, inexpensive, compact, very efficient, and which is economical to make and manufacture.

Another object is to present a new and novel pump structure that is especially suitable for long and carefree service, and which is capable of pumping fluids at higher pressures that any other resilient or rubber-vaned pump of a similar size and type.

Other objects, advantages and features of this invention will appear from a careful perusal of the accompanying drawings, the subjoined detailed description, the preamble of these specifications, and the appended claims.

Below, applicant describes one of the preferable forms of his invention in order to teach the art thereof and show how to make and use the same, but it is to be understood that the drawings and description thereof are not to limit the invention in any sense whatsoever except as the same is specifically limited by the prior art.

In the drawings:

Figure 1 is a plan view of a pump in which features of this invention are incorporated,

Figure 2 is a rear elevational view of same,

Figure 3 is a side elevational view thereof, but showing a part broken away,

Figure 4 is a front elevational view,

Figure 5 is a vertical view taken substantially along line 5—5 of Fig. 3 with parts broken away and parts in section,

Figure 6 is a vertical view taken substantially along line 6—6 of Fig. 3 but with parts being shown in section,

Figure 7 is an elevational view of the impeller with the shaft shown in section.

Figure 8 is a side elevational view of that shown in Fig. 7,

Figure 9 is a sectional view of the impeller taken substantially along the line 9—9 of Fig. 7,

Figure 10 is an end elevational view of the shaft,

Figure 11 is an elevational view of the shaft; a part thereof being broken away,

Figure 12 is an enlarged sectional view of the main bearing end for the shaft,

Figure 13 is an enlarged elevational view of the sealing ring,

Figure 14 is an elevational view of a wear-plate which is in combination with the invention.

The particular form of the invention, as illustrated, comprises the main unit or casting 1, the impeller housing or casing 2, shaft 3, impeller or rotor 4, wear-plate 41, and the sealing ring 5. Coupling means are provided for the shaft or the unit adapted to drive it which may be an electric motor, not shown. The type or kind of driving means is of little importance so far as this particular invention is concerned.

The casting 1 consists of the flanged base 6 having the usual screw or bolt holes so that it can be secured to any suitable support and a web fin or bracket structure 7 which is integral with the side disc-like member 8 and the outer bearing supporter 9; the member 8 is also integral with the flanged base 6, as indicated. The casting 1 has the elongated bore 10 which accommodates the bearing sleeve 11 for the shaft 3 and the spring-door type of oiler means 12 is provided for conducting a suitable lubricant to the shaft 3. Integral with the bearing supporter and the disc-like member 8, there is the cross fluid conductor member 13 which has the opposite ends and internally threaded portions 14 and 15 which are adapted to be connected with any suitable externally threaded pipe for conducting a fluid to and from the pump chamber.

The sealing ring 5 is positioned in a recessed portion 16 of the casting, see Figure 12. This ring may be rubber, neoprene, or any other suitable material that can dependably serve the purpose. This ring has the annular V-like groove 17 which provides the annular lip portion 18 that snugly engages the shaft to prevent fluid passage as the pressure of fluid within the V-like groove 17 forces the annular lip tightly against the curved surfaces of the shaft and makes a perfect seal. The shaft 3 has a cross slot 19 which opens to one end of the shaft, and at the other end of the slot there is a bore 20; the purpose of this slot and bore will be explained later.

The enclosure member or housing for the impeller 4 is an open sided receptacle having the annular flange 21 to accommodate bolts and/or screws for holding the housing securely to the disc-like member 8 of the main casting. Integral with the circular wall of this housing and axially alined with the shaft, there is a circular bearing boss 22 which is adapted to act as an outer support for the impeller 4, the impeller having the recessed portion 23 that is sized to receive the bearing boss.

The impeller is preferably made of some suitable resilient material such as rubber and/or neoprene, and such a material which has been treated, preferably well graphitized, so that it can stand long service and maintain its size. The impeller has a central bore 23' to accommodate the shaft 3 and integrally molded in this bore there is a cross fin 24 having the cross enlarged circular locking end 25. These parts 24—25 and the openings 19—20 of the shaft, as well as the shaft itself and the bore 23 of the impeller, are sized to make a very snug fit when the slot of the shaft is forced onto the fin 24 and the bored portion 20 is forced onto the rounded end 25 of the fin. In this manner, the impeller is firmly secured to the shaft and will not become loose.

