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P. F. TERRIE

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DOUBLE-OUTLET CENTRIFUGAL PUMP

Filed April 9, 1956

3 Sheets-Sheet 1

Fig. 1.

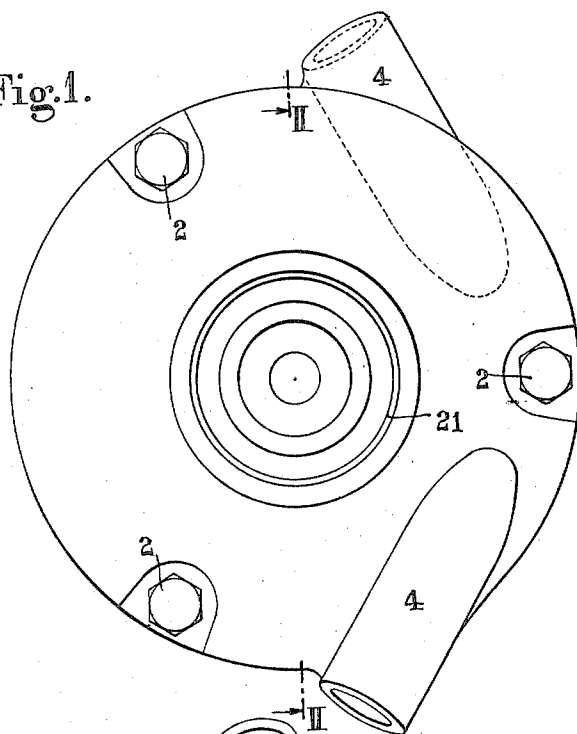
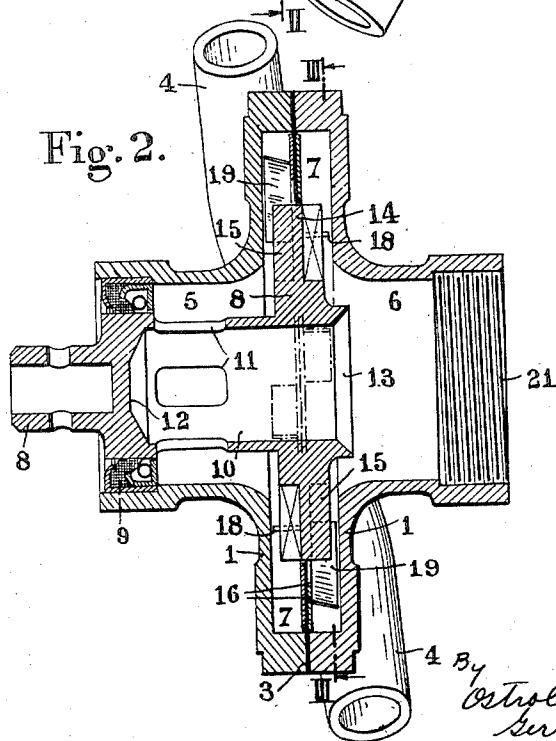


Fig. 2.



INVENTOR
PAUL FRANCOIS TERRIE

*Ostrolenk, Faber,
Kurb & Soffen*
ATTORNEYS

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Fig. 3.

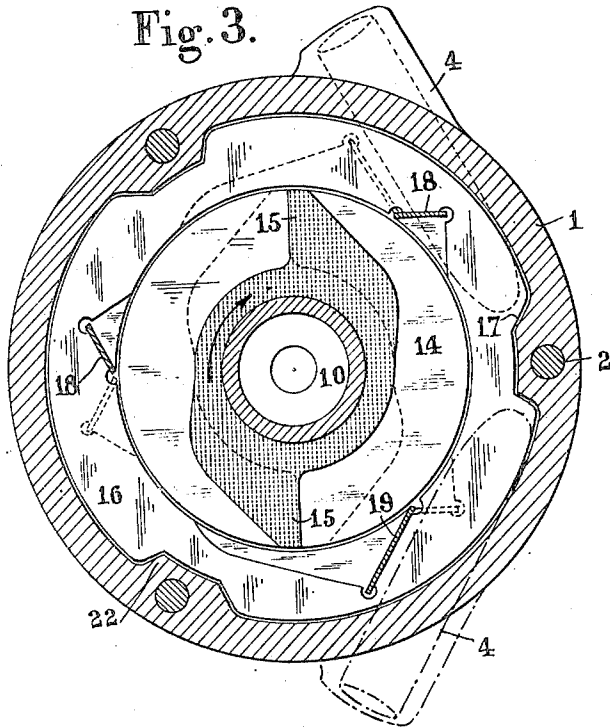


Fig. 5.

