Oct. 12, 1943. J. P. DAMONTE 2,331,310

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Filed May 7, 1942 2 Sheets-Sheet 1

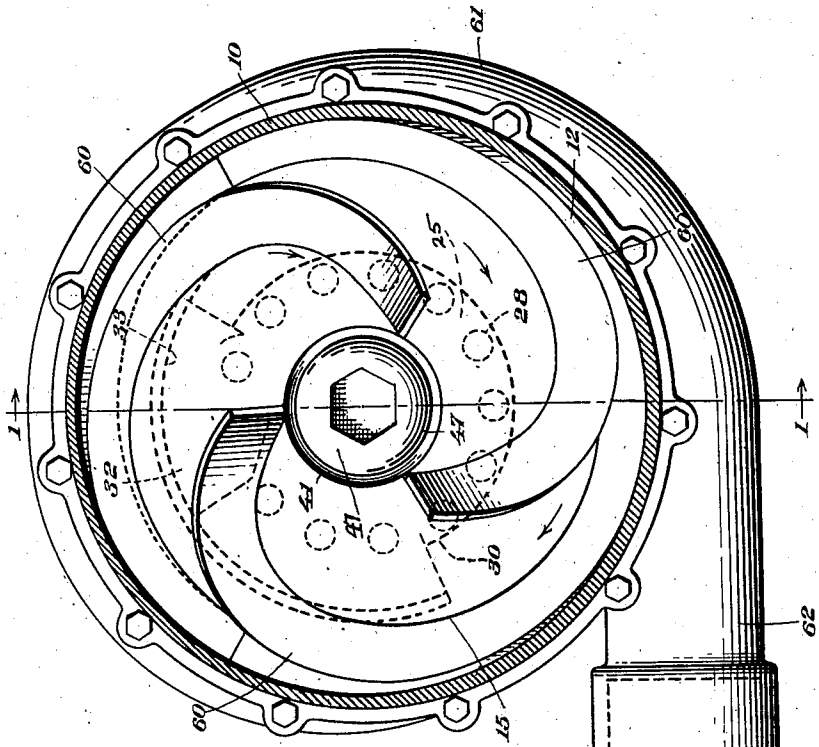

Fig. 2.

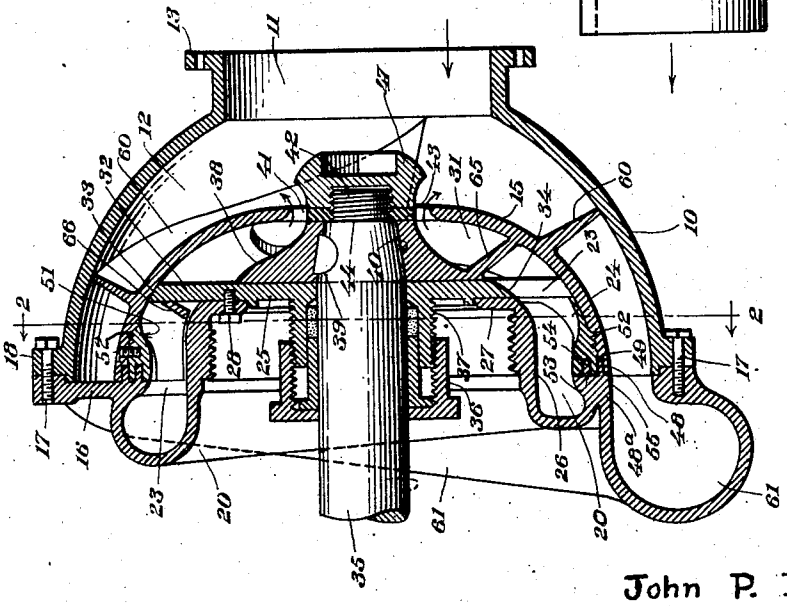

Fig. 1.

