April 27, 1965 W. S. WELLS 3,180,269

PUMPS

Filed Nov. 26, 1963

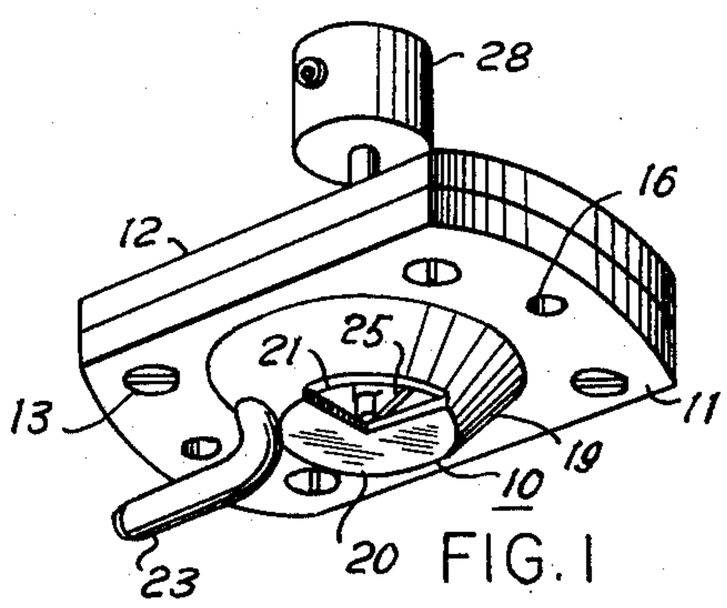

FIG. 1

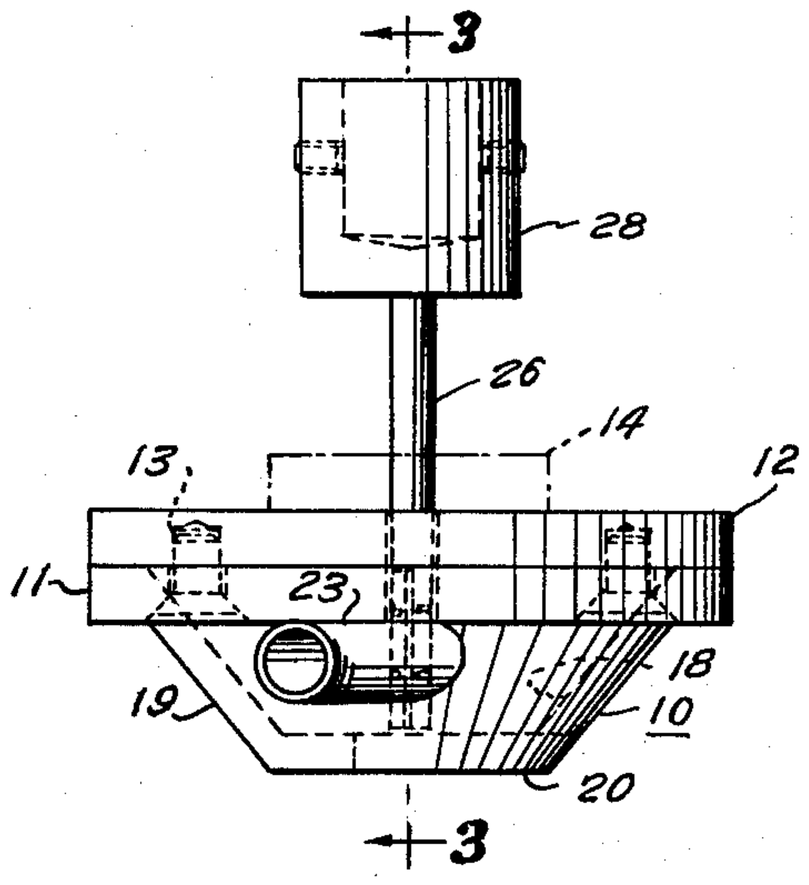

FIG. 2

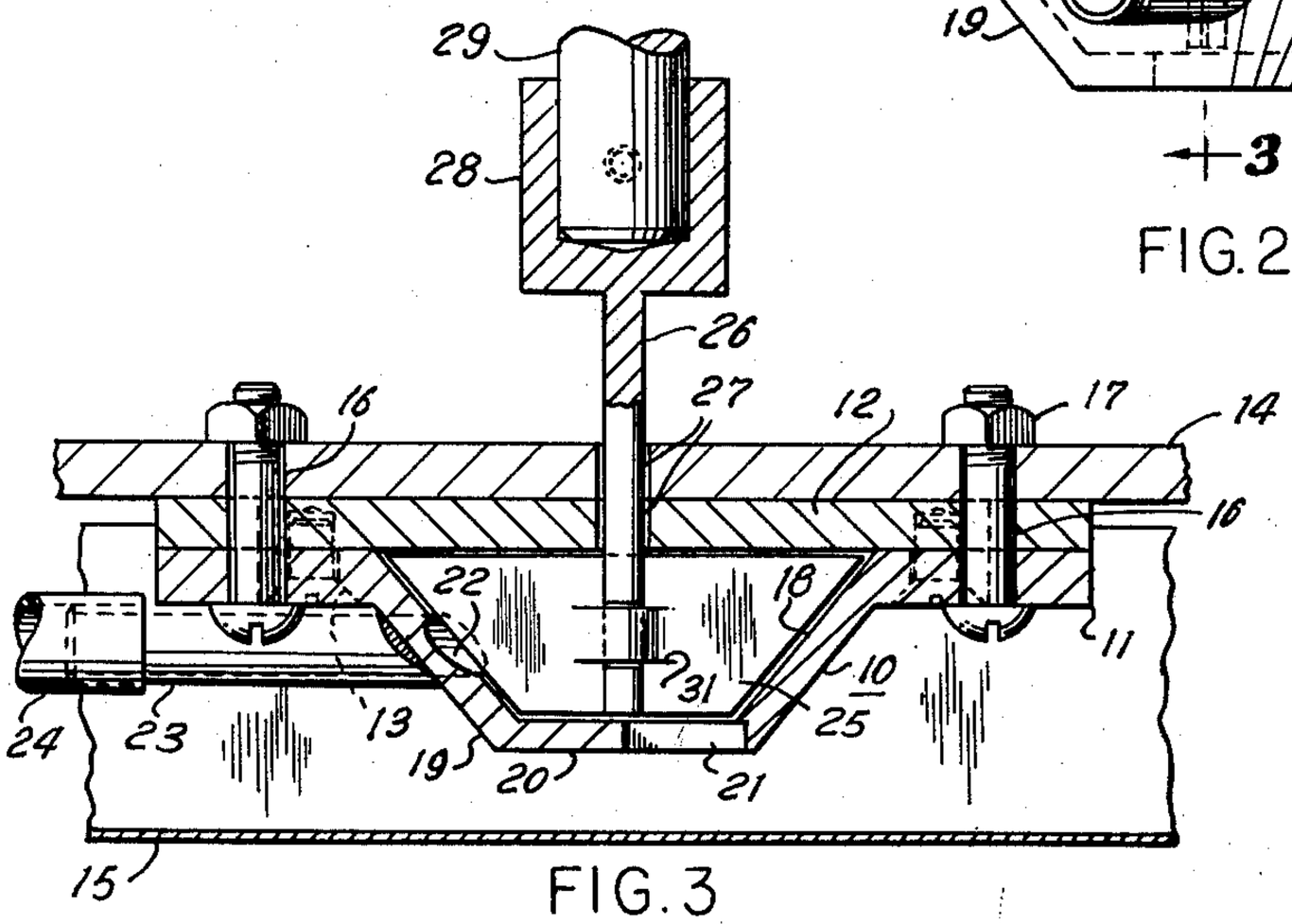

FIG. 3

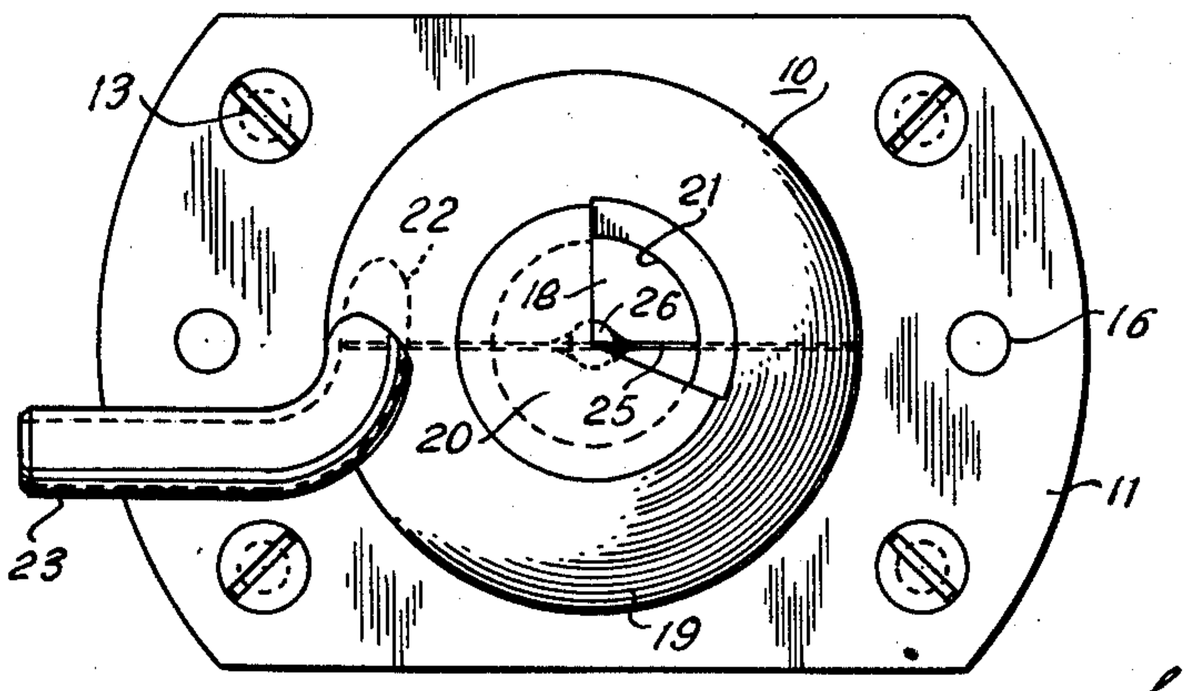

FIG. 4

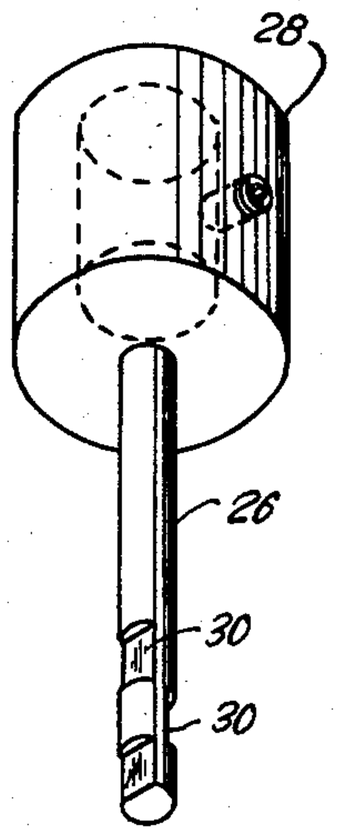

FIG. 5

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This invention relates to new and useful improvements in pumps.

One object of the invention is to provide an improved pump of simplified construction which will operate dry or in vapor or submerged without damage thereto and without the necessity of priming and which is particularly adapted to be of small size and capacity although it may be of relatively large size and capacity.

An important object of the invention is to provide an improved centrifugal pump which is adapted to scoop or pick up droplets of moisture as well as liquid and rapidly accelerate the movement of the droplets while imparting rotation thereto whereby the velocity of said droplets is increased sufficiently to permit the efficient ejection thereof.

A particular object of the invention is to provide an improved centrifugal pump having a chamber of inverted of inverted frusto-conical shape with an inlet in its bottom and a tangential outlet in its upper portion for coacting with a complementary impeller mounted in the chamber whereby fluid, such as droplets of moisture, drawn into said chamber are directed outwardly and upwardly therein so as to increase the speed of rotation of the droplets for discharge through the tangential outlet.

Another particular object of the invention is to provide an improved centrifugal pump wherein its chamber has an upright side wall inclined upwardly and outwardly from a bottom inlet to a tangential outlet for coacting with an impeller complementary to the chamber whereby droplets of moisture or other fluid drawn into said chamber are directed outwardly by centrifugal force and upwardly by the inclined side wall for accelerating the velocity thereof and discharging said droplets at a tangent to the path of rotation thereof.

