

March 3, 1959

F. O. FERNSTRUM

2,875,697

SUMP PUMP

Filed Aug. 5, 1953

2 Sheets-Sheet 1

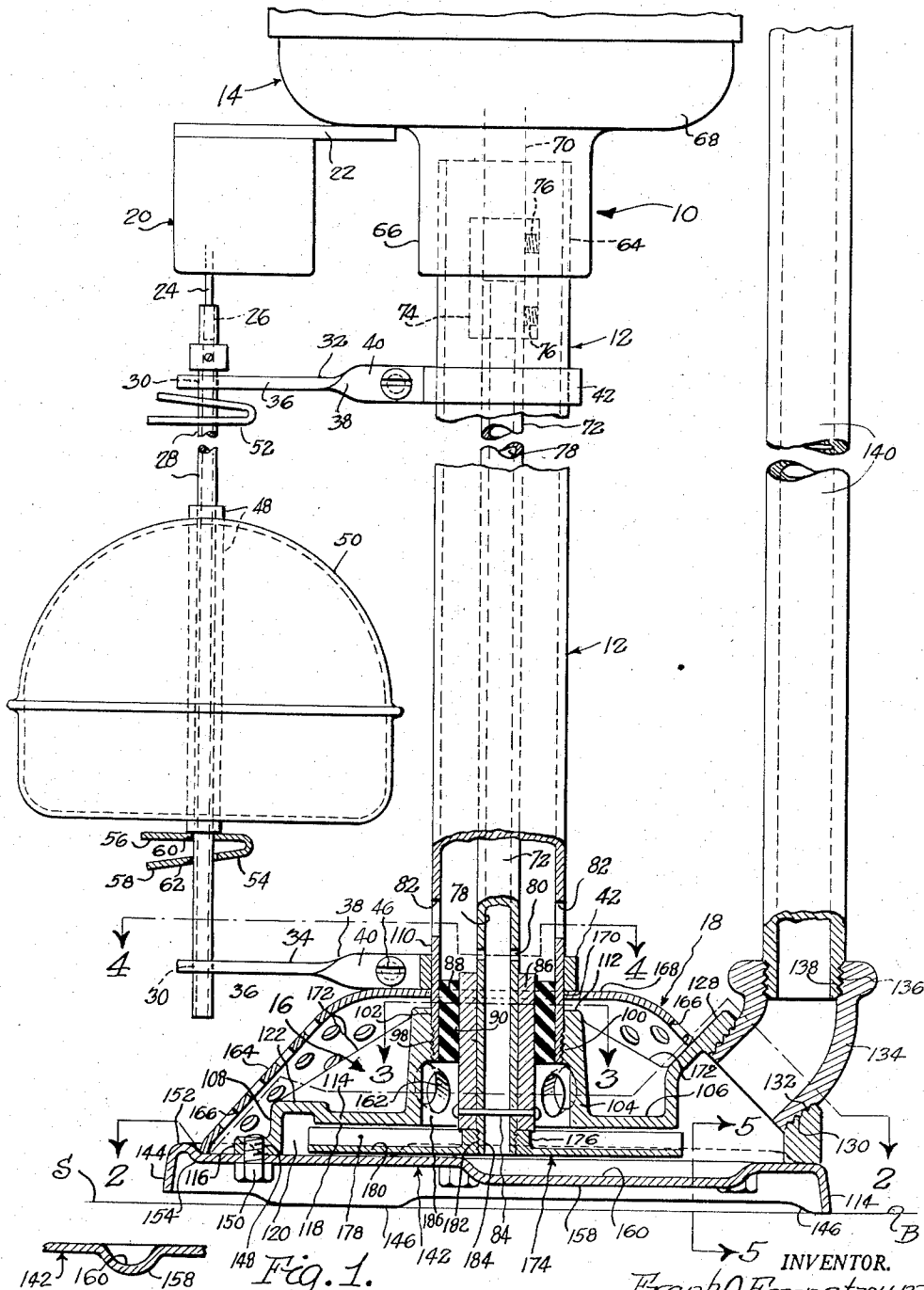


Fig. 5.

