Aug. 18, 1931. J. PRELEUTHNER 1,819,118

DOUBLE ACTING CENTRIFUGAL PUMP

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Fig. 1

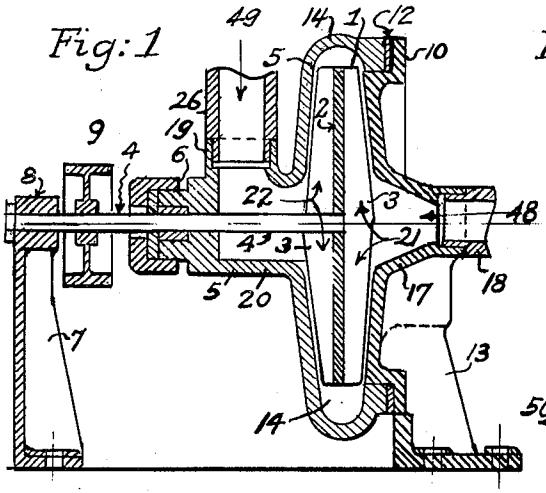


Fig. 2

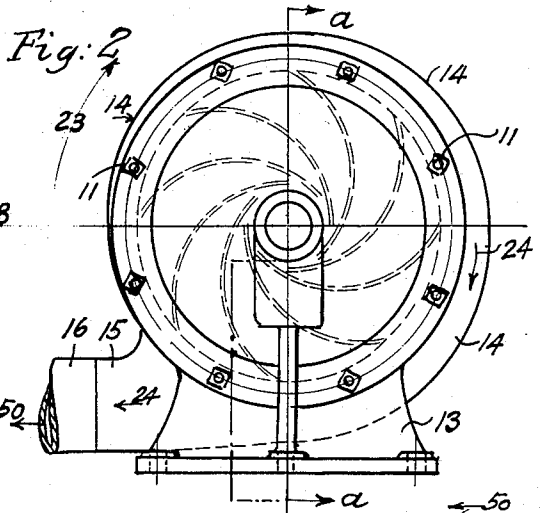


Fig. 4

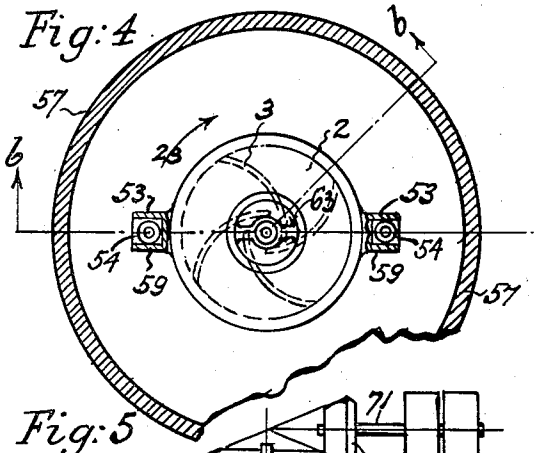


Fig. 3

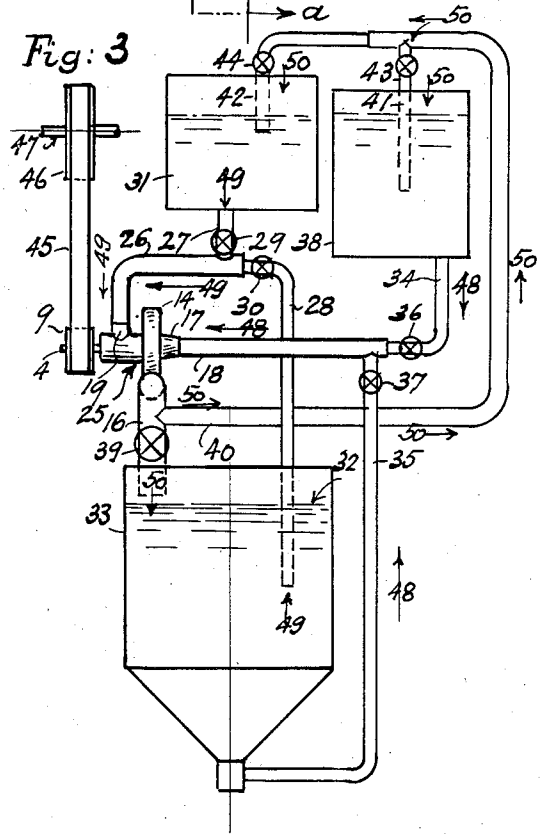
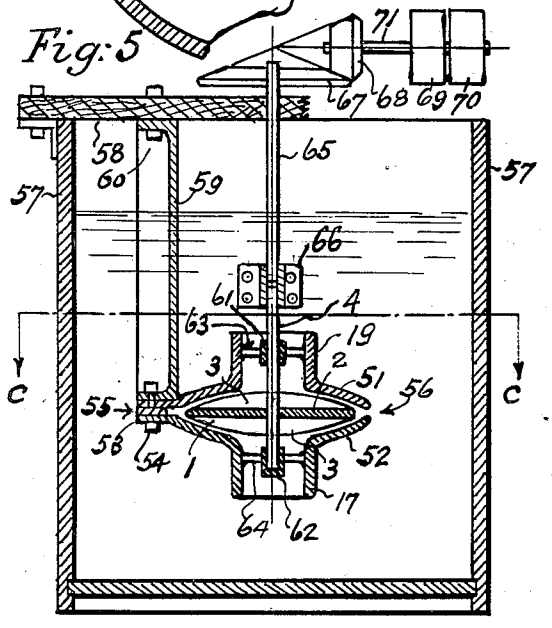


