Feb. 27, 1951 N. LAMPHERE 2,543,633

ROTARY PUMP

Filed Dec. 6, 1945 3 Sheets-Sheet 1

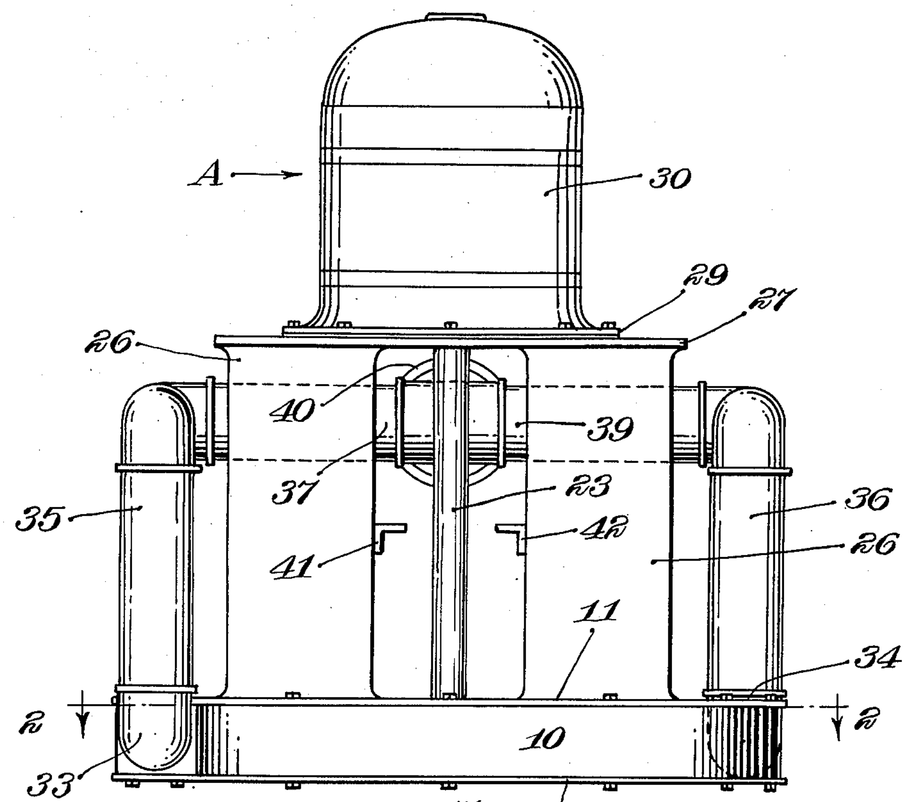

Fig. 1

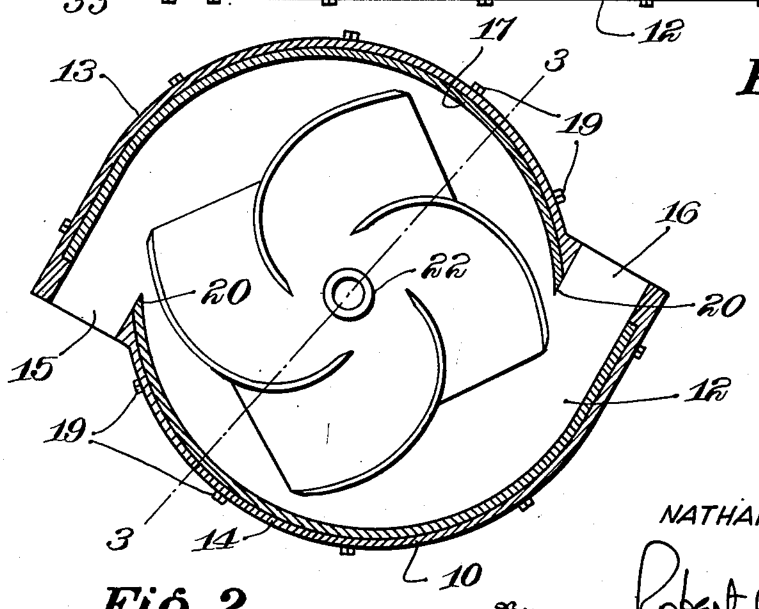

Fig. 2

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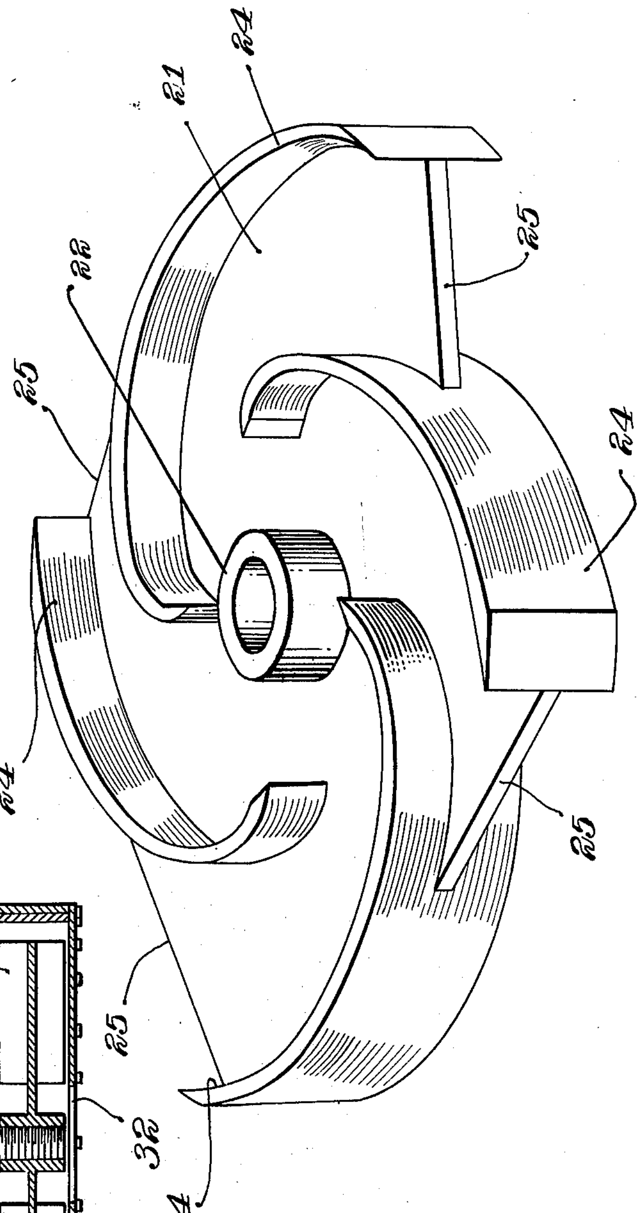