Fig. 1.

INVENTOR.
Frank O. Fernstrum
BY
Barthel + Bugbee
Attys

March 3, 1959

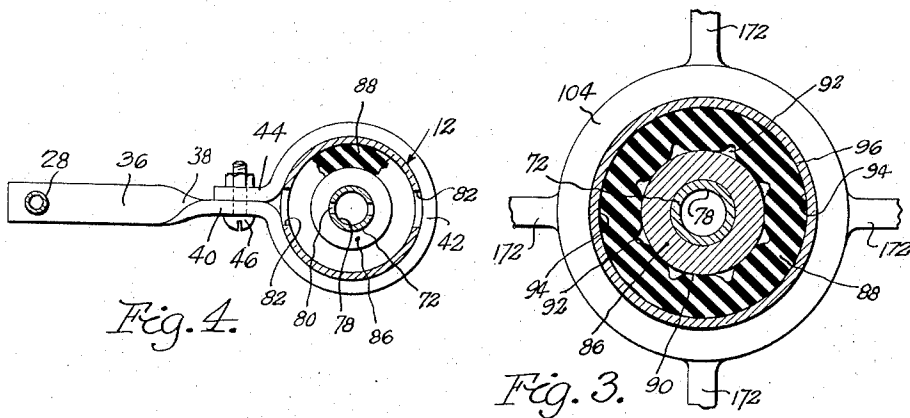
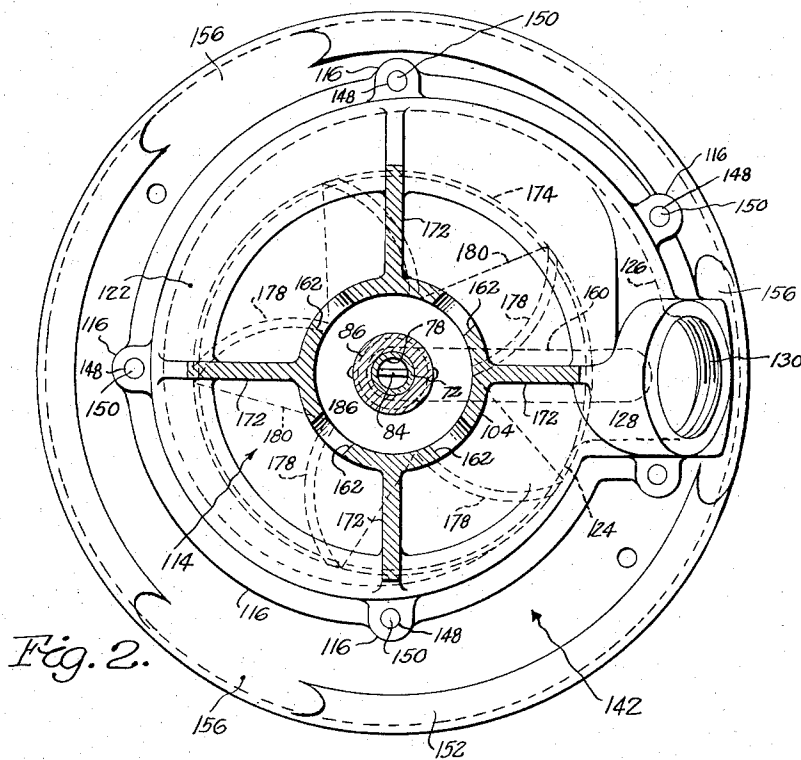
F. O. FERNSTRUM

2,875,697

SUMP PUMP

Filed Aug. 5, 1953

2 Sheets-Sheet 2



INVENTOR.

Frank O. Fernstrom
BY Barthel + Bugbee
Attys

BY

Barthel + Bugbee

Atlys

1

2,875,697

SUMP PUMP

Frank O. Fernstrum, Grosse Pointe, Mich., assignor to Marine Products Company, Detroit, Mich., a corporation of Michigan

Application August 5, 1953, Serial No. 372,503

2 Claims. (Cl. 103—103)

This invention relates to pumps and, in particular, to sump pumps or the like, namely pumps at the lower ends of vertical shafts with their driving motors at the upper ends thereof.

