

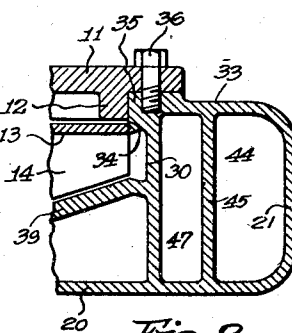
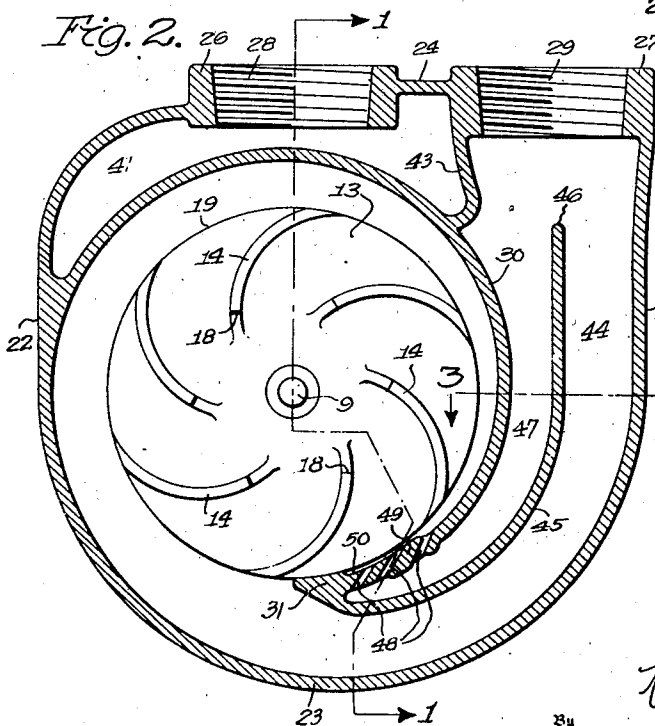
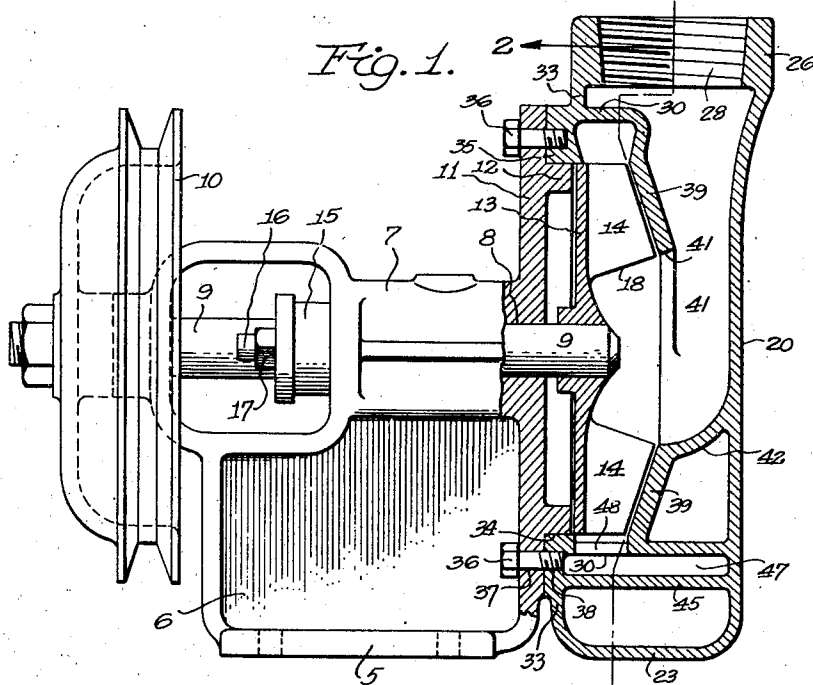
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CENTRIFUGAL PUMP AND AUTOMATIC PRIMER

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CENTRIFUGAL PUMP AND AUTOMATIC PRIMER

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The present invention relates to centrifugal pumps of the volute casing type, and more particularly, to an automatic self-contained priming chamber therefor.