A further object of the invention is to provide an improved pump, of the character described, wherein the impeller is in the form of a single blade of trapezoidal shape so as to be complementary to the diametric contour of the pump chamber, said impeller having its margins spaced from the adjacent margins of said chamber so as to be free from contact therewith, thereby eliminating frictional engagement therebetween and consequent wear and noise so as to prolong the life of the pump.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

FIG. 1 is a perspective view of a centrifugal pump constructed in accordance with the invention,

FIG. 2 is a side elevational view of the pump with a portion of a mounting bracket shown in broken lines,

FIG. 3 is an enlarged, transverse, vertical, sectional view, taken on the line 3—3 of FIG. 2, showing the pump connected to a drive shaft and mounted on the bracket so as to depend into a drip pan or other receptacle,

FIG. 4 is a bottom plan view of the pump, and

FIG. 5 is a perspective view of the shaft of the pump.

In the drawing, the numeral 10 designates the housing of a centrifugal pump having a marginal flange 11 underlying and secured to a complementary flat, top plate 12 by countersunk screws or other suitable fasteners 13. A bracket or other support 14 may overlie the top plate 12 for suspending the pump housing 10 within a drip pan or other receptacle 15, a portion of which is shown in FIG. 3. The flange 11, plate 12 and bracket 14, may have alined openings 16 for receiving fasteners 17, such

as bolts and nuts, to connect the pump housing to the bracket. A chamber 18, of inverted, frusto-conical shape, is provided within the pump housing and may be formed by an upwardly and outwardly inclined side wall 19 and a flat, circular bottom wall 20 in cooperation with the top plate whereby said housing also is of inverted, frusto-conical contour. The bottom wall 20 has an inlet opening 21 communicating with the chamber 18, while an outlet opening 22 for said chamber extends tangentially through the side wall 19 contiguous the marginal flange of the pump housing and in opposed relation to the inlet opening. A discharge tube 23 projects outwardly from the outlet 22 for connection with a suitable conductor 24 (FIG. 3).

A trapezoidal or substantially complementary impeller 25, of the flat single blade or vane type, extends diametrically and is suspended within the chamber 18 by an axial, upright shaft 26 which projects through alined openings 27 in the top plate 12 and bracket 14 and has a coupling 28 on its upper end for connection with the depending drive shaft 29 of an electric motor (not shown) or other drive means for counterclockwise rotation (FIG. 4). The lower end portion of the impeller shaft 26 has flats 30 thereon (FIG. 5) to permit connection of the impeller 25 thereto by slitting and bending or offsetting the medial portion of said impeller as shown at 31 in FIG. 3. The impeller is of a length slightly less than the diameter of the chamber and of a width slightly less than the depth of said chamber whereby the margins of said impeller are spaced from and do not contact the walls of said chamber. Also, the openings 27 of the top plate and bracket are of larger diameter than the impeller shaft to provide clearance therebetween. As a result, there is no frictional engagement between the impeller and pump housing to cause wear and noise and the life of the pump is determined solely by the life of the motor or drive means.

The inlet opening 21 of the chamber is of sector shape with its radius extending from the center of the bottom wall 20 and of at least one-half the length of the bottom margin of the impeller 25. As shown in FIG. 4, the inlet opening has an arc of approximately 110° whereby one-half of the bottom margin of the impeller is exposed to said opening throughout more than one-half and nearly two-thirds of each complete revolution of said impeller. Consequently, the inlet opening is of relatively large area in comparison to the area of the chamber so as to permit the intake of fluid during most of the rotation of the impeller and also permit the impeller to scoop or pick up liquid as well as moisture in the form of droplets or vapor. It is desirable that the radius of the inlet opening extend to the axis of the chamber so that all of the effective length of the impeller is utilized.

In use, the pump is adapted to withdraw water or other moisture from the drip pan or other receptacle 15 and is mounted so as to depend thereinto as shown in FIG. 3. Although it may be, the pump need not be submerged since it is only necessary for the inlet opening 21 to be sufficiently close to the moisture to permit the impeller 25 to pick or scoop up said moisture or droplets thereof into the chamber 18. When the inlet opening is spaced from the liquid, droplets with air are scooped up and drawn into the chamber by the impeller and are directed outwardly by centrifugal force. Due to the upward and outward inclination of the side wall 19 of the chamber, the velocity of the droplets increases as the same move upwardly in the chamber and becomes sufficient to cause ejection of said droplets through the outlet opening 22 and its discharge tube 23. It is noted that the inner end of the outlet opening faces clockwise (FIG. 4) so as to receive the droplets which are directed counterclockwise by the rotation of the impeller 25. Thus, the natural

tendency of the droplets to fly or spin outwardly is utilized to eject said droplets from the chamber 18 and thereby increase the efficiency of the pump. It has been found that the pump will pick up a single drop of liquid as well as operate efficiently when completely submerged. Since neither the impeller nor its shaft contacts any part of the pump housing, there is no damage to the pump when it is operated dry. Although particularly adapted to be of small size and capacity, the pump may be of relatively large size and diameter.