One object of this invention is to provide a sump pump which is of the maximum simplicity of construction and which utilizes metal stampings primarily in its construction, with a minimum of castings, so as to reduce its cost of manufacture to the minimum amount and likewise reduce the cost of the expensive materials employed in such castings for such pumps.

Another object is to provide a sump pump which is constructed in such a manner as to be capable of being shipped knocked-down and assembled in the field without any special tools, other than a screw driver and optionally a wrench, thereby economizing on space and shipping charges.

Another object is to provide a sump pump of the foregoing character wherein the only machining operations required in the stampings and single casting employed are merely drilling and threading certain holes.

Another object is to employ a sump pump wherein the pump housing or casing and the vertical tubular motor support may be assembled one within the other without the necessity of accurate aligning, such aligning being automatically accomplished by the use of the sense of touch, from the construction of the parts.

Another object is to provide a sump pump having a screen thereabove with upwardly-facing perforated surfaces so that the screen may be easily cleaned from above without removing the sump pump from the sump, such as, for example, by the use of a long-handled broom or brush.

Another object is to provide a sump pump wherein the pump inlet ports are so arranged in the pump casing as to be directed at the perforations of the protecting screen, with the result that when the pump ceases operation, the water which has been forced upward into the outlet pipe flows back downward by gravity and gushes out through these ports and against the screen perforations, automatically cleaning off the screen.

Another object is to provide a sump pump having a float rod and float, the positions of which are adjusted relatively to one another by means of spring stops of improved construction and of simple and easy adjustment.

Another object is to provide a sump pump having a bearing which is automatically lubricated by water even if the pump accidentally remains in operation after it has pumped the water out of the sump to the intended depth, because of a failure of the shut-off switch.

Another object is to provide a sump pump of the foregoing character wherein the pump driving shaft bearing is located on the suction side of the pump above the impeller so that the action of the pump does not force dirt, grit and other foreign substances into the bearing during the operation of the pump.

Other objects and advantages of the invention will be-

2

come apparent during the course of the following description of the accompanying drawings, wherein:

Figure 1 is a side elevation, mainly in central vertical section, of a sump pump according to one form of the invention, with the central portions of the supporting tube, outlet pipe, drive shaft and float rod omitted for conciseness of showing;

Figure 2 is a horizontal section taken along the line 2—2 in Figure 1;

Figure 3 is a horizontal cross-section taken along the line 3—3 in Figure 1, showing the pump rotor bearing construction;

Figure 4 is a horizontal section taken along the line 4—4 in Figure 1, showing the automatic flooding arrangement for the pump impeller bearing in the event of switch failure; and

Figure 5 is a fragmentary vertical section taken along the line 5—5 in Figure 1, showing the return liquid flow channel for automatic flooding of the impeller bearing upon switch failure.

Sump pumps are in frequent use for draining basements or other similar sunken areas where water is likely to collect, and are ordinarily mounted in vertical wells in such places. Such a sump pump ordinarily consists of a vertical supporting tube of considerable length, with the pump mounted on the lower end and the driving motor on the upper end, with the drive shaft extending downward through the tube from the motor to the pump. A switch is ordinarily mounted near the motor for regulating the energization thereof, and the switch in turn is ordinarily actuated by a vertical rod leading to a float mounted near its lower end in the vicinity of the pump. When the water level rises in the sump, it lifts the float, actuates the switch to close the circuit to the motor, and causes the motor to operate the pump until the water level subsides, causing the float to drop and open the switch, halting the motor. Such previous sump pumps, however, have been subject to numerous defects and disadvantages.

