United States Patent

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[54] DRAIN PUMP CONTROL

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[73] Assignee: **said Hine and said Murray, by said Lang**

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[52] **U.S. Cl.** **417/38**

[51] **Int. Cl.** **F04b 49/06**

[58] **Field of Search** 417/38, 36; 137/403, 387, 116.5; 138/45, 46

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[57] **ABSTRACT**

A control for preventing cavitation and cycling of electrically operated pumps employed for emptying sink drains or the like. The pump operation control includes a diaphragm operated device responsive to fluctuations in air pressure and a conduit for connecting the device to a drain pipe from which water is to draw upon operation of the pump. When water rises in the drain pipe to a point above the level of the inlet to the conduit, air trapped within the conduit is compressed by the water; the device upon sensing an increase in pressure within the conduit serving to effect energization of the pump.

4 Claims, 3 Drawing Figures

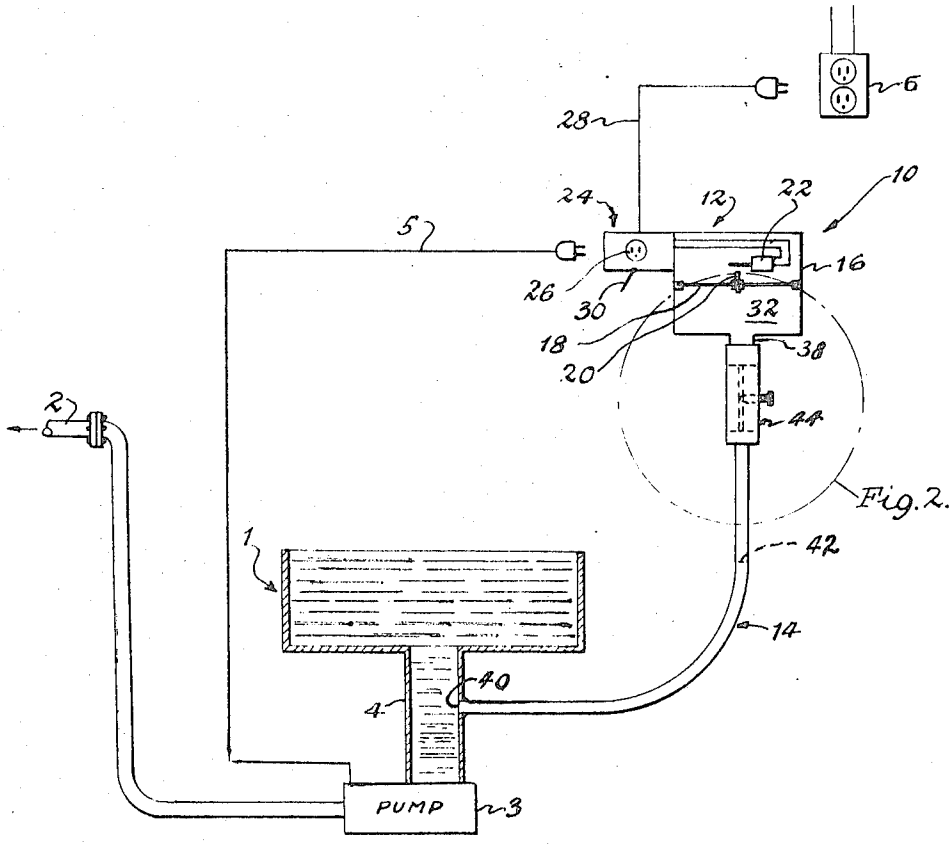


Fig. 2.

