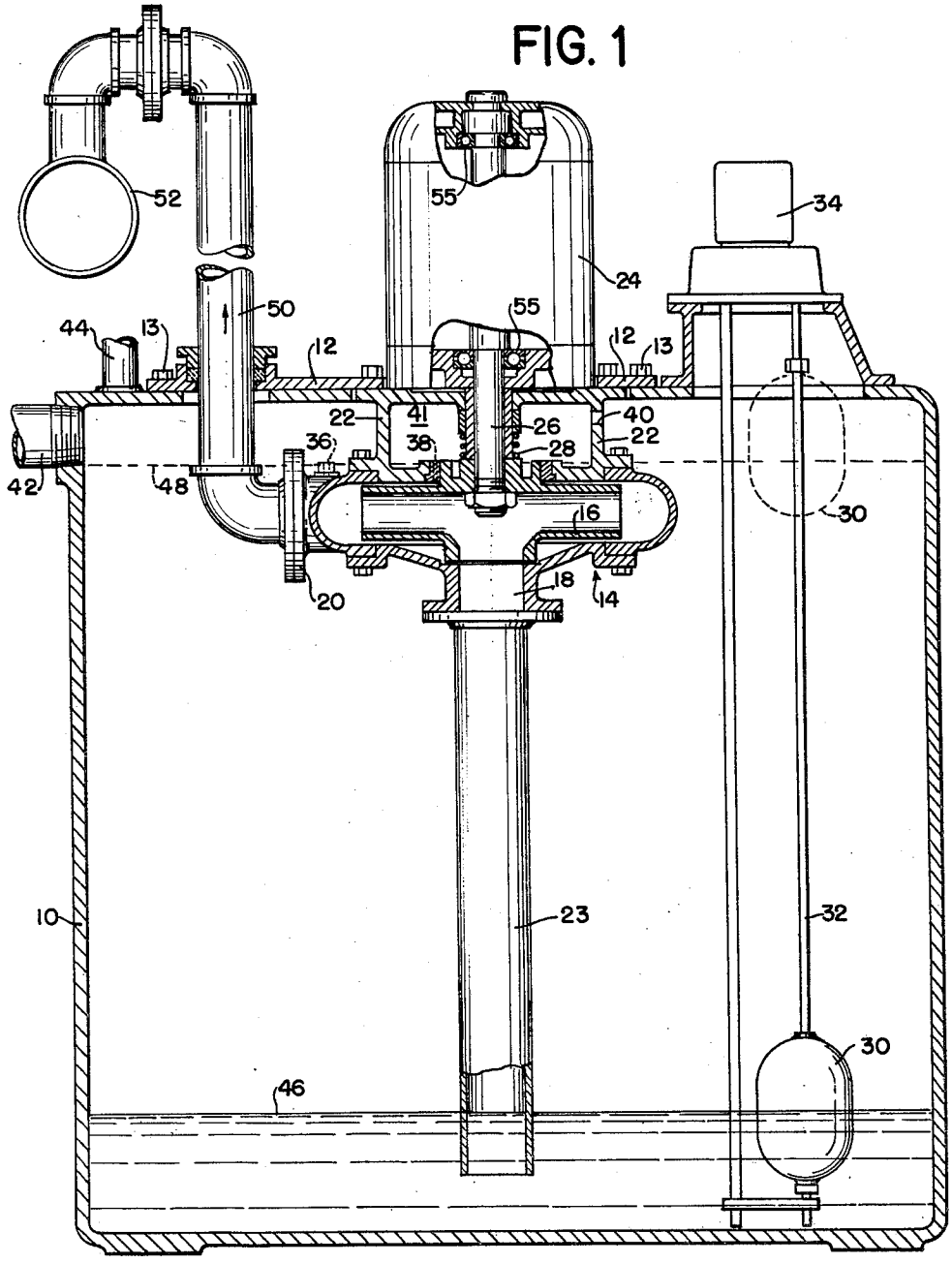
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PUMP PRIMING