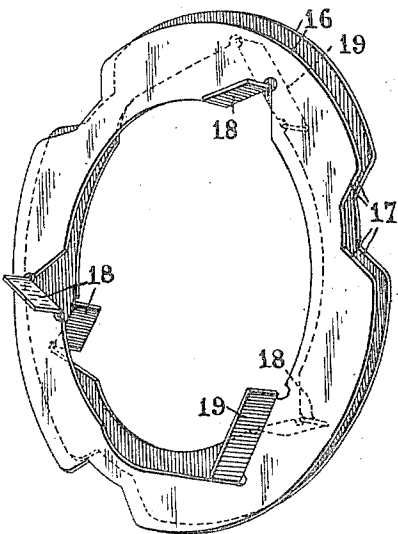
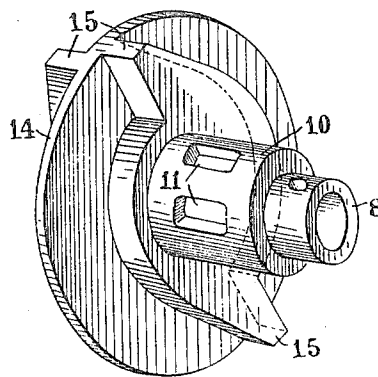


Fig. 4.



INVENTOR
PAUL FRANÇOIS TERRIE
By *Ostroluck, Faber,
Gerle & Soffen*
ATTORNEYS

Dec. 15, 1959

P. F. TERRIE

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Fig. 6.

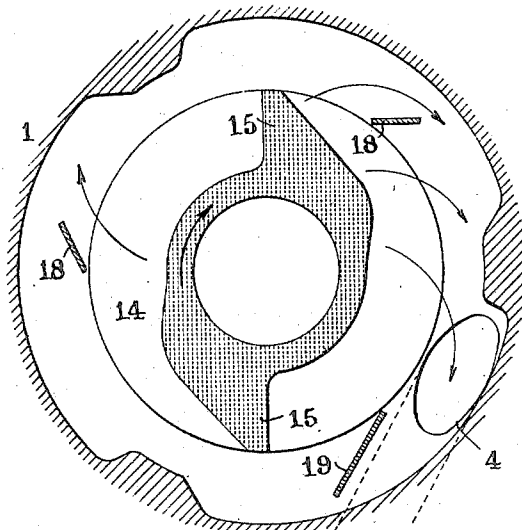
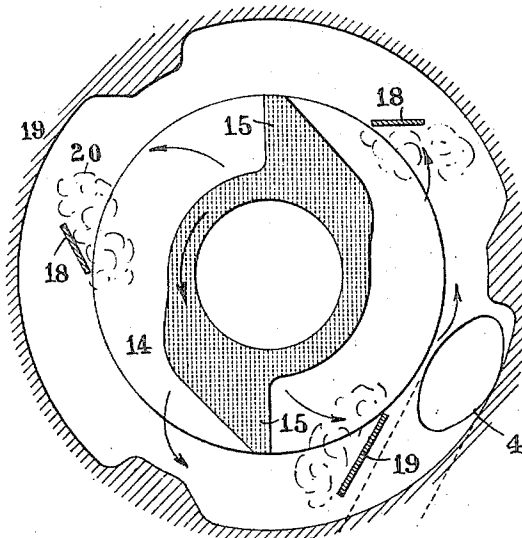


Fig. 7.



INVENTOR
PAUL FRANCOIS TERRIE
BY *Petroleum, Faber,*
Kerb & Soffen
ATTORNEYS

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DOUBLE-OUTLET CENTRIFUGAL PUMP

Paul François Terrie, Paris, France, assignor to Société à Responsabilité Limitée dite: Jobannes Freres, Saint-Ouen, France

Application April 9, 1956, Serial No. 577,020

1 Claim. (Cl. 103—2)

This invention relates to centrifugal pumps and has particular reference to a centrifugal pump having one inlet passage, two discharge outlet passages, and an impeller adapted to rotate in one or the other direction and to deliver the pumped fluid through one or the other discharge outlet passage according to the direction of rotation of the impeller.

