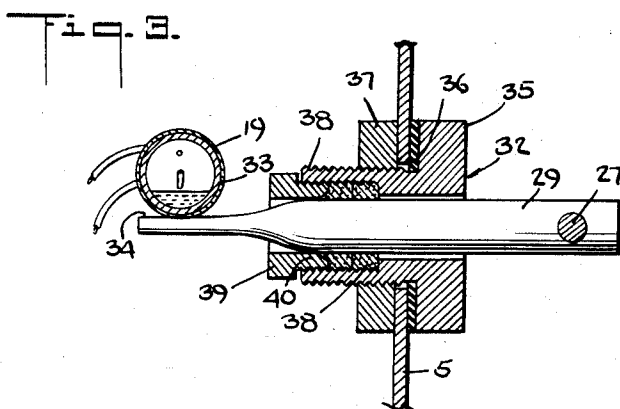
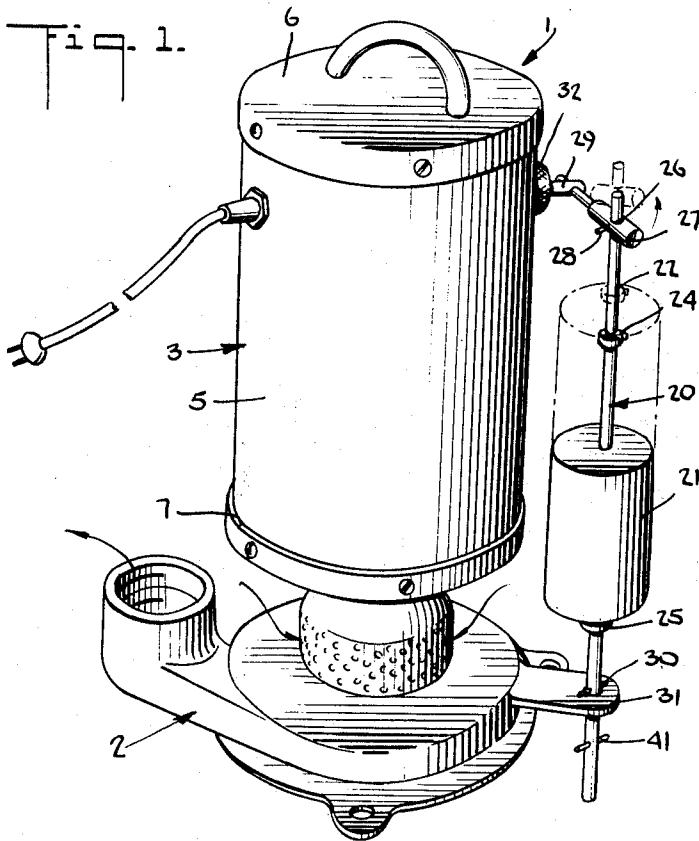