Fig. 5

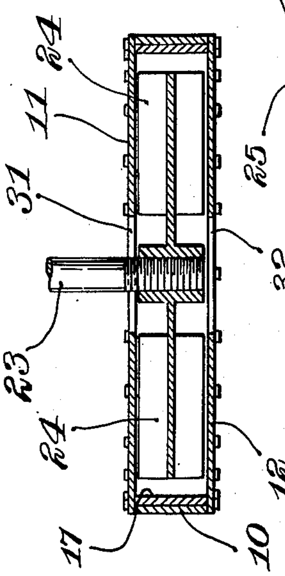

Fig. 3

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ROTARY PUMP

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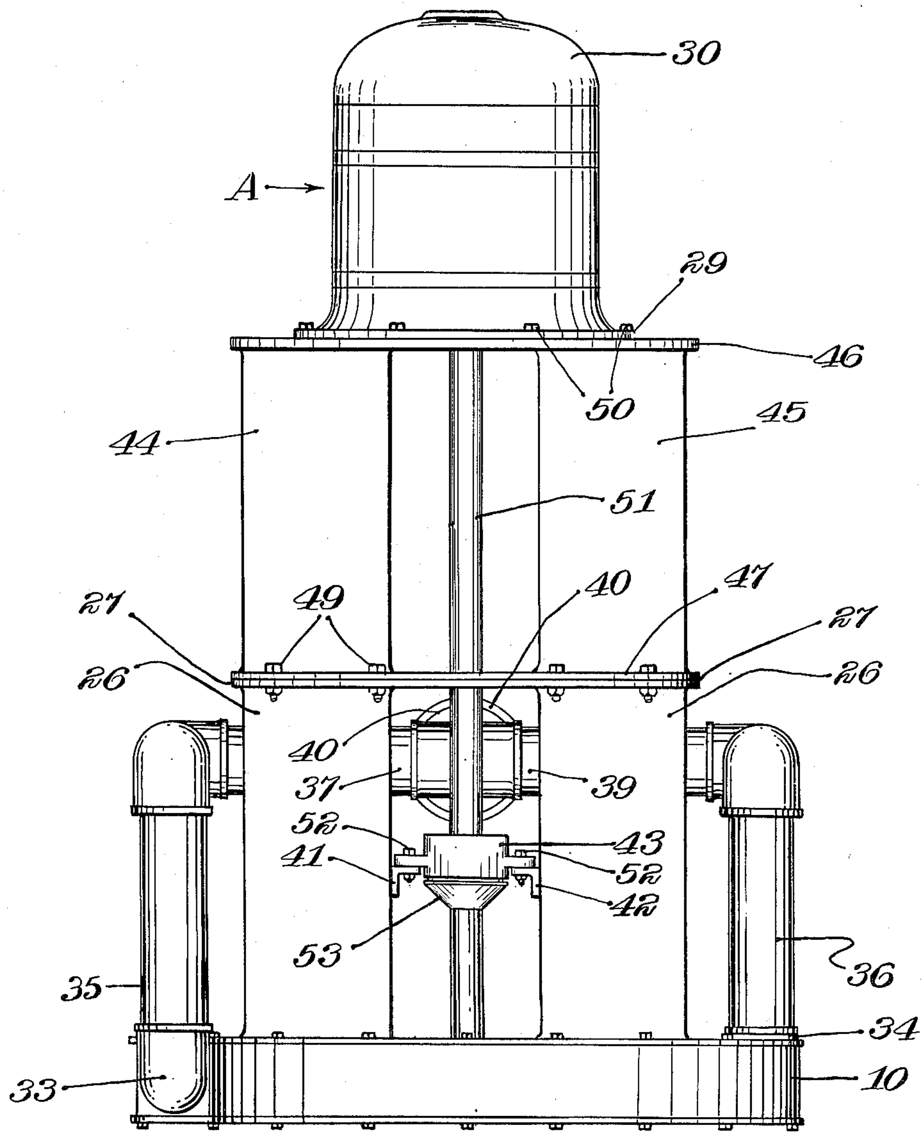

Fig. 4

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UNITED STATES PATENT OFFICE

2,543,633

ROTARY PUMP

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Application December 6, 1945, Serial No. 633,096

2 Claims. (Cl. 103—104)

1

My invention relates to an improvement in rotary pump wherein it is desired to provide a more efficient and effective design.

An object of the present invention resides in the provision of a rotary pump with an intake on both sides of the impeller. The volute casing enclosing the impeller is so arranged that the fluid to be pumped may enter the impeller from opposite sides thereof. As a result the pressure against the impeller is balanced, thus reducing or eliminating end thrust upon the impeller shaft.

A further object of the present invention lies in the provision of a rotary pump having a double or multiple discharge. By discharging fluid at equally spaced points about the periphery of the volute casing the side thrust on the impeller and shaft is balanced or equalized, thus reducing friction on the pump bearings and eliminating the necessity for providing a bearing at the extreme end of the impeller shaft.

A further object of the present invention lies in the provision of an interceptor or splitter which is inserted in the volute chamber at the discharge orifices. This interceptor or splitter extends substantially into contact with the vanes of the impeller to compel all fluid to leave through the discharge openings and to prevent the recirculation of fluid in the volute chamber.