Therefore, it is the object of this invention to provide a pump of this type which is so designed that to each direction of rotation of the impeller there corresponds a relatively moderate velocity of the fluid forced towards one of the outlets, in combination with means for absorbing the potential energy of this fluid, whilst the acceleration of the fluid tending to flow towards the other outlet is relatively great in combination with means for converting the potential energy of this fluid into pressure.

This result may be obtained for example by dividing the pump into two chambers by means of a transverse partition, both chambers being fed through the centre, a common impeller having vanes of different directions in each chamber being located in the central region of these chambers, and deflector vanes in the peripheral region of these chambers to direct or counteract the flow of fluid towards the tangential outlet passages provided in each chamber, according to the direction of rotation of the impeller.

The impeller vanes, tangential outlet passages, and deflector vanes may be so directed and arranged that in one direction of rotation of the impeller the liquid flowing through the central inlet passage will subsequently flow into one of the chambers in a direction parallel to the guide vanes and escape through the tangential outlet passage with a maximum diffusing effect, whilst in the other chamber the liquid flow created by the impeller vanes will impinge against the diffuser vanes and have its kinetic energy destroyed thereby so that this fluid will not reach the relevant outlet passage; the reverse takes place when the direction of rotation of the impeller is changed.

The central portion of the transverse partition dividing the pump casing into two chambers may consist of a plate provided for this purpose in the impeller, this plate carrying the impeller vanes disposed on either side thereof, and the peripheral portion of this partition may consist of an annulus carrying the stationary or deflector vanes.

The narrow annular gap left between the impeller plate and the annulus carrying the deflector vanes enables the fluid to flow from the chamber in which its kinetic energy is partly absorbed by the impingement on the guide vanes of the other chamber, thereby improving the pump efficiency.

Consequently, with the device of this invention it is possible to deliver fluid into one or the other outlet passage without it being necessary to equip same with valve means likely to become clogged or fouled when the fluid handled by the pump consists of the wash water of a washing-machine which may contain various fragments.

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This double-outlet pump may be used as a substitute for two pumps or a gate valve, and furthermore it is adapted to compensate errors in the connection of the delivery pipe of the pump when, in the specific case of a washing-machine, the water drawn from the washing pan is to be discharged either through a heating coil, when clean, or to the drain, when soiled.

The pump may be designed to operate symmetrically in both directions; in this case all the members of one chamber are substantially symmetrical to those of the other chamber. Besides, it may be advantageous that the pump delivers in one direction a low output under high pressure, for example in a heating installation, and in the opposite direction a high output combined with a low pressure, for example for draining purposes; in this case the symmetry between the corresponding elements of the two chambers, and notably the impeller symmetry, will be suppressed; under these conditions, the high-output low-pressure outlet may be connected through a small-diameter branch pipe to the pump inlet; in fact, when the pump has a low-output high-pressure delivery a flow tends to take place in the high-output low-pressure passage and is returned through the branch pipe to the pump inlet; on the other hand, under high-output low-pressure operating conditions a flow will nevertheless take place through the branch pipe but the leakage losses therein remain moderate since the branch pipe has a relatively small diameter.

In order to afford a clearer understanding of this invention and of the manner in which the same may be carried out in practice, reference will now be made to the accompanying drawings forming part of this specification and showing by way of example one possible form of embodiment of the invention. In the drawings:

Figure 1 is an elevational view showing a pump constructed in accordance with the teachings of this invention.

Figure 2 is a longitudinal section taken on the line II—II of Fig. 1.

Figure 3 is another section but taken on the line III—III of Fig. 2.

Figure 4 is a perspective view of the pump impeller.

Figure 5 is another perspective view showing the pair of deflector annuli which are normally juxtaposed but which are shown slightly separate from each other for explanatory purposes.

Figures 6 and 7 are diagrammatical views illustrating the principle of operation of the pump.

The pump according to this invention comprises a casing 1 made of two sections connected through bolts 2, a suitable gasket 3 being interposed therebetween. Each casing section is provided with an outlet passage 4.