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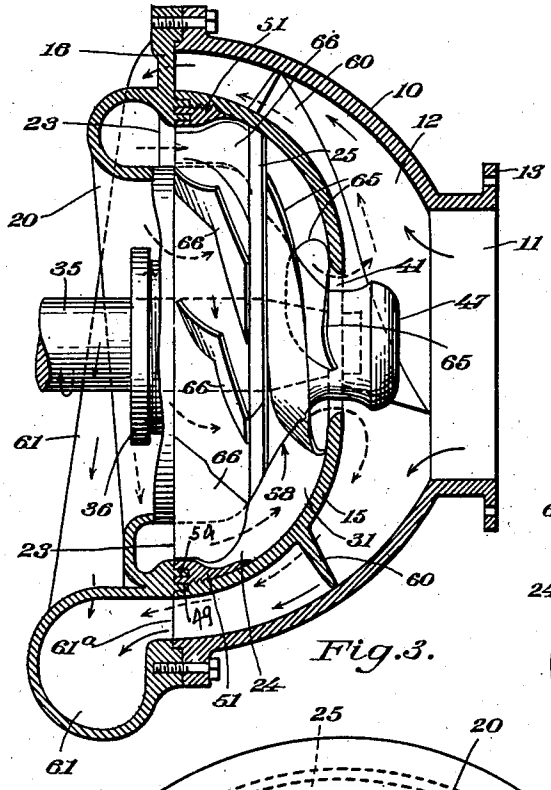

Fig. 3.

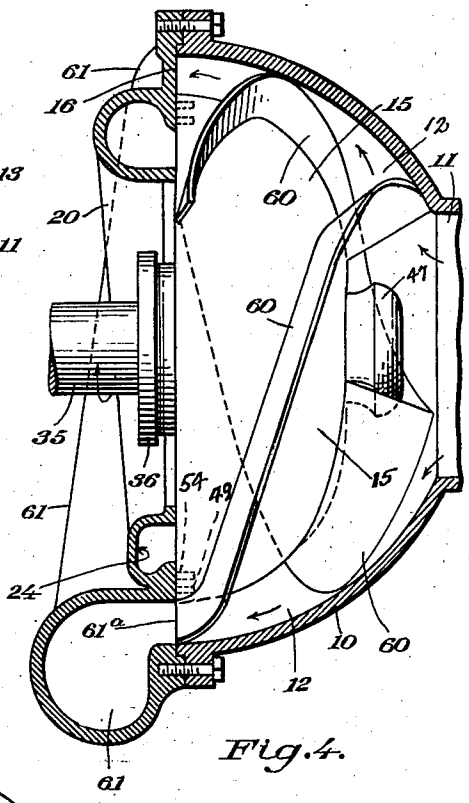

Fig. 4.

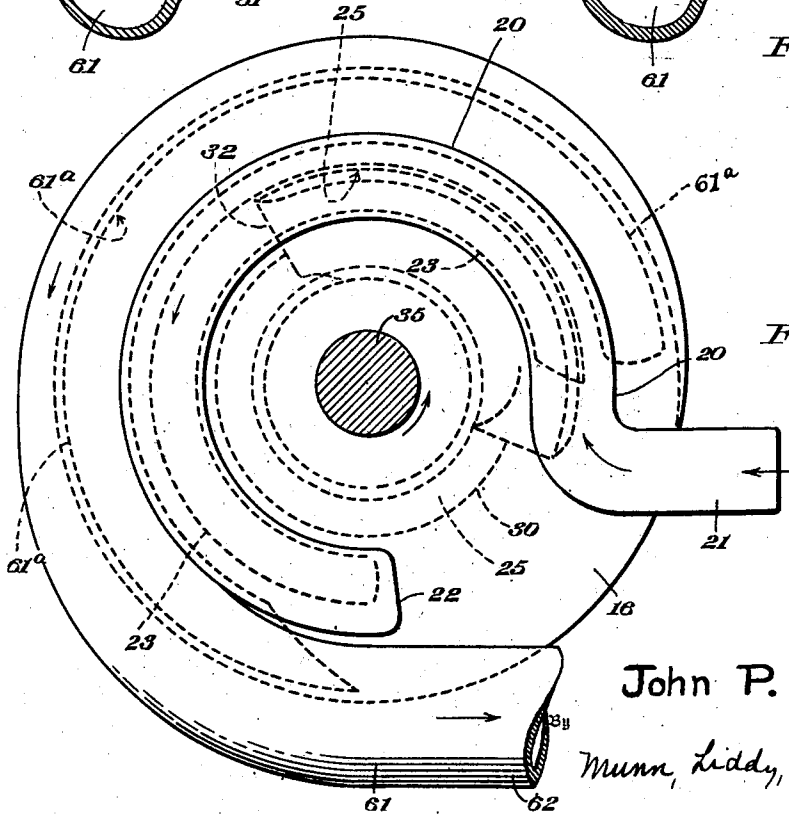

Fig. 5.