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FIG. 1



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FIG. 2

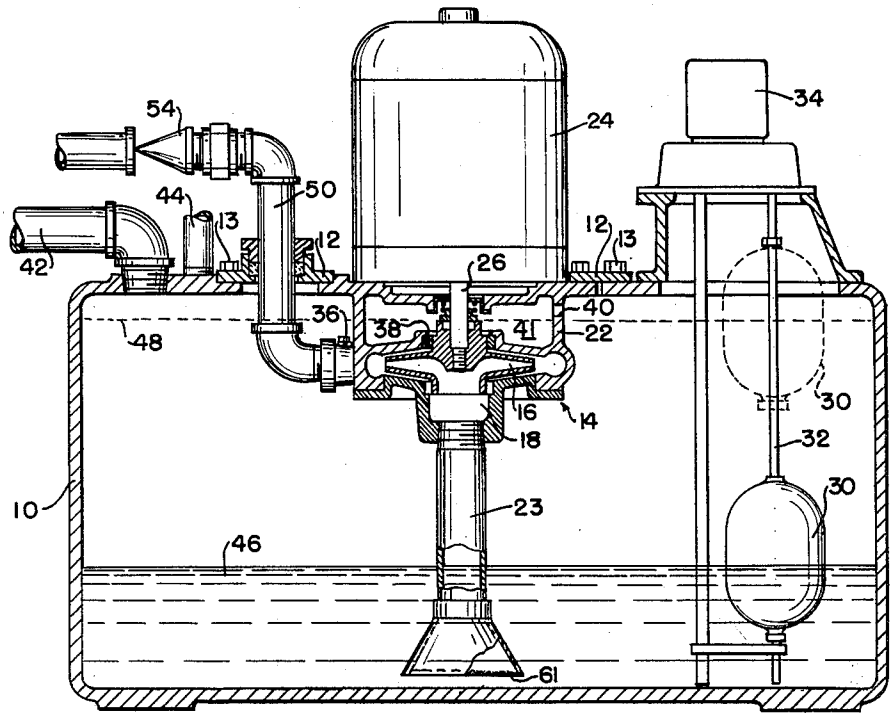
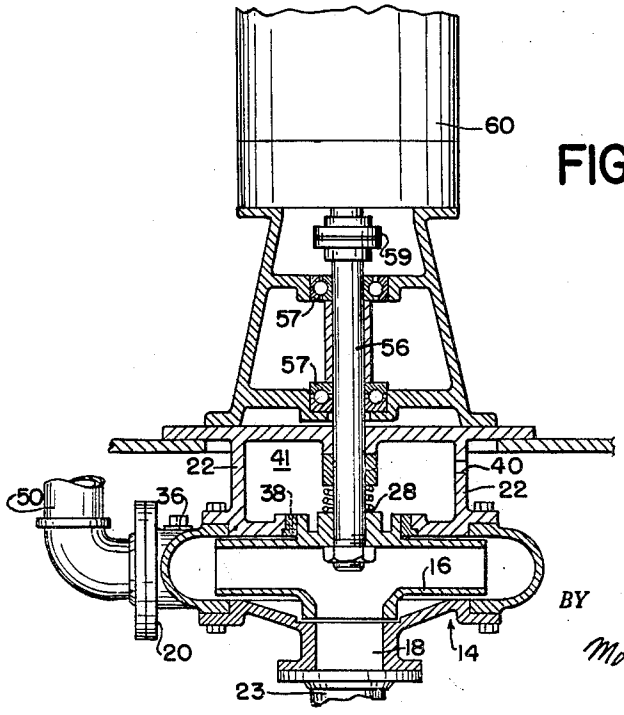


FIG. 3



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PUMP PRIMING

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This invention relates to pump arrangements in general and in particular to improvements in the arrangement of a submerged condensate pump for returning heating system condensate back to a boiler or hot-well. The invention also relates to an improvement arrangement for a sump pump handling accumulated sewage or other drainage liquid.