For various reasons, the motor sometimes continues in operation after it has pumped the water down to the desired level, causing burning out of the metallic bearing ordinarily used for the pump impeller. Furthermore, such pumps have usually employed cylindrical protective screens to keep them from being clogged with foreign matter, and since these screens have been located in vertical directions, they have been difficult to clean from above. Such sump pumps, moreover, have also previously employed expensive bronze castings requiring complicated machining and expensive assembly operations, bronze being used because of its low corrosive properties, with the result that a high quality pump has been expensive to manufacture and consequently expensive to buy. On the other hand, the cheapening of the pump by using less expensive but corrodible materials is also undesirable because failure of the sump pump in the absence of the owners of the property permits flooding to occur, with consequent damage to the contents of the basement or other area protected by the sump pump. Finally, such pumps have ordinarily been assembled at the factory and shipped in assembled condition, the bulk of the shipment resulting in high shipping charges, particularly to remote locations, such as the Pacific coast. Such prior pumps, however, have not been constructed in such a manner as to enable them to be shipped knocked-down and easily assembled at their destination.

The present invention provides an improved sump pump which eliminates these disadvantages and defects. The pump is so constructed that only one casting is employed and that is only a small casting comprising the upper half of the pump casing, the lower half being provided by

an easily produced stamping. The protective screen is also a stamping, and is arranged with its perforated surface facing upwardly so as to be visible from above and easily accessible for cleaning by means of a broom, mop or long-handled brush. The pump inlet ports are also inclined upwardly with their axes substantially perpendicular to the perforated surface of the screen, so that when the pump ceases operation, the pump outlet pipe acts as a standpipe so that water previously forced up into the outlet pipe flows back downward under the force of gravity and gushes out through the upwardly-inclined inlet ports and against the perforated surface of the screen, automatically cleaning the screen.

The pump, moreover, is so constructed that the parts may be shipped knocked-down, thereby economizing on shipping space and shipping costs, yet its construction is such that its parts are easily assembled in the field without skilled workmanship and without special tools, only a screw driver and optionally a wrench being required. The pump casing is provided with a pilot counter-bore above the threaded socket into which the supporting tube is inserted, so that these parts are automatically aligned with one another during assembly. The strain or shearing effect ordinarily present at the junction of the threads on the tube and the member into which it is threaded, as occurring in prior pumps and resulting in breakage at the weakened threaded location, is eliminated, since the portion of the tube seated in the pilot bore is unthreaded and is therefore of maximum strength.

Moreover, the sump pump of the present invention employs a pump impeller bearing of elastic deformable material, such as natural or synthetic rubber or mixtures thereof, this bearing having the properties of being lubricated by water and requiring no oil or artificial lubricant. As a consequence, the bearing is automatically lubricated as long as there is water in its vicinity, and the pump is so constructed that water always flows to the bearing through a hollow bore in the pump impeller and through a hollow impeller drive shaft to the bearing, thereby insuring against burning out of the bearing, even if the switch should fail or the motor for any other reason should continue in operation after the water level has been reduced to the point where the pump should have ceased operation.

Referring to the drawings in detail, Figure 1 shows a sump pump, generally designated 10, according to one form of the invention as consisting generally of an elongated supporting tube 12 upon the upper end of which a motor 14 is mounted and upon the lower end of which a pump 16 is also mounted and protected by a screen 18 of novel configuration. The motor 14 is of conventional construction and its details are outside the scope of the present invention. The operation of the motor 14 is regulated by a conventional switch 20 mounted on a bracket 22 secured thereto and actuated by a switch rod 24 seated in a socket 26 in the upper end of a float rod 28. The float rod 28 in the present pump is tubular, and is supported and reciprocally guided in holes 30 in upper and lower brackets 32 and 34, of similar construction. Each bracket consists of a horizontal arm 36 bent as at 38 into a vertical portion 40 and continuing in an annular portion 42. The latter encircles the supporting tube 12 and terminates in an extension 44 (Figure 4), the extension 44 and the vertical portion 40 being bored to receive a clamping bolt 46.