Fig. 5



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Fig: 6

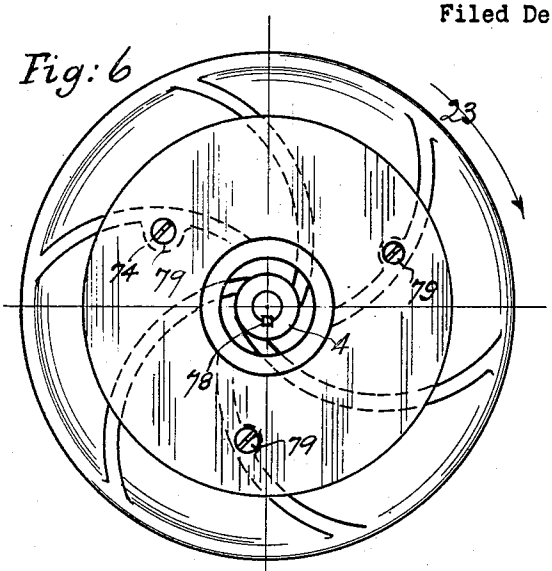


Fig: 9

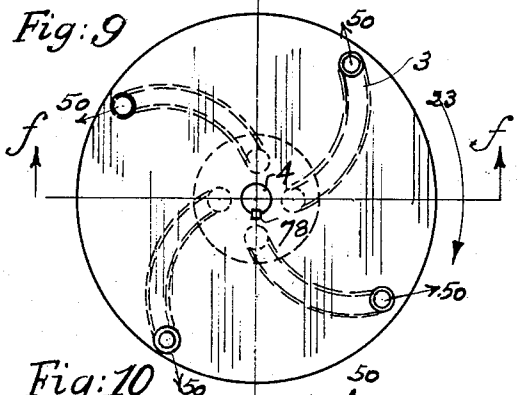


Fig: 10

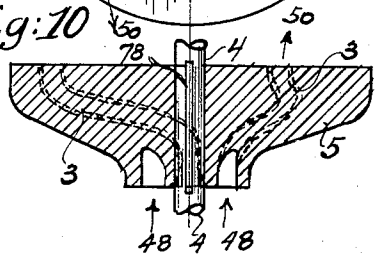


Fig: 7

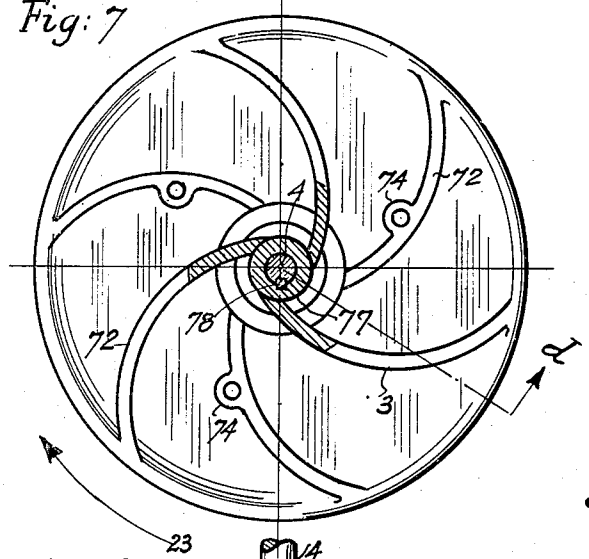


Fig: 11

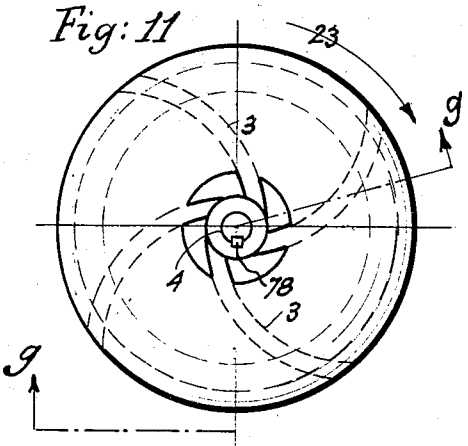


Fig: 8

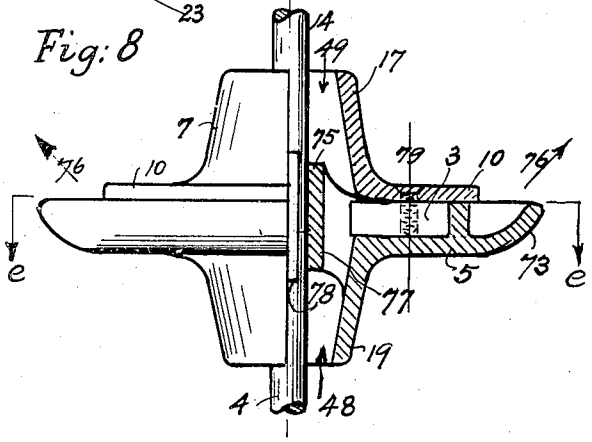
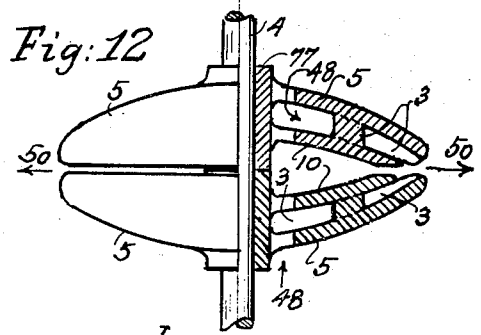


Fig: 12



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Patented Aug. 18, 1931 1,819,118

UNITED STATES PATENT OFFICE

JULIUS PRELEUTHNER, OF NEW YORK, N. Y.

DOUBLE ACTING CENTRIFUGAL PUMP

Application filed December 15, 1926. Serial No. 154,999.

My invention is a double acting centrifugal pump intended for mixing substances of which at least one has to be a pumpable liquid. The object of the invention is the adaptation of the centrifugal pump phenomena to mixing purposes and the object is attained by using a rotatable impeller in a stationary or co-rotatable housing which is provided with two intake openings so as to render possible to draw liquid from two separate sources into the pump, wherein they are mixed and wherefrom they are finally ejected through suitable, peripherally disposed discharge apertures.

The device may be used either for purely mechanically mixing or to accelerate the action of solvents or the reactions of chemicals. It may be utilized as a separate unit detached from the main mixing tank or in modified forms submerged within the contents of the tank.