Centrifugal pumps are usually employed for the above-mentioned type of service, but they have the disadvantage of requiring some means of priming before they will operate. In order to overcome this difficulty, it has been the usual practice in the past to place the centrifugal pump near the bottom of a hot-well or sump below the lower liquid level limit so that it will always be submerged in the liquid and thereby not require separate priming.

Submerged centrifugal pumps in this type of service are usually controlled by a float switch mechanism operated by the liquid level in the sump, with the lower liquid level pump shut-off point just above the level of the pump, so that priming of the pump is assured upon each operation thereof. Such submerged pumps are usually driven by a motor located above the sump having a long shaft extending downwardly thereto. One of the disadvantages of this arrangement is that the necessary pump bearing is always submerged and in contact with the hot or dirty liquid being pumped throughout the entire operating period of the pump, as well as during the period in which the pump is non-operative awaiting the rise of the float control mechanism to reach the upper pump turn-on liquid level. Obviously, pump bearings required to operate in this adverse environment do not stand up for any appreciable length of time and require frequent maintenance or replacement. Furthermore, if the pump should get clogged, it is necessary to raise it from the lower level of the sump along with its drive shaft, which requires adequate head room.

The present invention is concerned with an improved arrangement whereby a centrifugal pump may be located just below the normal upper liquid level limit of the sump chamber, while maintaining positive priming of the pump for each operation thereof.

Applicant's invention employs a short drive shaft between the pump drive means and the pump impeller. The arrangement places the centrifugal pump just below the surface of the upper liquid level limit. The inlet of the pump is provided with a downwardly extending conduit, the lower end of which terminates just below the normal lower liquid level of the sump. Priming of the pump prior to each cycle of operation is assured by the provision of a plurality of passageways through the upper side of the pump housing which permits the liquid level in the inlet conduit to rise along with the liqiud level within the sump, thereby insuring that the interior of the pump casing is filled with liquid upon the initiation of the pump cycle when the float reaches its uppermost activating position. The arrangement of the invention shields the pump bearing from direct contact with the liquid in the sump when the pump level is at its maximum. Furthermore, the novel positioning of the pump relative to the upper level of liquid within the pump keeps the pump bearings out of the environment of the sump liquid at all times.

Accordingly, an object of the invention is to provide an improved sump pump arrangement employing a centrifugal pump located just below the normal maximum sump liquid level limit.

Yet another object of the invention is to provide a sump pump arrangement wherein no contaminating liquid affects the pump bearing.

A still further object of the invention is to provide a self-priming centrifugal pump including vent apertures on a surface thereof.

A still further object of the invention is to provide a self-priming sump pump arrangement not requiring the usual foot valve or check valves.

Another object of the invention is to provide a sump pump system having a self-cleaning inlet strainer.

Yet another object of the invention is to provide a condensate or sump pump arrangement requiring little and easy maintenance and a minimum of head room clearance for the removal of the pump assembly from the sump housing.

A further object of the invention is to provide a novel pump arrangement which is simple in design, low cost in maintenance, trouble-free in operation, and economical to manufacture.

Other objects and advantages of the invention will become apparent and the invention will be fully understood from the following description and drawings, in which:

FIG. 1 is a cross-sectional view of the novel arrangement of the invention;

FIG. 2 is a view similar to FIG. 1, showing an alternate embodiment of the invention employing a check valve in the pump discharge passage; and

FIG. 3 is a view of the pump showing an alternate drive means.

Referring to the embodiment of FIG. 1, a receiver or sump housing 10 is shown with a cover plate 12 secured thereto by a plurality of bolts 13. A centrifugal pump shown generally at 14 is attached to the underside of the cover 12 via an intermediate housing member 22. The pump 14 includes an impeller 16, an inlet passage 18 and a discharge passage 20. The pump impeller 16 is rotationally driven by a shaft 26 of a drive motor 24. Suitable seal means shown generally at 28 function to separate the liquid within the sump from the motor 24.