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SUBMERSIBLE PUMP

2 Sheets-Sheet 1



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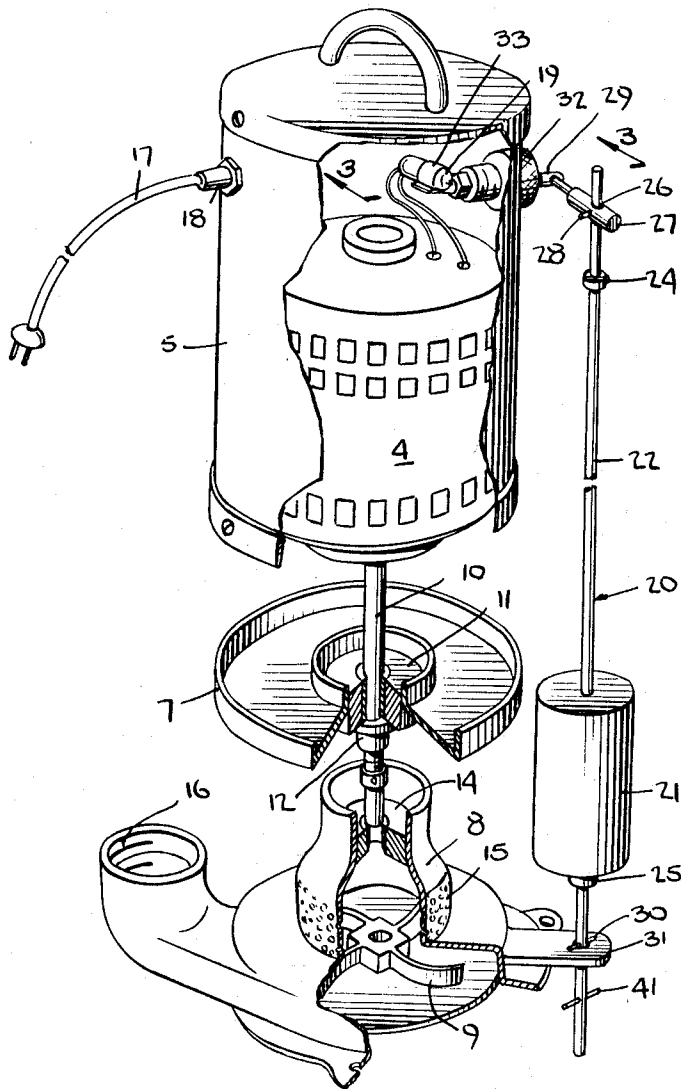
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Fig. 2.



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## SUBMERSIBLE PUMP

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3 Claims. (Cl. 200—84)

The present application relates to a submersible pump and more particularly to an improved control means for such a pump.

Various types of submersible pumps are known in which the pump mechanism and its associated drive means such as an electric motor are mounted in a suitable water proof housing so that the pump mechanism as a whole may be operated even though it is completely submerged in water. In order to control the operation of these pumps, various types of controlled systems have been used. These systems are normally based on the use of a float device which is submerged or floated on the water to be pumped and which is moved from an off to an on position depending upon the level of the water. Previous types of these controls have been relatively complex and, in addition, have either been susceptible to damage by water or have been made water proof by relatively complex means. These prior types of controls have therefore been relatively expensive to provide, difficult to adjust and sensitive in their operation. This has made these control systems unduly expensive as well as unreliable.

Accordingly, it is the object of the present invention to provide a submersible pump which is adapted for use with an improved control means and also to provide such a control means.

Another object of the present invention is to provide a simplified control means for a submersible pump.

Another object of the present invention is to provide an easily adjusted control means for a submersible pump.

Another object of the present invention is to provide a positive and reliable control means for a submersible pump.

Another object of the present invention is to provide a completely waterproof submersible pump in which all parts including the pump motor control means are adapted for complete water proofing.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a front elevational view in perspective of a preferred embodiment of the submersible pump according to the present invention.

Fig. 2 is an exploded perspective view of the pump with portions of the housing partially cut away.

Fig. 3 is an enlarged detailed sectional view of the switch control shaft taken along line 3—3 of Fig. 2.

As illustrated in the drawing, the submersible pump assembly 1 comprises a pump 2 attached to a motor housing 3. The pump 2 is operatively connected to and

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driven by a suitable electric motor mounted within the water tight motor housing 3. The motor housing 3 includes side wall portions 5, cover 6 and bottom 7 which are detachably connected together with suitable water proof seals.

As seen in Fig. 2, the pump 2 comprises a pump housing 8 whose upper portion is fitted against and suitably connected to the center portion of the motor housing bottom 7. The motor shaft 10 extends through a bearing 11 fitted in the center of the motor housing bottom 7 and extends downwardly to the pump impeller 9 which is connected to the lower end of the motor shaft 10. A water tight seal 12 is fitted on the bottom of the shaft bearing 11 and an additional bearing 14 is mounted in the pump housing 8 to provide additional support for the lower end of the motor shaft 10. The preferred embodiment of the pump 2 as illustrated in the drawings uses a conventionally shaped impeller blade 9 which forces water admitted to the pump housing 8 through inlet apertures 15 upwardly through the water outlet 16 and suitable connecting pipes or hoses.