These outlet passages 4 are symmetrical with respect to a diametral plane. The pump body or casing forms a pair of substantially cylindrical end chambers 5, 6 opening out into an intermediate, substantially cylindrical central large-diameter chamber 7. The chamber 6 is adapted to be connected through a pipe fitting to be screwed in the screw-threaded portion 21 to the vat or like container in which the liquid to be discharged or drained is contained.

An impeller 8 connected to a motor shaft (not shown) is mounted in the pump casing. A shaft packing 9 is provided between the impeller hub and the casing. The impeller comprises a hollow cylindrical hub 10 formed with ports 11 and having an end wall 12 to close the hub 10 on the driving side, the opposite side 13 or suction side of this impeller hub being open, as shown. The impeller proper 14 is a disk or plate formed on either face with vanes 15 of opposite direction (see Fig. 4). This plate and the vanes thereon are located in the central chamber 7 and divide it into two halves.

A pair of deflector annuli 16 (Fig. 5) having peripheral notches 17 formed therein are juxtaposed and mounted concentrically to the plate 14 in the central chamber 7; these annuli 16 are held in this chamber by inner projections 22 formed in the pump casing and corresponding in shape to the peripheral notches 17. Each annulus is formed with three vanes, i.e. a pair of small vanes 18 and a longer vane 19; these vanes extend at right angles to the plane of the annulus; each vane 19 is parallel to the axis of an outlet passage 4 (Fig. 3), and the annuli 16 are shifted angularly like the outlet passages 4.

When the impeller rotates and the liquid is drawn across the chamber 6 the operation in the two halves of chamber 7 is substantially as shown diagrammatically in Figs. 6 and 7 of the drawings. In the half-chamber corresponding to Fig. 6 the liquid is drawn in a direction parallel to the deflector vanes and directed towards the tangential outlet passage 4 with a maximum diffusing effect. In the other half-chamber corresponding to Fig. 7 the liquid stream created by the impeller vanes impinges on the deflector vanes and its kinetic energy is destroyed thereby. Bubbling zones 20 are formed in the vicinity of the vanes, a stabilized liquid ring developing peripherally of this half-chamber, whereby the liquid is not discharged through the corresponding outlet passage.

In the small free annular space existing between the impeller plate and the deflector vanes the liquid may flow to the half-chamber in which the kinetic energy of the liquid is partly absorbed by the shock against the vanes of the other half-chamber, thereby improving the efficiency of the pump.

The above description is given by way of indication only and should not be construed as limiting the purpose of this invention. Thus, the shape of the impeller and deflector vanes may vary and the partition dividing the central chamber of the pump casing into two halves may be independent of the impeller and deflector vanes; any other devices which, according to the direction of rotation of the pump, permits the absorption of the potential energy of the fluid tending to flow towards one of the outlet passages, and the conversion of the potential energy of the fluid tending to flow towards the other outlet passage into pressure with a maximum diffusing effect may be used without departing from the spirit and scope of this invention as set forth in the appended claim.

What I claim is:

A centrifugal pump for liquids, which comprises a

pump body, a driven impeller rotatively mounted in said pump body, at least one transverse partition dividing said pump body around said impeller into a pair of axially spaced annular chambers, said partition having only a small clearance with said impeller, said body having a central inlet permitting ingress of input liquid into the central portion of each chamber, said impeller comprising a disk having an axially extending hollow hub, said disk and said transverse partition defining said pair of axially spaced annular chambers, said hub having an opening communicating with said inlet, one of said chambers communicating directly with said central inlet, and the other of said chambers communicating with said central inlet through said hollow hub, a group of blades integral with each side of said disk, each of said groups being disposed on a different side of said transverse partition, said disk being co-planar with said transverse partition, the blades of one group being inclined to carry along the liquid in one direction in one of said chambers for one direction of rotation of said impeller, the blades of the other group being inclined to carry along the liquid in the opposite direction in the other chamber for a rotation of opposite direction of said impeller, a pair of outlet orifices disposed tangentially at the outer periphery of said pump body, each of said outlet orifices being disposed on a different side of said transverse partition, and associated the one with one chamber, the other with the other chamber, said orifices inclined in the direction corresponding to that in which the stream of liquid is carried along in the chamber at the periphery of which it is disposed, two groups of stationary deflector fins, each group of fins being disposed on a different side of said transverse partition, the fins of each group being inclined in the same direction as the outlet orifice of the chamber in which they are situated.

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