The advantages of the invention are enumerated in the following:

1. Highest efficiency, owing to the absence of undue currents;
2. As a consequence of the afore cited advantage considerable saving in power;
3. Simplicity of form and operation;
4. The pump is practically indestructible;
5. Considerable decrease in abrasion of the tank lining.

A few preferred forms of the invention are described in the following specification and illustrated in the accompanying drawings which are partly diagrammatical illustrations.

Figs. 1 and 2 illustrate a double acting centrifugal pump with a stationary housing for use as a separate unit, detached from the main process tank. Fig. 1 is the sectional elevation on line *a—a* in Fig. 2 which is an end elevation.

Fig. 3 shows schematically one of the various methods to connect the pumps with tanks and pipe lines.

Fig. 4 is a sectional plan on the line *c—c* in Fig. 5 which is a sectional elevation on the line *b—b* in Fig. 4, the two illustrations showing the pump modified for use as a submerged unit.

Fig. 6 is a plan, Fig. 7 also a plan partly in section on line *e—e* in Fig. 8 which is an elevation partly in section on the line *d—d* in Fig. 7 of a modification for submerged use in which the impeller vanes are a part of the rotatable housing.

Fig. 9 is a plan and Fig. 10 a sectional elevation on the line *f—f* in Fig. 9 of a modification in which cast-in pipes are used to form the impeller vanes.

Fig. 11 is a plan and Fig. 12 an elevation partly in section on the line *g—g* in Fig. 11 of a combination of two pump units in which each unit is formed by a single casting.

In the drawings similar figures denote similar parts.

Referring now to Figs. 1 and 2:

The pump resembles in general outlines the well known centrifugal pumps and the two types have the following parts in common: the impeller 1, comprising a circular web 2 with riblike impeller vanes 3; the impeller is suitably attached to the inner terminal of the shaft 4, preferably by being shrunk thereupon. The impeller and a part of the shaft are enclosed by the housing 5 which is provided with a stuffing box 6 where the shaft enters the housing. The outer terminal of the shaft is supported by a stand 7 which is provided with a bearing 8. The pulley 9 is rigidly mounted in a suitable manner on the shaft for convenient power transmission. The housing is closed by the cover 10 attached to the housing by stud-bolts 11, a gasket 12 between the cover and the housing assuring a liquid-tight fit. The cover is usually cast in one piece with the support 13 which, like the aforementioned support 7, is provided with holes for bolting the pump to a base plate which is not shown in the drawings. The housing of the pump forming with the cover what may conveniently be termed the case (5 and 10), is provided with a peripheral, spiral casing 14 which terminates in the discharge nozzle 15, adapted for suitable connection with a pipeline 16. The cover 10 is provided with an intake 17 adapted to receive the supply pipe 18. The pump may be provided with accessory parts not shown in the drawings as such parts are known im-

provements and do not form a part of my invention; parts of this kind are: plugged cleaning holes in the spiral casing, grease cups, test cocks, etc.

The invention differs in the following features from the known centrifugal pumps: it has in addition to the previously specified intake another intake 19 which is a part of the housing 5 or rather a part of the central tube shaped projection 20 of the housing; thus it is possible to supply liquids to the pump from two separate sources in the directions given by the arrows 21 and 22. This requires a double acting impeller and accordingly the impeller 1, previously specified is provided with impeller vanes 3 at both sides of the circular impeller web 2 also previously mentioned. It should be noted, however, that it is not the web which renders the impeller double acting; the web is only a constructive member incorporated in order to add strength; but it could be omitted without impairing the double acting property of the impeller.

The pump if driven in the direction of the arrow 23 at adequate speeds by power transmitted over the pulley 9 acts as follows: The impeller vanes force the liquid within the pump by centrifugal force towards and into the peripherally disposed spiral casing 14 whence it is discharged through the nozzle 15 into the pipeline 16. The forced discharge of the contents of the pump as specified tends to create a vacuum at and near the central parts of the pump which causes liquid to be sucked into the pump through the two intakes in the directions of the arrows 21 and 22. And as the action of the vanes is continuous the flow of liquid through the pump is also continuous taking place as indicated by the arrows 21, 22, and 24.