The electric motor 4 is supplied with power from a suitable source through a power cable 17 which enters the motor housing 3 through a water tight connector 18. A switch 19 is connected in one side of the power supply line to control the operation of the motor 4. As will be described more fully below, the switch 19 is actuated by the water depth control system which is indicated generally at 20.

The control system 20 is actuated by float 21 which is slidably mounted on the generally vertical float rod 22 between adjustable stops 24 and 25. The vertical rod 22 passes through an aperture 26 in the switch arm 27 and is pivotally connected to the switch arm 27 by pin 28. The aperture 26 has an elongated shape to allow the vertical rod 22 and the switch arm 27 to swing with respect to one another about the pin 28 when the vertical rod 22 is raised upwardly to rotate the switch arm 27. The lower end of the vertical rod 22 is slidably mounted in aperture 30 bracket 31.

The switch arm 27 is rigidly connected to a generally horizontal switch shaft 29 which is shown in detail in Fig. 3. The switch shaft 29 is rotatably mounted in the wall 5 of the water tight motor housing in a water tight bearing 32. The switch 19 is mounted on the inner end of the switch shaft 29 within the water tight motor housing 3. In the embodiment illustrated in Fig. 3, the switch 19 is attached to the switch shaft 29 by means of a mounting clip 33 which rigidly attaches the switch 19 to a flattened end portion 34 of the switch shaft 29.

The bearing 32 comprises a body member 35 which is mounted in an aperture 36 in the housing wall 5 by means of nut 37 which is screwed on to the threaded portion 38 of the body member 35. The bearing 32 is made water tight by packing washers 38 which are pressed into engagement with the switch shaft 29 by packing nut 39 which is screwed into the internally threaded portion 40 of the bearing body 35. Other suitable types of water proof bearings may be used to mount the switch shaft 29.

In the preferred embodiment illustrated herein, switch 19 comprises a mercury switch of the well known type, which is operated by tilting the switch from an off position where a pool of mercury is remote from the switch contacts to an on position in which the mercury bridges the switch contacts. Other suitable switches may be used.

The control system 20 operates in the following manner. When no water is present in the pump chamber, the float 21 rests on the lower stop 25 and the vertical rod 22 is moved to its lowermost position as seen in Fig. 2 by the weight of the float 21 so that the switch arm 27 and the interconnected switch shaft 29 tilt the

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mercury switch 19 to its open position. When the water enters the pump compartment or the sump in which the lower portion of the pump is mounted, the float 21 begins to slide vertically up the vertical shaft 22. The rod 22 is not moved until the float 21 engages the upper stop 24. When this occurs, the vertical rod 22 is moved upwardly until the stop 41 on the lower end of the vertical rod 22 engages the bracket 31. At approximately this point the mercury switch is tilted by the rotation of the switch arm 27 and the interconnected switch shaft 29 to its closed position energizing the pump motor to start the pump action. As long as the water remains at this level or a greater level, the float 21 will hold the vertical rod 22 in its raised position with the stop 41 against the bracket 31 and the pump will continue to operate to remove water from the compartment or sump. When the pump begins to lower the water level, the float 21 will begin to slide downwardly on the vertical rod 22. In order to cause the pump to continue to run until the float reaches its lowermost position, the switch shaft 29 with its associated switch arm 27 and vertical rod 22 are balanced by the flow of mercury to the closed end of switch 19 so that the mercury switch 19 remains tilted in its closed position until the float 21 reengages the lower stop 25 on the lower end of rod 22. When this occurs, the weight of the float 21 will lower the rod 22 and will therefore rotate the interconnected switch arm 27 and switch shaft 29 to tilt the mercury switch 19 to its open position.