A feature of the present invention resides in providing an interceptor or splitter which is removably attached to the inner surface of the volute chamber and is renewable or replaceable. Thus if wear takes place in the operation of the pump the splitter may be replaced to provide the smallest possible clearance between the impeller and the splitter at the discharge openings. These interceptors or splitters are likewise advantageous in that they may be replaced or adjusted to provide the necessary clearance for the type of fluid being pumped.

My pump has no suction value and the volute casing must be immersed so that at least one inlet opening to the impeller is below the surface of the fluid. However, my pump is so arranged that should the fluid in which it is immersed be temporarily exhausted, it will continue to hold fluid in the discharge column as long as the pump continues to rotate. As a result the return surge of liquid through the pump into the sump in which the pump is located is eliminated. The reason for this result is due to the fact that no vacuum is created in the pump itself or in the suction line connected thereto.

A feature of the present invention resides in the fact that no packing, seals or wearing rings are required between the impeller or the impeller shaft and volute casing. The double intake and double discharge features eliminate excess side or end thrust against the impeller shaft allowing the shaft to be supported by a bearing located at a substantial distance from the impeller. Furthermore as no suction is to be created within the pump or within the intake to the impeller the volute casing need not be sealed relative to the impeller to produce the desired pumping action. The elimination of packing, seals and wearing rings and the elimination of metallic contact between the impeller or the shaft and the volute casing permits the pump to run indefinitely without being immersed in fluid without creating undue heat due to friction. Furthermore the elimination of such packing, seals, and the like permits the impeller to rotate freely and with a minimum of friction.