Affixed to the pump inlet 18 is a downwardly projecting inlet extension conduit 23 which terminates at its lower end adjacent the bottom of the housing 10. Connected to the discharge 20 of the pump is an upwardly extending conduit 50 communicating with a header shown generally at 52. Within the housing 10 is a conventional float 30 vertically positionable upon a centering rod 32, as a function of the liquid level within the housing. The float 30 is connected through means (not shown) in a conventional manner to a pump control switch 34, to start operation of the motor 24 whenever the float 30 is raised to its uppermost dotted position defined by the upper limit of liquid level line 48. Similarly, as the centrifugal pump discharges liquid through conduit 50 from the sump, the level decreases to the lower limit 46, at which time the lowermost vertical position of float 30 is effective to shut-off the operation of the pump 24.

As may readily be seen, the horizontal line defined by the upper liquid level limit 48 is substantially coplanar with the upper surface of the body of the centrifugal pump 14. This upper surface of the pump body is provided with a plurality of vent apertures 36 and 38. Aperture 38 places the chamber 41 within the housing 22 in communication with the interior of the pump. The chamber 41 is vented through an aperture 40 to a point above the normal upper liquid level limit 48. Therefore, as liquid enters the housing 10 through inlet 42, the apertures 36 and 38 allow trapped air within the inlet conduit 23 and the pump 14 to escape as the level of

liquid gradually increases from its lowermost level 46 to its uppermost level 48. The housing also includes a conventional vent 44 to allow escape of air to atmosphere as the liquid level therein rises. Thus, it can readily be seen how the present novel arrangement of the invention allows the pump to be physically positioned adjacent the upper liquid level within the sump, yet to be positively primed at all times when the pump begins to operate as the position of float 30 assumes its uppermost dotted location. During pump operation, the upper level of the liquid quickly decreases to a level below that of the pump 14 proper, emptying the sump 10. When the liquid limit 46 is reached the pump is stopped by the operation of the float 30. This arrangement thereby submerges the pump in liquid for only the short interval of time that the liquid level within the sump is at or near its peak, as distinguished from the prior art practice wherein the pump was continually submerged below the lowermost liquid level limit.

The novel arrangement allows the pump bearings to operate free and clear of the contaminated liquid in the sump, and, furthermore, permits the easy removal of said pump, if required, because of its close location to the top of the sump housing.

In FIG. 1 and FIG. 2 the pump is attached directly to the motor, the pump impeller being mounted on the pump shaft, and the bearings of the motor also supporting the pump impeller.

In FIG. 3 is shown an alternate arrangement where the pump has its own shaft 56 and bearings 57 and is driven through a flexible coupling 59 by the motor 60.

In both arrangements the bearings of the pump and motor are always above the liquid in the sump.

Referring to FIG. 2, wherein elements having similar functions to the corresponding parts in FIG. 1 have been similarly numbered, an alternate embodiment of the invention is shown. This embodiment includes a check valve 54 within the conduit 50, which may be required to prevent the return of condensate in a reverse direction back from a boiler or conduit such as element 52, shown in FIG. 1. However, it should be appreciated that check valve 54 is not required for purposes of insuring that the pump is primed whenever its operation is commenced. As previously described, apertures 36 and 38 working in combination with vent 40, guarantee priming of the centrifugal pump by allowing escape of trapped air therefrom.

To prevent large particles from clogging up the impeller 16, a strainer 61 is attached to the lower end of the inlet conduit 23. These particles will lodge on the outside of strainer 61 when the pump is operating and after a time tend to restrict the flow of liquid to the pump. When the pump stops, however, all the water in the pump casing, pump impeller and the inlet conduit will fall back into the sump 10, passing through the strainer 61, thus cleaning the strainer by reverse flow.