A characteristic of mercury switches is that when they are tilted on a shaft such as shaft 29 they close at a different angular position than they open. Thus, for example, when the rod 22 is raised to tilt the switch 19, the switch 19 may be adjusted so that it will not close until the rod 22 nearly reaches its uppermost position. However, when the rod is lowered downwardly the switch 19 will remain on until the rod very nearly reaches its lowermost position. This effect results from the tendency of the mercury to remain in either end of the containing tube until the tube is tilted to have a significant downward slope. The effect may be increased by raising the center portions of the switch envelope to provide a partial barrier to the mercury flow. This characteristic is useful in the control system 20 as it prevents continual start and stop operation of the pump for small changes in water level. Even with the stops 24 and 25 adjusted to prevent motion of the float 21 on rod 22, the switch 19 may be positioned so that it does not close until the rod 22 is lifted its full distance and thereafter the switch 19 will remain closed until the pump has lowered the rod 22 back down to its lowest position.

It will be seen that an improved and relatively simple water submersible pump has been provided which is adapted for reliable automatic control. The control means of the preferred embodiment is readily adapted for water proofing so that the entire pump including the control means will operate under water. The pump and its associated control means has a relatively simple construction so that a positive and reliable automatic switch operation is obtained to provide for automatic pumping. In the event that the pump chamber is flooded, the pump will continue to operate even though the flooding is sufficiently rapid to completely submerge the pump before

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the pump is able to control the water level. The control system in the pump is also easily adjusted so that the starting and stopping of the pump may be regulated to provide the degree of control desired in any particular pumping situation and so that the pump is inoperative for minor changes in the water level. The relatively simple and rugged pump construction also makes the pump relatively easy to manufacture and inexpensive to supply so that the pump is adaptable for use in a wide variety of low cost automatic pumping applications.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim:

1. A control system for a submersible pump having an electric drive motor in a water-tight housing and operatively connected to the pump comprising the combination of a switch within the water-tight housing adapted to connect the motor to a source of electric power, a water-tight bearing, a rotatable shaft mounting said switch and passing through the water-tight bearing in a wall of the water-tight housing, an arm rigidly connected to the outer end of said shaft, a generally vertical elongated rod pivotally connected to said arm and slidably mounted adjacent to said housing, a pair of adjustable stops on said elongated rod, a float slidably mounted on said elongated rod between the adjustable stops whereby the lifting of the float by a rising water level moves the float against the upper stop to lift said vertical rod to rotate said shaft to turn said switch to its closed position, and whereby the lowering of the water level moves said float against the lower stop to lower said vertical rod to turn said switch to its open position.

2. The pump as claimed in claim 1 in which said switch comprises a mercury switch which is opened and closed by the tilting of the switch from one angular position to another and in which said switch opens and closes at different angles whereby the switch position may be set to close and start the pump motor at a higher water level than the water level at which the switch opens to stop the pump motor.

3. The pump as claimed in claim 1 in which the switch comprises a mercury switch whose mercury acts as a counterweight which urges it to remain in the position corresponding to the on position of the switch after the switch has been moved to its on position by said float and which urges it to remain in the position corresponding to the off position of the switch when the switch has been moved to its off position.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |                   |               |
|-----------|-------------------|---------------|
| 1,760,382 | Teesdale          | May 27, 1930  |
| 1,941,815 | Ringstrom         | Jan. 2, 1934  |
| 2,153,421 | Jessup            | Apr. 4, 1939  |
| 2,270,784 | Miller et al.     | Jan. 20, 1942 |
| 2,669,934 | Lovett            | Feb. 23, 1954 |
| 2,730,591 | Nielsen           | Jan. 10, 1956 |
| 2,829,598 | Zimmermann et al. | Apr. 8, 1958  |