The primary object of the invention is to provide a centrifugal pump of the volute casing type with a priming chamber arranged to contain a quantity of liquid when the impeller of the pump has been brought to rest so that liquid will find its way to the pump chamber through a series of obliquely and tangentially arranged openings and thereby prime the pump in a minimum amount of time and with the least expenditure of energy.

Another object of the invention is to provide a centrifugal pump of the volute casing type with a priming chamber which is formed as part of the casing of the pump and is arranged to feed liquid to the pump impeller and pump chamber at a point in advance of the volute casing discharge passageway.

Another object of the invention is to provide a centrifugal pump of the volute casing type having a centrally arranged suction inlet and a peripherally arranged discharge opening disposed lowermost with respect to the volute casing so that when the pump is brought to rest, a quantity of liquid will be trapped in the priming chamber as well as in the pump casing proper.

Another object of the invention is to provide a centrifugal pump of the volute casing type having its discharge disposed lowermost and communicating with the discharge nozzle through a vertically arranged passageway in which there is disposed a partition wall terminating adjacent the discharge nozzle and arranged with its lower end connected to the wall of the discharge opening so as to form a priming chamber between the volute casing and the partition wall to contain a quantity of liquid so that the liquid may be fed to the interior of the volute casing through a series of tangentially arranged apertures and thereby prime the pump when the same is set in operation.

Another object of the invention resides in constructing the centrifugal pump in such a manner as to provide a central suction intake and a discharge which has its outlet communicating with the casing conduit arranged lowermost.

Another object of the invention is to provide a priming chamber in the casing of a centrifugal pump which is so arranged as to trap a quantity of liquid which is adapted to be fed to the pump chamber through a series of obliquely arranged openings disposed in the direction of rotation of the pump impeller and positioned adjacent the volute casing discharge opening.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawing, wherein:

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Figure 1 is a vertical cross-sectional view taken on the irregular line 1—1 of Figure 2 showing the general arrangement of the pump structure and the lower portion of the priming chamber with the obliquely arranged passageways connecting the priming chamber with the interior of the volute casing;

Figure 2 is a vertical cross-sectional view taken on line 2—2 of Figure 1 looking in the direction of the arrows and showing the general arrangement of the priming chamber and structural details of the pump casing; and

Figure 3 is a horizontal cross-sectional view taken on line 3—3 of Figure 2 looking in the direction of the arrows and showing the vertically arranged pump discharge which is separated from the priming chamber by a central partition extending through the discharge passageway.

In the drawing, attention is first directed to Figure 1 wherein there is shown a base 5 having an integrated structure 6 which is formed to provide a bearing boss 7 having a bearing opening 8. A shaft 9 is rotatably mounted in the bearing boss 7 to rotate in the bearing opening 8 and is provided on one end with a pulley 10 having a V-shaped groove for receiving a V drive belt.

Also formed as an integral part of the base structure 5 is a disc-like portion 11 which is adapted to form one of the walls of the centrifugal pump and is provided with an annular flange 12 for receiving the pump casing in a manner which will be hereinafter more fully described.

The pump impeller is of the usual construction and includes a disc 13 having a series of arcuately curved blades 14 and said impeller disc 13 is mounted on the shaft 9 to rotate therewith, and may be keyed to the shaft or otherwise secured thereto. A shaft packing 15 is bolted in place by means of a pair of bolts 16 disposed on diametrically opposite sides of the shaft 9 and is adapted to be held in place by retaining nuts 17 on the bearing boss 7.

The impeller blades extend from a point slightly spaced from the center of the disc 13 as at 18 and terminate adjacent the peripheral surface of the disc 13.

The pump casing is formed with a front wall 20 having relatively straight side walls 21 and 22 connected to the bottom by an arcuately curved bottom wall 23. Also formed integral with the front wall of the casing 20 is a top wall 24 which connects the upper end of the side walls 21 and 22. Inlet and outlet connections 26 and 27 are formed with threaded openings 28 and 29 respectively and are provided in the top wall 24 as shown clearly in Figure 2.