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A further feature of the present invention resides in the provision of an impeller having a series of curved blades or vanes which are connected by a central supporting web. As a result the fluid entering from either side of the volute casing is forced by the vanes or blades from the volute chambers.

A further feature of the present invention resides in the provision of an impeller having a series of vanes or blades supported by a central web and in forming this web so that it does not extend to the full diameter of the impeller between adjacent blades or vanes. As a result the fluid entering by one of the impeller intake openings may be urged outwardly by the full width of the impeller blades or vanes. The full capacity of the blades may thus be exerted against the fluid for pushing the fluid through the volute discharge even though the volute chamber is but partially submerged.

These and other objects and novel features of my invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of my specification:

Figure 1 is a side elevational view of my pump showing the construction thereof.

Figure 2 is a sectional view through the volute casing, the position of the section being indicated by the line 2—2 of Figure 1.

Figure 3 is a sectional view through the impeller and volute, the position of the section being indicated by the line 3—3 of Figure 2.

Figure 4 is a side elevational view of the pump in extended position.

Figure 5 is a perspective view of the impeller, showing the construction thereof.

The pump A comprises a volute casing 10 having upper and lower closure plates 11 and 12 connected thereto. The volute chamber 10 includes two spirally shaped segments 13 and 14 which terminate on diametrically opposite sides of the center of the casing. The segments 13 and 14 provide volute chambers which gradually increase in size and provide diametrically opposed pump outlets 15 and 16. If desired one of the plates 11 or 12 may be formed integrally with the segments 13 and 14 or these segments may be connected adjacent the discharge chamber to form a circular outlet.

If preferred, however, the segments 13 and 14 may be separately formed and held in proper relationship by removable closure plates 11 and 12. Within each of the segments 13 and 14, I provide a splitter or turbulence interceptor 17. The splitters or turbulence interceptor 17 are removably attached to the segments 13 and 14 by bolts 19. As a result these splitters may be removed and replaced or may be changed to provide a greater clearance between the end of the splitter and the impeller.

Each of the splitters 17 are provided with an edge 20 which extends in closely adjacent relation to the blades or vanes of the impeller as it rotates. The clearance between the splitters and the blades may be regulated by adjusting the position of the splitter 17 or by replacing one set of splitters with a second set which provides the desired clearance. This feature is of importance in view of the fact that different clearances are desirable while handling different types of fluids.

The impeller is formed as best illustrated in Figure 5 of the drawings. A central sleeve or hub 22 is provided with a center aperture designed to accommodate the shaft 23. The shaft 23 is held in place within the hub 22 by means of threaded engagement or by any other suitable means. A web 21 extends outwardly from the sleeve 22 on a plane normal to the axis of the sleeve intermediate the ends of the sleeve. Vanes 24 of any desired or preferred shape extend outwardly from a point spaced from the intermediate sleeve 22 to the periphery of the impeller. The shape of the blades 24 is best determined by formula and the most efficient blade shape depends upon the amount of fluid to be pumped in a given time and the type of fluid being handled.

The blades 24 extend outwardly from both surfaces of the central supporting web 21 as best illustrated in the drawings. The web 21 is cut away, however, so that its outer periphery does not extend along the circumference of a circle. The web 21 is cut away as indicated at 25, preferably from the end of each blade to an intermediate point on the next adjacent blade. Thus a space is provided within the circumference of the impeller at the outer extremity of each blade to permit fluid on one side of the web 21 to be acted upon by the full width of the blades 24.

As best illustrated in Figure 1 of the drawings a pair of suspension members 26 extend upwardly from the top closure plate 11. These suspension members 26 are connected to a ring 27 at their upper extremity. This ring 27 is designed for attachment to the flange 29 of the motor housing 30 which encloses the motor acting to drive the pump. The motor is provided with the usual bearings for supporting the shaft 23 and these bearings hold the impeller in proper position within the volute casing 10.