Slidably mounted upon the float rod 28 is the tubular central support 48 of a hollow air-tight float 50. Also mounted on the float rod 28 above and below the float 50 are adjustable stops 52 and 54 of similar construction. Each stop is in the form of a roughly V-shaped spring member with upper and lower arms 56 and 58 which are loosely bored as at 60 and 62 respectively to freely slide along the float rod 28 when the arms 56 and 58 are pressed together, as by the fingers. When the arms 56 and 58 are released, however, the edges of the holes 60 and 62

tightly engage the float rod 28 and clamp themselves in a fixed position thereon.

The upper end of the supporting tube 12 is seated in a socket 64 in the extension 66 of the motor casing 68.

The motor shaft 70 is drivingly secured to the pump impeller drive shaft 72 by a tubular coupling 74 and clamping screws 76. The drive shaft 72 is of tubular construction, containing a central bore or passageway 78 and, immediately above the pump 16, is provided with liquid outlet ports 80. Near the same location, the supporting tube 12 is provided with liquid ports 82 in its side walls (Figures 1 and 4).

Mounted on the lower portion of the drive shaft 72 and secured thereto as at 84 (Figure 1) is a sleeve or bushing 86 which rotatably engages a pump impeller bearing 88 of elastic deformable material, such as natural or synthetic rubber or a mixture thereof. The pump impeller bearing 88 has a bearing core 90 in the center thereof (Figure 3), with vertical grooves 92 spaced at intervals circumferentially thereof for facilitating the flow of water into the bearing bore 90. The pump impeller bearing 88 is of material which is naturally lubricated by water and requires no oil or other artificial lubricant as is ordinarily required for the metallic or sintered powdered metal impeller bearings used in prior sump pumps. The outer surface 94 of the pump impeller bearing 88 is bonded or otherwise firmly secured to the inner surface 96 of the supporting tube 12 to fix the bearing 88 in position at the lower end of the supporting tube 12.

The lower end of the supporting tube 12 is externally threaded as at 98 (Figure 1) and threaded into a correspondingly threaded bore 100 which is preceded by a smooth pilot bore 102, both located in the tubular central extension 104 of the upper half 106 of the pump casing, generally designated 108. By this construction, the outer surface 110 of the supporting tube 12 engages the pilot bore 102, thereby lining up the threaded portions 98 and 100 with one another, as well as locating these threaded portions. Moreover, the same construction locates the threaded portions 98 and 100 at a considerable depth below the upper end 112 of the casing extension 104, so that the shearing strain between the pump casing 108 and the tubular support 12 is exerted against a strong solid portion of the latter instead of against the weakened threaded portion 98 as in ordinary constructions.

The upper half 106 of the casing 108 is provided with a hollow cylindrical portion 114 (Figure 1) which extends outwardly from the central extension 104 to a peripheral flange 116, and contains a cylindrical impeller chamber 118 surrounded by a volute or peripheral flow passageway 120 contained partly within a raised peripheral casing portion 122 of approximately spiral form (Figure 2), increasing in width gradually from one end 124 to the opposite end 126, where it is provided with an upwardly-inclined hollow boss 128 which is internally threaded as at 130 to receive the correspondingly-threaded portion 132 of a pipe coupling 134, the upper end of which is threaded as at 136 to receive the correspondingly threaded lower end 138 of a vertical outlet or discharge pipe 140. The discharge pipe 140 serves as a standpipe in a manner described in connection with the operation, and extends upwardly out of the sump to a connection with the sewer or other suitable place of disposal.

The upper half 106 of the casing 108 at its lower side is open, and closing this opening is a stamped closure plate or disc 142 forming the lower half of the casing 108 and having a downwardly-turned edge flange or skirt 144 likewise having downwardly-extending feet 146 adapted to rest upon the bottom B of the sump S. The flange 116 and the closure plate 142 are bored with aligned holes and the flange holes 148 are threaded to receive bolts or screws 150 by which the upper and lower casing halves 106 and 42 are secured to one another. The lower casing half 142 is provided with an upturned

5

rim 152 immediately above the skirt 144 to provide an annular lodgment groove 154 for the lower edge of the screen 18. Immediately above the feet 146, the upturned rim 152 is provided with flattened spots 156 resulting from the formation of the feet 146. Also formed in the lower casing half 142 or closure plate is an elongated radial trough or depression 158 forming a channel 160 for liquid to flow from the hollow boss 128 to the center of the tubular drive shaft 72, which is open at its lower end to communicate with the channel 160 (Figure 1).