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Application May 7, 1942, Serial No. 442,074

7 Claims. (Cl. 103—113)

This invention relates to improvements in pumps.

An object of the invention is the provision of a pump for insuring the delivery of an exceptionally large volume of fluids in which a priming means is incorporated for supplying the pump with the necessary amount of liquids during the starting of the pump.

A further object of the invention is the provision of a pump which is initially supplied with a priming fluid and which may be continued during the normal operation of the pump for not only maintaining the flow of the liquids through the pump but for increasing the capacity of the pump.

A further object of the invention is the provision of a pump in which a priming fluid is supplied and maintained in circulaton through various compartments or chambers of the pump after which it is discharged into an outlet passage through which the main volume of the liquid is forced.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a vertical section taken along the line 1—1 of Fig. 2.

Figure 2 is a transverse vertical section taken along the line 2—2 of Fig. 1.

Figure 3 is a vertical section similar to that shown in Fig. 1 in which the outer shell and inner shell or rotor only are disclosed in section.

Figure 4 is a section similar to that shown in Fig. 3 in which the outer shell only is shown in section.

Figure 5 is a front view of the pump.

Referring more particularly to the drawings, 10 designates a shell which is hemispherical in shape with the dome portion flattened and provided with an opening 11 through which fluids are adapted to be drawn for supplying a pressure chamber 12 with the requisite quantity of fluids. The flange 13 is adapted to be connected to a pipe which supplies the fluid to the chamber 12.

A rotor generally designated by the numeral 15 is located approximately concentrically within the shell 10 and is also substantially hemispherical. Said rotor is spaced from the walls of the shell 10 to provide the chamber 12, which terminates at a closure plate generally designated by the numeral 16 which is bolted at 17 to a flange 18 formed at the inner periphery of the shell 10.

The plate 16 is formed with an integrally formed chanel member 20 which is curved along an arc of a circle as shown in Fig. 5. The member 20 includes an extension 21 which forms an inlet pipe and is adapted to be connected to the same source of supply from which suction 11 derives its supply or a supply of priming fluid which is the same type of fluid supplied to the chamber 12. It will be noted that the member 20 extends from the pipe 21 in a circular arc around the longitudinal axis of the pump and terminates in 22. An inspection of Fig. 1 will show that the inner wall of the tube where it is integrally formed with the plate 16, is cut away to provide an arcuately shaped passage 23 which places the tube 20 throughout substantially its length in communication with a suction compartment 24.

A suction compartment is formed between a partition or wall 25, the inner wall of the rotor 15 and an inturned portion 26 that extends from the tube 20 and the integrally formed plate 16. The inturned portion 26 has an annular flange 27 that is bolted at 28 to the wall 25 to form a cup-shaped depression at the inner face of the pump.

The division wall 25 is shown more particularly in dotted lines in Figures 2 and 5. The greater portion of the wall at its periphery is cut away as shown at 30 to provide an annular passage between the suction or priming compartment 24 and a pressure compartment 31 which is also formed between the inner wall of the rotor 15 and the wall or partition 25. Thus it will be seen that the suction compartment 24 and the pressure compartment 31 are in communication at the bottom portion while an arcuately shaped flange 32 cuts off communication at the upper portions of the compartments 24 and 31. Furthermore, the outer peripheral edge of the flange 32 is beveled as shown at 33 so that it will neatly fit the curved wall of the hollow rotor 15. The portion 30 of the partition wall 25 is also beveled as shown at 34 to provide a smooth curved surface at a point where the member 30 is connected to the flange 27 adjacent the lower portion of the compartment 24.