As best shown in Figure 7, the impeller has a plurality of flexible vanes about its periphery which are integral with the main body thereof. Each vane is foot-like in shape when viewed in side elevation (see Fig. 7) and each vane has the same width as the chamber 38. In this particular illustration, six vanes are shown and they are numbered consecutively 26 to 31 inclusive. The shape of these vanes is important although it is realized that the vanes may be given other somewhat similar shapes and made to work very well. However, the shapes of the vanes shown in Figure 7 is believed preferable in that each vane provides a working space 32 which is designed to receive and expel fluids. This impeller unit can be made to operate so as to pass fluids in either of two directions through the ports 33 and 34 of the casting 1, these ports being isolated from each other by the cross partition 35 in the member 13, note Figure 5. Merely, by reverse rotation and reverse positioning of the rotor 4, either port can become the ingress or egress port.

Now, attention is directed to Figure 6 of the drawings wherein is shown the shape of the walls 36 and 37 in the chamber 38. Wall 36 has the same radius as the wall 37, but the center for wall 36 is at 40 whereas the center for wall 37 is at 39; that is, the two centers are spaced apart a sufficient distance to enable the vanes upon the impeller to completely close as shown at the top portion of the chamber 38 and to open their proper distance as the curvature of the chamber wall allows. The stationary fixed wall acts as a cam 36 and wall 37 acts merely as a guide in a manner, so that, in the position now illustrated in Fig. 6, vanes 30 and 31 would be moving into position for forcing liquid from their respective spaces 32, and vanes 27 and 26 would be moving into position for sucking fluid into their respective spaces 32. The spaces 32 of these latter vanes discharged their liquid on their upward path and are now about to open to receive liquid. In this particular arrangement of the rotor, port 34 of the casting would be an outlet port and the other port 33 an inlet port. For purposes of smooth operation for the rotor, the meeting loci of the walls 36 and 37 are neatly curved into one another, but this merging of the curves can be a line abutment, if desired.

In Figure 14, a wear-plate is shown and indicated by the reference character 41. The two faces of this wear-plate and the face of the disc-like member 8 are carefully machined to a smooth even surface. This wear-plate serves to prevent wear on the facing of the casting or main pump part 8 and also to provide suction about the shaft 3 and thus positively avoid leakage. This latter mentioned purpose is accomplished by the slot 42 which connects the surface of the shaft with the port 34', these ports being the primes of the whole numbers which indicated the ports in the member 8 as all these ports register, that is, port 33 of the member 8 is in exact registration with

port 33' of the wear-plate and port 34 of member 8 is in exact registration with port 34' of the wear-plate. When the rotor is to be run in the opposite direction than that indicated by the arrow, this wear-plate is then reversed at the same time that the rotor is reversed in order that the suction slot 42 will be in proper working position.

It is, of course, understood that various changes and modifications may be made in the details of form, style, design, and construction of the whole or any part of the specifically described embodiment of this invention without departing from the spirit thereof in that such changes and modifications are considered as being within the scope of the following claims.

I claim:

1. In a fluid impeller device having a rotor with a plurality of flexible vanes about the periphery thereof and fixed thereto, a bore through the central portion of the rotor having a fin across it with an enlarged locking edge integral therewith, a shaft which snugly fits into the bore of the rotor, and the shaft having at one end thereof an open slot which terminates into an enlarged bore that is diametrically across the shaft, the rotor, fin, and enlarged locking edge of the fin being made of a resilient deformable material so that the slotted end of the shaft can be forced over said enlarged locking edge of the fin, and so that the shaft can rotate the rotor and each vane having a foot-like configuration and a wide area of attachment to the rotor so that fraction stresses are at a minimum.

2. In a fluid impeller device having a rotor with a plurality of flexible vanes integral with the periphery thereof, a bore through the center portion of the rotor for accommodating a shaft, a diametrical cross fin in the bore having an enlarged rounded edge, a shaft having one end provided with an open slot which has at its inner end an enlarged bore adapted to receive the enlarged rounded edge of the fin, the rotor, fin, and enlarged locking edge of the fin being made from a resilient deformable material so that the slotted end of the shaft can be forced over said enlarged locking edge of the fin and thus lock the shaft to the rotor; said vanes being foot shaped and evenly spaced about the periphery of the rotor and each vane having a leading edge which is shiftable and a trailing edge which is fixed and which is integral with the rotor, the spaces between the leading edges and trailing edges of the vanes providing working spaces which change in size as the rotor revolves within a chamber of the device.

FRANK L. CARSON.

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