The upper closure plate 11 is provided with an intake opening 31 therein through which the shaft 23 extends. The lower closure plate 12 is likewise provided with an intake opening 32 which is coaxial with the opening 31. Thus when the impeller casing is submerged in fluid this fluid may enter the impeller casing both through the intake opening 31 and the intake opening 32 to thus produce a balanced force against the impeller. As a result the end thrust against the shaft 23 is maintained at a minimum.

The discharge openings 15 and 16 are connected by adapters 33 and 34 to discharge pipes 35 and 36 respectively. These discharge pipes are connected by aligned connections 37 and 39 to a common discharge manifold 40. The manifold 40 may be connected to any suitable pipe line or the like to deliver fluid thereto.

A pair of angle brackets 41 and 42 are mounted in opposed relation on the suspension members 26. These brackets 41 and 42 are for use in supporting a bearing 43 when it is necessary that the motor be supported at a greater distance from the impeller. As best illustrated in Figure 4 of the drawings a pair of suspension members 44 and 45, similar to the suspension members 26 are connected at their upper extremity by a mounting ring 46 and at their lower extremity by an attachment link 47. The ring 47 is designed to engage against the ring 27 on the suspension members 26 and aligned apertures through rings 27 and 47 permit attachment of these rings by means of bolts 49 or other suitable means. The ring 46 may then be attached to the flange 29 of the motor housing 30 by bolts 50 or other suitable means.

When the suspension members 44 and 45 are attached in place the motor within the motor housing 30 is equipped with a longer motor shaft 51 which is supported by the bearing 43 attached by bolts 52 to the angle brackets 41 and 42. A shield 53 is preferably provided on the shaft 51 beneath the bearing 43 to protect the bearing in the event fluid should suddenly flow into the sump in which the pump is positioned.

For example should the electric power fail suddenly, the shield 53 will prevent the fluid from splashing into the bearing 43.

In operation of the pump the volute casing 10 is submerged below the level of liquid in the sump or the like. When current is supplied to the motor within the casing 30 the shaft 23 or 51 is rotated acting to rotate the impeller. This impeller is rotated in a counter-clockwise direction as viewed in Figures 2 and 5 of the drawings. The fluid entering the inlets 31 and 32 is urged outwardly by the blades 24 through the outlet passages 15 and 16. The edges 20 of the turbulence interceptors or splitters extend sufficiently close to the impeller to prevent the escape of an undue amount of fluid.

Should the liquid level drop to an extent when only the lower inlet 31 is submerged, fluid will be forced outwardly by the portions of the blades 24 on the underside of the web 21 until the fluid flows past the ends 25 of the web 21. The fluid is then forced by the full width of the blades 24 through the volute discharge openings.

It will be seen that the impeller may run freely within the volute casing 10 and that no packing, rings, or the like are required between the rotating impeller and the stationary casing. It will also be seen that end thrust upon the impeller shaft is equalized when fluid is entering both inlet openings. It will also be noted that when the liquid level has dropped sufficiently so that only one of the inlets is open, water enters only through the lower inlet aperture 32, thus creating a force to oppose the weight of the rotor and its shaft. It will further be noted that at all times during the operation of the pump the discharge therefrom is opposed, thus equalizing the force against the shaft. This is extremely important in view of the bearing support and the impeller shaft.

It should also be noted that in the operation of my pump the fluid is forced into the discharge by the entire width of the blades even though the intake is provided through but one of the intake openings. As a result there is a constant force against the fluid in the discharge line. As no suction is created within the pump casing or within the intakes thereto, there is no tendency for the fluid to be drawn back into the pump when the liquid is exhausted. Furthermore as the impeller runs freely within the volute, there are no bearings to become overheated in the event that there is no liquid in the sump to be pumped.

In accordance with the patent statutes, I have described the principles of construction and operation of my rotary pump, and while I have endeavored to set forth the best embodiments thereof, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. A rotary pump including a volute housing, an impeller rotatably mounted therein, said impeller including an intermediate web and a series of impeller blades projecting from opposite sides thereof, said blades curving outwardly continuously from their inner ends to their outer extremities, said web extending to the outer extremity of each of said blades at one side thereof and extending to a point substantially spaced from the outer extremity of the blades on the other sides thereof.

2. An impeller for a rotary pump including a central hub, a web extending outwardly from said hub, and a series of angularly spaced blades supported by said web and projecting on opposite sides thereof, said blades curving outwardly continuously from their inner ends to their outer extremities, said web extending to the outer extremity of each blade on one side thereof and terminating at a point substantially spaced from the outer end of each blade on the other side thereof.

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