While two specific embodiments of the invention have been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

I claim:

1. In combination, a tank arranged to receive liquid having bottom, side and top wall portions, pump means for removing liquid from said tank, said pump means being located closely adjacent the top wall of said tank and including; a casing, an impeller, and an inlet and a discharge; vertically disposed elongated conduit means connected at its upper end to the inlet of said pump means and extending downwardly therefrom to terminate at its lower end at a level closely adjacent the tank bottom wall portion, control means for starting the operation of said pump means when the level of the liquid in said tank reaches a predetermined upper limit substantially equal to the level of the top of the pump means casing and

for stopping the operation of said pump means when the level of the liquid in the tank reaches a predetermined lower limit equal to or slightly above the lower end of said conduit means, and vent means formed in an upper wall portion of said pump means casing for venting air trapped within said pump means and conduit means as the liquid within said tank rises from the lower predetermined level to the upper predetermined level to assure priming of said pump means upon starting thereof.

2. The combination of claim 1 wherein the tank top wall portion includes a cover plate for mounting said pump means, and drive means extending through said cover plate and connected to operate said pump means, and means for removing said cover plate and pump means as a unit from said tank.

3. The combination of claim 2, including check valve means in the discharge of said pump means.

4. In combination, a tank arranged to receive liquid having bottom, side and top wall portions, and centrifugal pump means for removing liquid from said tank located closely adjacent the top wall of said tank and including, a casing, and an inlet, vertically disposed elongated conduit means connected at its upper end to said inlet and extending downwardly therefrom to terminate at its lower end at a level closely adjacent the tank bottom wall portion, control means for starting the operation of said pump means when the level of the liquid in said tank reaches a predetermined upper limit substantially equal to the level of the top of the pump means casing and for stopping the operation of said pump means when the level of the liquid in the tank reaches a predetermined lower limit equal to or slightly above the lower end of said conduit means, and means for directing the pumped liquid from said pump means and for venting air trapped within said pump means and conduit means as the liquid within said tank rises from the lower predetermined level to the upper predetermined level to assure priming of said pump means upon starting thereof.

5. The combination according to claim 3, wherein said conduit means includes strainer means at its lowermost inlet end.

6. In combination, a tank arranged to receive liquid having bottom, side and top wall portions, pump means for removing liquid from said tank, said pump means being located closely adjacent the top wall of said tank, said pump means including; a casing, an impeller, and an inlet and a discharge, wall means forming a collar extending upwardly from the upper side of said pump means casing and connecting said pump means to the interior surface of the top wall portion of said tank, shaft means connected to said impeller and extending upwardly within said collar, first and second vent means formed in an upper portion of said pump means casing on opposite sides of said wall means, third vent means extending through said collar at a location closely adjacent the interior surface of the top wall portion of said tank; vertically disposed elongated conduit means connected at its upper end to the inlet of said pump means and extending downwardly therefrom to terminate at its lower end at a level closely adjacent the tank bottom wall portion, and control means for starting the operation of said pump means when the level of the liquid in said tank reaches a predetermined upper limit substantially equal to the level of the top of the pump means casing and for stopping the operation of said pump means when the level of the liquid in the tank reaches a predetermined lower limit equal to, or slightly above, the lower end of said conduit means, whereby air trapped within said pump means and conduit means, as the liquid within said tank rises from the lower predetermined level to the upper predetermined level, is vented through the first, second and third vent means to assure priming of said pump means upon starting thereof.

7. The combination of claim 6 including check valve means in the discharge of said pump means.

8. The combination of claim 7 wherein said conduit means includes strainer means at its lowermost end.

References Cited in the file of this patent

UNITED STATES PATENTS

1,479,096	Ioach	Jan. 1, 1924
1,633,786	Horter	June 28, 1927
1,653,167	Graham	Dec. 20, 1927
2,744,469	Schaefer	May 8, 1956
2,829,598	Zimmerman	Apr. 8, 1958
2,867,173	Lung	Jan. 6, 1959
2,927,174	Walskin	Mar. 1, 1960

FOREIGN PATENTS

295,152	Germany	Nov. 10, 1916