The casing extension 104 is provided with a plurality of upwardly-inclined liquid intake or inlet holes or ports 162, four being shown (Figures 1 and 2), these being directed approximately perpendicularly to the perforated wall portion 164 of the screen 19 so as to provide, in effect, flushing nozzles for the perforations 166 upon reverse flow of liquid by gravity from the outlet pipe 140, as explained in connection with the operation, for cleaning the screen 18. The latter is of bowl-shaped or dished configuration having its perforated side wall 164 inclined upwardly in an approximately conical formation, and its upper wall 168 approximately flat and centrally bored as at 170 for the passage of the tubular support 12. The lower edge of the screen 18, as previously stated, is held in the groove 154 in the upper surface of the lower casing half 142 adjacent the upstruck rim 152. The screen 18 is held in position by the lower arm 34 which supports the float rod 28 (Figure 1). The upper casing half 106 adjacent the holes 162 is provided with radial webs 172 of approximately triangular form leading from the central extension 104 to the raised spiral portion 122 for strengthening purposes.

The cylindrical impeller chamber 118 contains a pump impeller, generally designated 174, having a hub 176 from which spiral vanes or blades 178 radiate outwardly (Figures 1 and 2). The blades 178 are connected to the hub 176 by radial sectors or webs 180 of approximately triangular or half-crescent shape. The hub 176 is bored and threaded as at 182 to receive the correspondingly threaded lower end 184 of the tubular drive shaft 72, to which it is thereby attached immediately below the sleeve or bushing 86.

In the operation of the invention, let it be assumed that the parts have been assembled in the manner shown in Figure 1, with the supporting tube 12 inserted in the pilot bore 102 and having its threaded portion 98 threaded into the correspondingly threaded bore 100 of the casing extension 104 immediately below the pilot bore 102. This construction enables an unskilled workman to assemble these parts without damaging the threads by misalignment. The float 50 is adjusted to its proper position on the float rod 28 by means of the spring clips or stops 52 and 54, so as to determine the range of water levels to which the switch 20 and consequently the motor 14 will operate the pump 18 to pump out the water from the sump S. When the water level rises to the point where the float 50 engages the upper stop 52, it pushes upward the latter and the float rod 28, together with the switch plunger 24, operating the switch 20 and energizing the motor 14.

The consequent rotation of the motor shaft 70 and tubular drive shaft 72 causes rotation of the pump impeller 174 in the impeller chamber 118, thereby sucking water through the perforations 166 in the screen 18 and the intake ports 162 through the annular chamber 186 in the casing extension 104 and into the impeller chamber 118, whence it is expelled through the volute 120 and hollow boss 128 through the coupling 134 into the discharge or outlet pipe 140 and thence to the point of disposal. The pump operates until the water level falls to the point where the float 50 engages the lower stop 54, pushing the float rod 28 downward and with it the switch plunger 24, opening the switch 20 and deenergizing the motor 14.

In the meantime, water flows freely through the ports

6

82 in the tubular support 12 into the latter above the pump rotor bearing 88 and thence through the axial grooves 92 thereof into the bearing bore 90, lubricating the bearing 88 in its engagement with the rotating sleeve 86 attached to the driveshaft 72. If, for any reason, the pump should remain running after it has pumped the liquid down to the required minimum level, water will still flow back through the bore 78 in the drive shaft 72 and outward through the ports 80 to lubricate the bearing 88 and prevent it from burning out.