A driveshaft 35 is mounted in a packed bushing

36 which is threaded onto a collar 37 extending from and integrally formed with the partition wall 25 in order to prevent leakage of fluid at this point from the pump. A hub 38 receives the outer end of the shaft 35 and is keyed at 39 to said shaft. The tapering of the outer end of the shaft as shown at 40 and likewise the tapered opening in the hub 38 will prevent the hub from binding against the partition wall 25.

It will be noted from Fig. 1 that the curved end of the rotor 15 is provided with an opening 41 through which projects the reduced end 42 of the shaft 35. A washer 43 rests on the outer end of member 38 and does not touch shoulder 44 of the shaft 35. A nut 47 screwed onto the outer end of said shaft securely binds the hub 38 to the shaft so that when the shaft is rotated the rotor 15 will likewise be revolved. However, the annular passage 41 in the rotor 15 provides for the discharge of fluids from the pressure compartment 31.

The periphery of the hollow rotor 15 is provided with an annular proove 48 to receive an annular rib 49 which projects inwardly from an enlarged portion 48a on the plate 16.

A ring 51 is threaded at 52 onto the inner face of the rotor 15 adjacent the annular groove 48. This ring is provided with a groove 53 which receives an annular rib 54 concentric with the rib 49 and said rib also projects from the enlarged portion 48 on the plate 16. A packing 55 is located between the ribs 49 and 54.

The outer wall of the rotor 15 as shown more particularly in Figs. 2 and 4 is provided with a plurality of integrally formed vanes 60 which extend outwardly therefrom and have their outer edges in close association with the inner wall of the shell 10. These vanes are so curved that when they are revolved they will create a suction on the liquid which enters the opening 11.

These vanes create also considerable pressure on the liquid in the pressure chamber 12 so that the liquid is forced outwardly towards and through an arcuately-shaped passage 61a (Fig. 5) which is provided in the plate 16 near the periphery thereof, whence said liquid will enter an arcuately-shaped discharge tube 61, that is formed as an outward extension of the plate. The passage 61a places the greater portion of the chamber 12 in communication with the tube 61. A continuation of the tube 61 as shown at 62 is adapted to be connected to a pipe when the liquid from the pump is conveyed to a desired point.

Vanes 65 shown more particularly in Figs. 1 and 3 are formed integrally with the inner wall of the rotor 15 and the outer wall of the hub 38 in the pressure compartment 31. In other words, the vanes 60, 65, hub 38 and rotor 15 are cast in one piece as an integral formation. The vanes 65 are curved in a helical manner somewhat similar to the vanes 60 in the pressure chamber 12 but are set in an opposite direction to the setting of the vanes 60.

The vanes 60 form diverging passages while the vanes 65 form converging passages. The priming fluid in the chamber 24 is forced towards the axial center of the rotor 15 thence outwardly through the restricted passage 41 in the hemispherical rotor 15.

A plurality of vanes 66 are formed integrally upon the inner wall of the ring 51. Since this ring is located within the suction compartment 24 and is secured to the inner wall of the rotor 15 adjacent the plate 16, said vanes are so constructed and positioned in relation with flange 32 that they will create a suction in the tube 20 and draw in priming fluid from this tube into the suction compartment whence this fluid is then forced through the arcuately shaped opening at a portion of the periphery of the partition wall 25 into the pressure chamber 31. As has been explained the vanes 65 are so constructed and positioned that they will force the liquid or fluid from the pressure compartment through the opening 41 into the pressure chamber 12.

The operation

of my device is as follows: When the shaft 35 is rotated in any approved manner in the direction indicated by the arrows in Figs. 1 and 3, the rotor 15 will be revolved so that all of the vanes connected therewith will likewise be revolved. The number of vanes 66 in the suction compartment 24 will draw in the priming fluid and this fluid is then forced under pressure into the pressure compartment as indicated by the dotted arrows in Fig. 3. It will be seen that the fluid passes through the opening 41 into the pressure chamber 12 and it will be forced by the vanes 60 into the discharge tube 61. When the pump has been properly primed the liquid or fluid which is drawn through the passage 11 will follow the arrows indicated in full lines (Fig. 3) and then will be discharged through the tube 61 into the extension 62.