Formed within the pump casing is a volute casing 30 which extends from a position adjacent the lowermost portion of the curved bottom wall 23 as at 31 and terminates in a juncture with the

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side wall 22 as at 32. The volute casing is formed integral with a partial rear wall 33 which is provided with an opening 34 and terminates in an enlarged beaded portion 35. The annular flange 12 of the disc-like plate 11 is adapted to be received in the opening 34 in the rear wall 33 and bolts or the like as at 36 may extend through suitable openings 37 in the disc-like casting 11 so as to be received in threaded openings 38 in the annular boss 35. When the pump casing above described is fastened to the disc-like casting 11, the impeller disc assumes a position with respect to the volute casing 30 so as to position said impeller with respect to the casing in such a manner as to obtain the most efficient operation of the centrifugal pump. The volute casing 30 is provided with an interior wall 39 having an opening 40 which is adapted to communicate with the intake connection 26 through a chamber 41 so that fluid will be fed to the suction side of the pump through the opening 21. A partition wall 42 connects the interior wall 39 of the volute casing with the front wall 20 of the pump casing so as to block off the inlet chamber 41 from the remaining portion of the pump chamber. It is also to be noted that the inlet connection 26 and the outlet connection 27 are divided by a short partition wall 43 which connects with the volute casing 30 and extends downwardly on one side of the opening 40 and is integrated with the interior wall 39 of the volute casing so as to connect with the short wall 42, and likewise connects with the front wall 20 of the pump casing. Thus, the short wall 43 and the remaining portion thereof extending on one side of the opening 40 and integrated with the rear wall 39 of the volute casing, forms on the other side thereof between the volute casing 30 and straight wall portion 21 of the pump housing or casing, an outlet or discharge passageway 44 which has its lower end in communication with the discharge opening in the volute casing 30 between the peripheral portion 31 of the volute casing and the arcuately curved bottom wall 23 of the pump casing.

Extending between the front wall 20 of the pump casing and the partial rear wall 33 thereof in the exhaust passageway 44 is an arcuately curved partition wall 45 which is integrated with the volute casing 30 as at 31 and has its upper end terminating as at 46 a short distance from the exhaust coupling or connection 27. The partition wall 45 thus divides the exhaust passageway 44 and forms between the volute casing 30 and said partition a priming chamber 47.

A series of obliquely arranged passageways 48 is formed in the peripheral surface of the volute casing 30 and extends tangentially with respect to the impeller disc 13. The openings or passageways 48 are formed in the lowermost portion of the volute casing 30 in spaced relation from the juncture of the partition wall 45 therewith as at 31. It is also to be noted that the portion of the volute casing 20 in which the obliquely arranged passageways 48 are disposed is slightly enlarged as at 49 to provide a stepped surface connecting the volute casing 30 and the point 31 which has its inner surface in contiguous relation with the end surfaces of the impeller blades 14. It has been found that better results are obtained and that the pump may be primed in a reasonably short period of time by providing the stepped surface 50 between the volute casing 30 and the point 31 thereof adjacent the discharge of the pump.

Also, it has been found that with the arrangement of the oblique passageways 48 such that

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they are disposed tangentially in the direction of rotation of the impeller, better results will be accomplished and the time required for priming the pump will be greatly decreased.

Operation

The base 5 may be mounted on a suitable support and secured thereto by anchoring the same in place so that a motor may be drivingly connected with the pulley 10 by means of a suitable V belt. The inlet connection 26 is connected with a source of liquid and the outlet connection 27 may be connected by piping with a system to be supplied with liquid. A suitable fitting may be provided to facilitate the initial filling of the casing 20 with a substantial amount of liquid, or, if desired, the casing may be half filled with liquid before the connection 27 is attached to a pipe line or the like of a system to be filled with liquid. Once the pump casing is partially filled with liquid, the pump will be automatically primed when the impeller is rotated and during operation of the pump, a portion of the liquid will be trapped in the priming chamber 47 while the pump is continually forcing liquid through the discharge passageway 44. When the pump is stopped, and if the source of liquid is below the level of the pump, the pump casing will drain until partially filled with liquid in the lower portion thereof by reason of the fact that the liquid trapped in the priming chamber 47 will find its way into the pump chamber through the obliquely arranged passageways 48. When the pump is again started, the trapped liquid will be forced upwardly through the passageway 44 and will flow into the priming chamber 47 and thence into the pump chamber formed by the volute casing through the obliquely arranged openings or passageways 48. Circulation will continue until all of the air is dispersed through the liquid from the suction side of the pump, after which the liquid will be drawn up to the level of the pump intake and will thus be primed for pumping action.