One of the various methods to connect the pump with tanks is indicated in Fig. 3. In this schematical illustration the pump is shown by the number 25; the intake 19 accommodates the pipe line 26 which collects the flow coming through the two pipe lines 27 and 28 which are controlled by the valves 29 and 30; the line 27 originates in the overhead tank 31, and the line 28 originates below the liquid level 32 in the main tank 33. The other intake 17 accommodates the pipe line 18 which collects the liquid flowing through the two pipe lines 34 and 35, valves 36 and 37 being inserted for the control of the respective lines; the line 34 conveys the liquid coming from the overhead tank 38 and the line 35 is connected with the outlet of the cone shaped bottom of the main tank 33.

The pump discharges into the main tank 33 by the discharge pipe 16 which is controlled by the valve 39; the pipe 16, however, may also discharge into the branch pipe 40 which splits into the pipe lines 41 and 42 which are controlled by the valves 43 and 44; these two lines terminate in the tanks 38 and 31 respectively.

The pump is driven by the shaft 47, belt 45 and the pulleys 46 and 9 and the flow of liquid through the pump is indicated by the arrows 48, 49 and 50 in Figs. 1 and 2. The arrows in Fig. 3 indicate the direction of the flow of liquid if the valves in the respective pipes were open. By opening some of the valves and closing the others the liquid may be caused to flow into any of the three tanks and very quick mixing may be effected. For instance: by opening the valves 29, 36 and 39, and by closing the other valves indicated in Fig. 3, liquid enters the driven pump, partly by gravity, partly owing to suction, from the tanks 31 and 38; the two streams of liquid entering the pump as afore specified are mixed within the casing of the pump and discharged into the main tank 33 through the line 16.

If it be desired to mix the liquids coming from the two overhead tanks 31 and 38 more thoroughly before discharging the mixture into the main tank, the valve 39 has to be closed and instead the valves 43 and 44 must be opened. Then the superficially mixed liquids will be discharged through the pipe lines 40, 41, and 42 into the tanks 31 and 38 and the operation may be continued in the stated routine until a thorough mixture has been accomplished, when the valves 43 and 44 have to be closed and the valve 39 must be opened in order to effect the discharge into the main tank 33.

It may be observed in the drawings that the line 35 originates in the apex of the cone bottomed tank 33. This method of connecting the pipe with the bottom of a tank facilitates mixing with substances of high specific gravity, be they liquids or solids, as f. i. metal files; substances of this kind tend to collect in the bottom of the tank and are easily forced into circulation by a connection of the specified method.

By placing tanks, wherefrom liquid is supplied to the pump, above the pump the liquid will flow into the pump by gravity when the pump is started; otherwise it is necessary to prime the pump.

The pump may be variously modified, particularly for use as a unit submerged within the contents of the main tank. Pumps of this type may be grouped into two classes, namely pumps with stationary and pumps with rotatable housings.

Pumps of this type do not need pipe connections, neither for the supply nor for the discharge and consequently they are provided only with general intake tubes or apertures; the spiral casing and the discharge nozzle are omitted and the discharge takes place through a peripheral discharge slot.

A modification with stationary housing is shown in the Figs. 4 and 5. The case or hous-

ing comprises two congruent halves, 51 and 52 of which the upper one (51) is called for purposes of distinction the case and the lower one (52) the cover. The two parts have peripherally disposed lugs 53 which serve to bolt them together by means of bolts 54 and separators 55, the latter one determining the width of the slot 56 which extends circumferentially around the housing except where it is interrupted by the aforementioned separators, 55. The housing is attached to the tank 57 either to its bottom or to the cross beam 58 on top of the tank by means of supports or (as in the present case) hangers 59 and bolts 60. The approximately lens-shaped cavity between the parts of the housing (51, 52) accommodates the impeller 1 which like the impeller in the previously specified pump comprises a circular web-plate 2 and impeller vanes 3 at each surface of the web. The impeller is suitably mounted upon the impeller shaft 4; it extends at both sides of the impeller and is guided by bearings 61 and 62. These bearings are adjustably mounted in crossbars 63 and 64 disposed in the cavity of the intakes 19 and 17. The upper bearing 61 is a sleeve bearing but the lower bearing is a cup bearing and by manipulating it the impeller may be adjusted so as not to come into contact with the inner surface of the housing.