The members 10 and 15 are shown as hemispherical in shape but modifications of these configurations may be made without affecting the efficiency of the pump.

Due to the position, shape and angle of vanes 66 and 65, and the direction of their rotation, also the position of flange 32 in relation to passage 23, it has been found that a very high vacuum is developed in channel 20. Due to the creation of the vacuum by said means in channel 20 or extension thereof any liquid exposed to its internal surface would be drawn into the suction compartment 24, where vanes 66, due to their angle, rotation and position, aided by the position of flange 32 will force the water or liquid into pressure chamber 31, where vanes 65, due to their angle, position and rotation, will force the water or liquid through the opening 41 into chamber 12.

Since the flow of water or liquid has been started and is passing through outlet 41, it will come into contact with nut 47. The surface of this nut is so arranged that it will deflect any liquid leaving opening 41 and entering chamber 12. By this means the water or liquid will come in contact with vanes 60, whose rotation, position and angle will create a centrifugal force and thereby force the water or liquid to a point at the edge of the blade and inner surface of shell 10, resulting in sealing up the clearance between shell 10 and outer edges of vanes 60, with the liquid sealed at this point. Due to the continued flow of liquid or water through the outlet 41 into chamber 12, there will be maintained a liquid or water seal between the outer edges of vanes 60 and the inner surface of shell 10. After this seal has developed there will be created a vacuum in chamber 12 and suction tube 11, caused by vanes 60, because of its angle, position and rotation, aided by the water or liquid seal.

It will be noted that channel 20 is small, and cannot furnish sufficient water to satisfy the vacuum created in chamber 12 and tube 11. Because of this condition the atmospheric pressure on the surface of the liquid or water on

the outside of the tube 11 will force the air therein into chamber 12.

Due to the shape and angle of vanes 60 and the liquid seal, the air will be forced out through tube 62, until there is no more air in tube 11 or chamber 12. When this is accomplished vanes 60 will begin handling the liquid which will follow the air. It has been found from actual practice that this centrifugal pump does not become airbound.

It will be further borne in mind that when there is no liquid at suction chamber 11 there will be no necessity to pump water to supply the auxiliary suction tube 20.

I claim:

1. A pump comprising a hemispherical shell, a closure plate secured to the periphery of the shell, a hollow hemispherical rotor within and spaced from the walls of the shell to provide a pressure chamber, said shell having a fluid inlet in the axial center thereof leading into the pressure chamber, a partition within the rotor and dividing the hollow rotor into a suction compartment and a communicating pressure compartment, a curved tube integral with the plate and being in communication with the suction compartment through its length, a second curved tube in communication throughout its length with the pressure chamber and having an extension forming a discharge, means supplying the first-mentioned tube with a priming fluid, vanes secured to the inner and outer walls of the rotor for creating pressure on the fluids in the pressure compartment and in the pressure chamber respectively, and vanes on the inner wall of the rotor and confined to the suction compartment for drawing priming fluid into said compartment and for forcing said fluid into the pressure compartment.

2. A pump comprising a hemispherical shell, a closure plate secured to the periphery of the shell, a hollow hemispherical rotor within and spaced from the walls of the shell, to provide a pressure chamber, said shell having a fluid inlet in the axial center thereof leading into the pressure chamber, a partition within the rotor and dividing the hollow rotor into a suction compartment and a communicating pressure compartment, said partition being cut away along a portion of its periphery to provide a free passage of fluids between the two compartments, a curved tube integral with the plate and being in communication with the suction compartment through its length, a second curved tube in communication throughout its length with the pressure chamber and having an extension forming a discharge, means supplying the first-mentioned tube with a priming fluid, vanes secured to the inner and outer walls of the rotor for creating pressure on the fluids in the pressure compartment and in the pressure chamber respectively, and vanes on the inner wall of the rotor and confined to the suction compartment for drawing priming fluid into said compartment and for forcing said fluid into the pressure compartment.