It is noted that the pump is capable of operating completely dry for an unlimited period of time and remain wholly self priming with material ranging from a droplet of moisture to a full head of liquid. The relatively large size of the inlet opening 21 permits the impeller 25 to actually contact the liquid, or moisture in the form of droplets or vapor, and draw the same into the pump chamber 18 by scooping or picking up said liquid or moisture. Although the arcuate length of the inlet opening may be varied, an arc of 110° has been found to be more efficient than greater or lesser arcs. It has also been found that the efficiency of the pump is increased when the outlet opening 22 is as close as possible to the top of the chamber and decreases when said opening is lowered. In the illustrated construction, the outlet opening is shown as being below the flange 11 for economy of manufacture; however, it is contemplated that said opening could extend through said flange so as to be disposed in the upper extremity of the pump chamber. This elevated position of the outlet opening is readily feasible when the pump housing is cast or molded. Manifestly, the pump may be formed of metal, plastic or other suitable material due to its simplicity and lack of wearing parts. In addition, it is pointed out that the outlet opening 22 is of relatively small area in comparison to the chamber 18 as well as the inlet opening 21 so that the velocity imparted to the moisture by the upwardly increasing radii of said chamber creates sufficient pressure to cause ejection of said moisture through said outlet opening.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A centrifugal pump including a housing having a chamber, an inlet in the bottom of the chamber, a tangential outlet in the upper portion only of said chamber, said chamber having an upright circumferential wall inclined upwardly and outwardly between the inlet and outlet, and an impeller complementary to said chamber and mounted for rotation therein about an upright axis, the impeller being adapted to draw fluid including moisture in the form of droplets or vapor into said chamber through said inlet and to impart rotation thereto whereby the droplets are directed outwardly by centrifugal force and upwardly by the inclination of the upright wall so as to increase the velocity thereof and eject said droplets through the tangential outlet, said inlet including a sector shaped opening having its radius extending from the axis of rotation of said impeller to the lower margin of said upright wall and an arc of from approximately 90° to 120° whereby at least one-half of said impeller is exposed to said inlet during at least one-half of each revolution of said impeller.

2. A centrifugal pump including a housing having an upright chamber, the chamber having flat circular top and bottom walls connected by an upwardly and outwardly inclined side wall, the bottom wall having an inlet opening, the side wall having an outlet opening extending tangentially through its upper portion only, and an impeller complementary to the chamber and mounted therein for rotation about the upright axis of said chamber, the impeller imparting rotation to fluid including moisture in the form of droplets or vapor drawn into said chamber whereby the droplets are directed outwardly by centrifugal force and upwardly by the inclination of said side wall so as to rapidly accelerate the speed of rotation thereof and eject said droplets through the outlet opening, the inlet opening being of sector shape and having its radius extending from the axis of rotation of said impeller to the margin of said bottom wall, said inlet opening having an arc of from approximately 90° to 120° whereby at least one-half of the lower margin of said impeller is exposed to said opening during at least one-half of each revolution of said impeller.

3. A pump as set forth in claim 2 wherein the impeller includes a single blade of trapezoidal shape extending diametrically of the chamber and of a width substantially equal to the depth of said chamber so as to have its upper and lower margins contiguous the top and bottom walls of said chamber.

4. A centrifugal pump including a housing having flat circular top and bottom walls connected by an upwardly and outwardly inclined side wall and coacting therewith to form an inverted frusto-conical chamber, the bottom wall having an inlet opening of relatively large area in comparison to the area of the chamber, the side wall having an outlet opening extending tangentially through its upper portion only and of relatively small area in comparison to the area of the inlet opening, and an impeller complementary to said chamber and mounted for rotation therein about the axis of said chamber, the impeller being adapted to draw moisture into said chamber and impart rotation thereto whereby the moisture is directed outwardly by centrifugal force and upwardly by the inclination of the side wall so as to increase the velocity thereof and eject said moisture through the outlet opening, the inlet opening being of sector shape and having its radius extending from the axis of rotation of said impeller to the margin of said bottom wall, said inlet opening having an arc of from approximately 90° to 120° whereby at least one-half of the lower margin of said impeller is exposed to said opening during at least one-half of each revolution of said impeller.

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