It is to be noted that the volute casing 30 and curved wall 23 of the pump casing form a spiral, since the volute casing 30 is integrated with the curved bottom wall 23 and relatively spaced side wall 22 as at 32 to form a volute casing in which the discharge is lowermost and which is of a design to produce the most efficient operation.

It will thus be seen that during priming, the trapped liquid will be pumped through the passageway 44 and over the top of the partition 45 as at 46 so as to be drawn into the pump chamber through the passageways 48 after the air has been dispersed and has passed through the discharge pipe connection 27. The slight clearance between the step 50 and the peripheral edges of the impeller blades 14 reduces the pressure in the priming chamber 47 so that the liquid will be drawn through the obliquely arranged openings or passageways 48 in a continuous flow stream rather than one which is interrupted each time the peripheral edge of the blade passes thereover.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment thereof and that various changes may be made in the shape, size and arrangement of parts without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. A centrifugal pump comprising a pump casing having an impeller chamber therein, an im-

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5 peller rotatably mounted in said impeller chamber, said casing having an inlet passageway opening into said impeller chamber and a discharge passageway opening out of the bottom portion of said impeller chamber and extending upward therefrom, and an upwardly extending priming chamber disposed adjacent said impeller chamber, said priming chamber having its upper portion communicating with said discharge passageway and having a priming port extending from its lower portion into said impeller chamber.

10 2. A centrifugal pump comprising a pump casing having an impeller chamber therein, an impeller rotatably mounted in said impeller chamber, said casing having an inlet passageway opening into said impeller chamber and a discharge passageway opening out of the bottom portion of said impeller chamber and extending upward therefrom, and an upwardly extending priming chamber disposed adjacent said impeller chamber, said priming chamber having its upper portion communicating with said discharge passageway and having a priming port extending from its lower portion into said impeller chamber, said priming port being arranged obliquely to the radius thereto of said impeller.

30 3. A centrifugal pump, comprising a casing having a curved wall portion, a spiral wall connected to said casing and merging with the curved wall portion thereof to provide a volute pump chamber, said volute pump chamber being provided with a centrally arranged suction opening and peripheral discharge opening, a rotary impeller mounted in said volute casing, inlet and discharge passageways in said casing communicating respectively with said suction opening and discharge opening, a priming chamber formed in said discharge passageway for trapping a quantity of liquid therein when said impeller is brought to rest, and a series of ports in said spiral wall communicating the priming chamber with said volute pump chamber, said ports being arranged obliquely with respect to the radius thereto of said impeller and extending inwardly in the direction of rotation thereof.

40 4. A centrifugal pump comprising a pump casing having an impeller chamber therein, an impeller rotatably mounted in said impeller chamber, said casing having an inlet passageway opening into said impeller chamber and a discharge passageway opening out of the bottom portion of said impeller chamber and extending upward therefrom, and an upwardly extending priming chamber disposed adjacent said impeller chamber, said priming chamber having its upper portion communicating with said discharge passageway and having a priming port extending from its lower portion into said impeller chamber, said priming port being arranged obliquely to the radius thereto of said impeller and extending inward in the direction of rotation of said impeller.

50 5. A centrifugal pump comprising a pump casing having an impeller chamber therein, an impeller rotatably mounted in said impeller chamber, said casing having an inlet passageway opening into said impeller chamber and a discharge passageway opening out of the bottom portion of said impeller chamber and extending upward therefrom, and an upwardly extending priming chamber disposed adjacent said impeller chamber, said priming chamber having its upper portion communicating with said discharge passageway and having a priming port extending from its lower portion into said impeller chamber, the

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interior surface of said impeller chamber adjacent the outlet of said priming port being stepped back from the periphery of said impeller to provide clearance between said outlet and said impeller.