The impeller shaft 4 is rigidly connected with the main shaft 65 by means of the sleeve coupling 66, which may be actuated by means of the bevel gears 67, 68, pulleys 69, 70 and the shaft 71.

In operation the pump draws liquid through the intakes owing to the centrifugal action caused by the impeller vanes and the liquid is discharged through the aforementioned slot 56. As the liquid is sucked into the pump from various parts of the tank, namely the bottom and the top and discharged approximately midway between the top and the bottom the particles of the charge come into frequent contact with one another and a thorough mixing is accomplished.

Pumps of this type operate without causing rotation of the liquid charge in the main tank, utilizing the power needed for their operation practically without losses for mixing.

The other modifications refer to pumps with rotatable housing. These forms are also intended for submerged use and a very efficient form is shown in the Figs. 6, 7, and 8.

In describing this form as it developed from the previously specified forms it may be said that the impeller is turned inside out forming one piece with the housing. Referring to the drawings, the combined housing and impeller is represented by 5; it is provided with a downwardly projecting intake nozzle 19 and the rim 73 is somewhat bent upwardly so as to direct the discharged liquid in a slanting direction indicated by the arrows 76. This rim, however, and the nozzle 19 are not essential parts and may be omitted. The vanes 3 are attached to the inner surface of the housing 5, and the named parts, namely the vanes 3 and the housing 5 are preferably formed by a single casting, as shown in the drawings. The vanes, or only some of them (as in the present case), originate in the center forming the connection between the housing 5 and the central hub or sleeve 77 which accommodates the shaft 4 to which it is rigidly attached in a suitable manner, f. i. by a key 78. The circular cover 10 preferably provided with a similar intake nozzle 17 as the housing is attached to the housing by screws 79 which are accommodated by tapped bosses 74 in the housing. If actuated as indicated by the arrow 23 liquid is drawn into the interior of the pump as indicated by the arrows 48 and 49; the two streams of liquid mingle in the interior of the pump where they are mixed and finally ejected peripherally in an upwardly slanting direction indicated by the arrows 76.

The modification illustrated in the Figs. 9 and 10 indicates the use of pipes replacing the impeller vanes. The pipes are adequately bent and imbedded in cast iron. In operation liquid is drawn into the pipes as indicated by the arrows 48; the ejection of the liquid takes place in the direction of the arrows 50.

The illustrations 11 and 12 represent two pump units, each unit being formed by a single casting. These castings include the housing 5, the cover 10, and the vanes 3. The latter ones connect the named parts with the central sleeve 77 which is rigidly mounted to the shaft 4. The superimposed unit is inverted and by the combined action of both units the liquid drawn into the interiors of the two pumps is ejected peripherally as indicated by the arrows 50.

The mixing pumps shown in the drawings indicate the impeller vanes or blades in the usual, curved form; it should be borne in mind that the pump pumps liquid only when operated in the correct direction, as indicated by arrows; however, the mixing pumps may also be used with straight, radial impeller blades or vanes; vanes of this form adapt the pumps to operation in any direction, although at the sacrifice of a part of the efficiency.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent is:

A rotatable stirrer for liquids operating on the principle of the centrifugal pump, comprising a circular dished case or body, having a centrally disposed inlet opening, a peripheral upturned lip on said body, a centrally disposed sleeve, a rotatable shaft in said sleeve, curved vanes originating centrally and terminating near the periphery of said body, a circular cover for said body having a central inlet opening, said cover and body

forming peripherally a ring-shaped outlet opening for the peripheral ejection of the liquid from the stirrer causing a suction for drawing liquid into the cavity of the stirrer through the inlet openings of body and cover during the operation of said stirrer.

Signed at New York in the county of New York and State of New York, this 11th day of December, A. D. 1926.

JULIUS PRELEUTHNER.