When the pump ceases operation in the normal manner, the water which has been forced upward into the outlet pipe 140 and remaining therein now descends by gravity into the impeller chamber 118 and thence gushes outward and upward through the ports 162 and perforations 166 in the screen 18, washing off foreign matter which may have temporarily clogged these perforations. From time to time, the operator or owner by means of a flashlight, can look down into the sump and examine the perforated wall 164 of the screen 18 which is easily visible because of its upwardly-inclined configuration. If he finds by his inspection that the screen requires cleaning, he can quickly and easily do so by means of a broom, long-handled brush or mop lowered into the sump and moved to and fro over the screen 18. The bearing 88, being above the suction ports 162 of the pump 16, is free from grit or dirt which would otherwise be forced into the bearing if, as in certain prior sump pumps, it were located on the discharge or pressure side of the pump.

What I claim is:

1. A sump pump comprising an elongated upstanding motor supporting tube having an upper end portion adapted to receive and support an operating motor, a pump casing structure mounted on the lower end portion of said supporting tube and having a pump impeller cavity therein, said casing structure having an inlet port and an outlet port communicating with said cavity, said supporting tube having a hollow bearing supporting portion within the lower end portion thereof disposed centrally of said cavity, a shaft sleeve bearing of water-lubricated material secured in said bearing supporting portion and having its lower end communicating with said cavity, a hollow pump impeller drive shaft journaled in said bearing and adapted to be operatively connected at its upper end to the motor, and a radial-discharge pump impeller rotatably mounted in said cavity and drivingly connected to said hollow shaft, said supporting tube near the upper end of said bearing having a lubricating port extending therethrough from the exterior thereof and communicating with the upper end of said bearing, said hollow shaft having a lubricating water passageway extending therethrough from said cavity to said bearing, said shaft having an outlet from said passageway communicating with said bearing.

2. A sump pump comprising an elongated upstanding motor supporting tube having an upper end portion adapted to receive and support an operating motor, a pump casing structure mounted on the lower end portion of said supporting tube and having a pump impeller cavity therein, said casing structure having an inlet port and an outlet port communicating with said cavity, said supporting tube having a hollow bearing supporting portion within the lower end portion thereof disposed centrally of said cavity, a shaft sleeve bearing of water-lubricated material secured in said bearing supporting portion and having its lower end communicating with said cavity, a hollow pump impeller drive shaft journaled in said bearing and adapted to be operatively connected at its upper end to the motor, and a radial-discharge pump impeller rotatably mounted in said cavity and drivingly connected to said hollow shaft, said supporting tube near the upper end of said bearing having a lubricating port extending therethrough from the exterior thereof and communicating with the upper end of said bearing, said hollow shaft having a lubricating water passageway

extending therethrough from said cavity to said bearing, said shaft having an outlet from said passageway communicating with said bearing, and said casing structure having a water channel extending from said outlet to said hollow shaft passageway beneath said impeller.

References Cited in the file of this patent

UNITED STATES PATENTS

106,061	Horning	Aug. 2, 1870	10
870,310	O'Donnell	Nov. 5, 1907	
1,273,913	Ostenberg	July 30, 1918	
1,488,237	Durbin	Mar. 25, 1924	
1,500,607	Conant	July 8, 1924	
1,695,846	Harding	Dec. 18, 1928	15
1,705,263	McIlvaine	Mar. 12, 1929	
1,758,391	Dunham	May 13, 1930	

1,883,266
1,919,375
1,981,965
2,362,566
2,399,548
2,499,454
2,525,370
2,542,896
2,545,600
2,575,568
2,735,613
2,766,696

Yoder	Oct. 18, 1932
MacLachlan	July 25, 1933
Morgan	Nov. 27, 1934
Lappert	Nov. 14, 1944
Ingersoll	Apr. 30, 1946
Bowman	Mar. 7, 1950
Pollak	Oct. 10, 1950
Brady	Feb. 20, 1951
Berry	Mar. 20, 1951
Topanelian	Nov. 20, 1951
Calling	Feb. 21, 1956
Lung	Oct. 16, 1956

FOREIGN PATENTS

124,290	Australia	Apr. 23, 1945
651,619	Great Britain	Apr. 4, 1951
916,910	France	Aug. 26, 1946