3. A pump comprising a hollow shell having one end open, a closure plate secured to the open end, the opposite end of the shell having an inlet opening, a hollow rotor within and spaced from the walls of the shell to form a pressure chamber, a partition dividing the hollow rotor into a suction compartment and a pressure compartment, said partition being cut away to provide a passage between the two compartments, means supplying a priming fluid to the suction compartment, vanes in the suction compartment and carried by the rotor for drawing in the priming fluid which enters the pressure compartment, said rotor having an opening which provides communication between the pressure compartment and the pressure chamber, vanes in the pressure compartment and carried by the rotor for forcing the priming fluid into the pressure chamber, vanes in the pressure chamber and operated by the rotor for drawing fluid through the inlet into the pressure chamber and for forcing the fluid out of said pressure chamber, and a discharge pipe for carrying off the fluid under pressure.

4. A pump comprising a hollow shell having an inlet opening at one end adapted to be connected to a supply of fluid, the other end of the shell being closed, a hollow rotor located concentrically in the shell and forming with the shell a pressure chamber in communication with the inlet opening, vanes on the rotor and revolved in said chamber for forcing fluid therethrough, a discharge conduit connected with said chamber, means dividing the rotor into a suction compartment and a pressure compartment, said compartments having restricted communication with each other, vanes connected to the rotor and operating in the suction compartment to draw in a priming fluid, the pressure compartment being in communication with the pressure chamber, a series of vanes on the rotor and operated in the pressure compartment for drawing in fluid from the suction compartment and discharging the same under pressure into the pressure compartments and means for supplying priming fluid to the suction compartment.

5. A pump comprising a hollow shell having an inlet opening at one end adapted to be connected to a supply of fluid, a plate closing the other end of the shell, a hollow rotor located concentrically in the shell and forming with the shell a pressure chamber in communication with the inlet opening, vanes on the rotor and revolved in said chamber for forcing fluid therethrough, a discharge conduit connected with said chamber, means dividing the rotor into a suction compartment and a pressure compartment, said compartments having restricted communication with each other, vanes connected to the rotor and operating in the suction compartment to draw in a priming fluid, the pressure compartment being in communication with the pressure chamber, a series of vanes on the rotor and operated in the pressure compartment for drawing in fluid from the suction compartment and discharging the same under pressure into the pressure compartment, an arcuately-shaped inlet tube formed integrally with the plate, said plate and tube having a curved slot extending substantially the length of the tube for placing the tube in communication with the suction compartment, and means connected with the tube adapted to supply a priming fluid thereto.

6. A pump comprising a hollow stator of hemispherical shape having an inlet opening at one end, a closure plate secured to the opposite end of said stator, a fluid priming pipe and a discharge pipe connected to the plate, a hollow rotor of hemi-spherical shape in the stator and forming with the stator a pressure chamber, which is in communication with the inlet opening, means on the exterior wall of the rotor for drawing in fluid and for forcing the same through the discharge pipe, the rotor being provided with communicating suction and pressure

compartments, the priming pipe adapted to supply the suction compartment with priming fluid, the pressure compartment having restricted outlet communication with the pressure chamber, means within the suction compartment and on the interior wall of the rotor for drawing in priming fluid and forcing the same into the pressure compartment, and means within the pressure compartment and on the interior wall of the rotor for forcing the priming fluid from said compartment into the pressure chamber, the discharge pipe being in communication with the pressure chamber.

7. A pump comprising a hollow stator having an inlet opening at one end and an outlet port at the other end, the other end thereof being closed, a hollow rotor within the stator and divided interiorly into a suction compartment and a communicating pressure compartment, the rotor forming with the stator a pressure chamber, vanes connected to the exterior walls of the rotor and located in the pressure chamber for causing liquid to be drawn through the inlet opening and discharged through the outlet port, means for supplying a priming liquid to the suction compartment, a ring in the suction compartment secured to the inner wall of the rotor and provided with vanes for causing liquid to be drawn into the suction compartment and for forcing the same into the pressure compartment, the pressure compartment and the pressure chamber being in communication, and vanes in the pressure compartment and operated by the rotor for forcing the primary liquid into the pressure chamber.

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