5 6. A centrifugal pump, comprising a casing having side and end walls connected by a curved bottom wall, a rotary shaft extending into said casing through one of the side walls thereof and disposed eccentrically with respect to said curved bottom wall, a spiral wall connected to one of said side walls and merging with one of said end walls to form a continuation of said curved bottom wall and provide a volute pump chamber within said casing, suction and discharge openings for said volute pump chamber, an impeller mounted on said rotary shaft to rotate within said pump chamber, inlet and discharge passageways formed in said casing communicating respectively with the suction and discharge openings in said volute pump chamber, and a partition wall connected with the spiral wall of said volute pump chamber adjacent said volute pump chamber discharge opening and extending through said discharge passageway to divide said passageway and form a priming chamber between the partition wall and spiral wall of said volute pump chamber, said spiral wall being provided with a series of ports connecting the priming chamber with the volute pump chamber adjacent the discharge opening of said volute casing, and said ports being arranged obliquely with respect to the radius thereto of said impeller and extending inward in the direction of rotation of said impeller.

7. A centrifugal pump, comprising a casing having side and end walls connected by a curved bottom wall, a rotary shaft extending into said casing through one of the side walls thereof and disposed eccentrically with respect to said curved bottom wall, a spiral wall connected to one of said side walls and merging with one of said end walls to form a continuation of said curved bottom wall and provide a volute pump chamber within said casing, suction and discharge openings for said volute pump chamber, an impeller mounted on said rotary shaft to rotate within said pump chamber, inlet and discharge passageways formed in said casing communicating respectively with the suction and discharge openings in said volute pump chamber, and a partition wall connected with the spiral wall of said volute pump chamber adjacent said volute pump chamber discharge opening and extending through said discharge passageway to divide said passageway and form a priming chamber between the partition wall and spiral wall of said volute pump chamber, said spiral wall being provided with a series of ports connecting the priming chamber with the volute pump chamber adjacent the discharge opening of said volute casing, and the interior surface of said spiral wall adjacent said ports being stepped to space the outlets of said ports from the peripheral edge of said impeller.

8. In a centrifugal pump having a volute pump casing having suction and discharge openings and an impeller rotatably mounted therein, a discharge passageway connected to said discharge opening, an upwardly-extending priming chamber associated with said discharge passageway and arranged to entrap liquid passing from said discharge opening, and a series of ports extending from the lower portion of said priming chamber into said volute pump casing for

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connecting said priming chamber with said volute pump casing adjacent the discharge opening thereof.

9. In a centrifugal pump including a volute pump casing having suction and discharge openings and an impeller rotatably mounted therein, a priming chamber associated with said pump casing and arranged to entrap liquid passing from said discharge opening, and a series of ports in said volute pump casing for connecting said priming chamber with said volute pump casing adjacent the discharge opening thereof, said ports being arranged obliquely and extending inward in the direction of rotation of said impeller.

10. In a centrifugal pump including a volute casing having suction and discharge openings and an impeller rotatably mounted therein, a priming chamber associated with said pump casing and arranged to entrap liquid passing from said discharge opening, and a series of ports in said volute pump casing adjacent the discharge opening thereof, said ports being arranged obliquely and extending inward in the direction of rotation of said impeller, the interior surface of said volute casing adjacent the ports being stepped to provide clearance between the outlet sides of said ports and said impeller.

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11. In a centrifugal pump including a volute casing having suction and discharge openings and an impeller rotatably mounted in said casing, a priming chamber connected to said volute casing arranged to entrap liquid from said discharge opening, and a series of ports in the volute casing adjacent the discharge opening thereof for communicating the liquid trapped in said priming chamber with the interior of said volute pump casing, said ports being obliquely arranged and extending inward in the direction of rotation of said impeller.

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