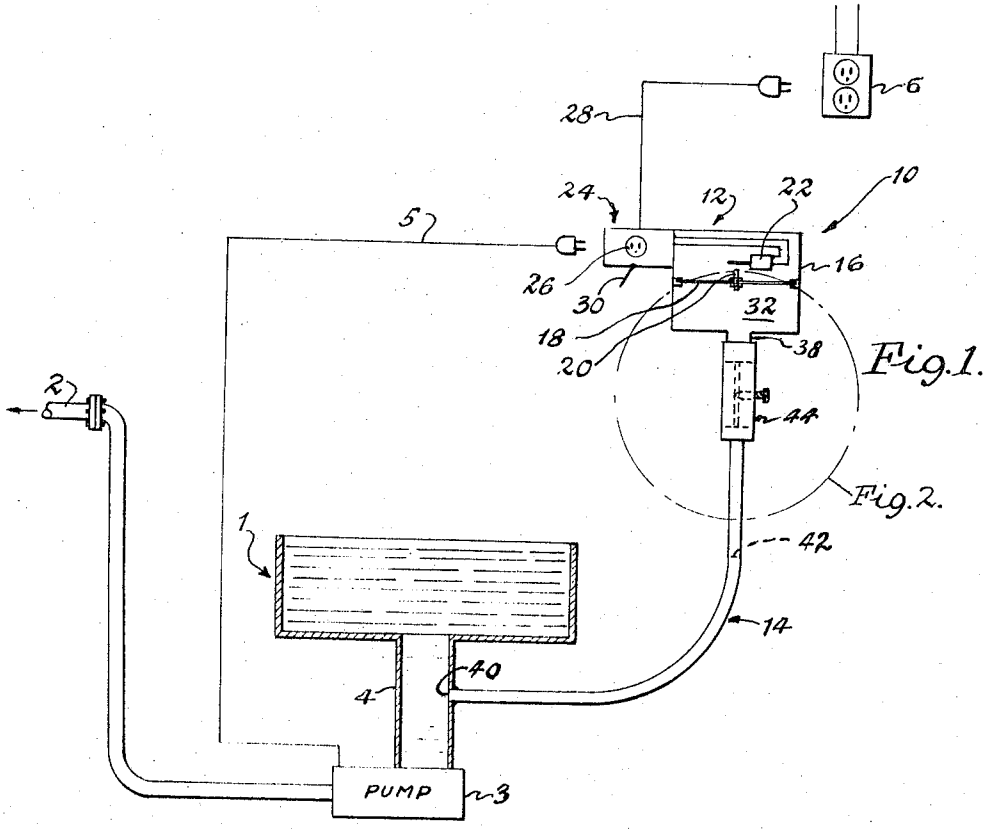


Fig. 1.

Fig. 2.

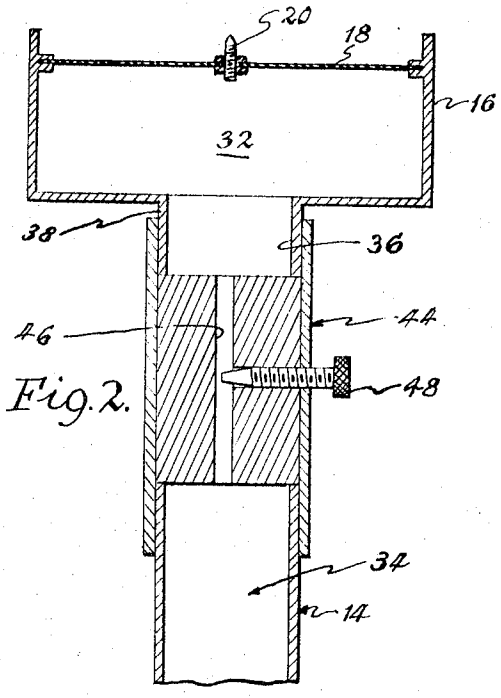


Fig. 2.

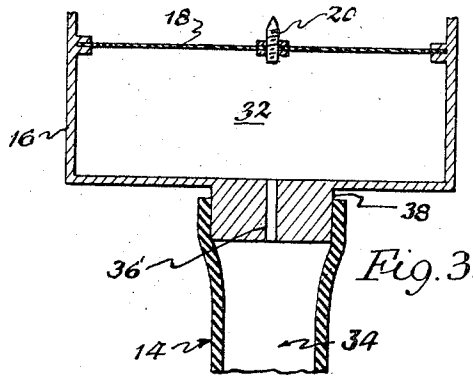


Fig. 3.

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DRAIN PUMP CONTROL

BACKGROUND OF THE INVENTION

A typical cellar laundry tub is often so located that it will simply not drain out, and thus a pump is connected to the drain pipe of the tub so as to enable a user to quickly empty the tub into a waste sewer.

Such pumps have sometimes been controlled by means of a water pressure responsive diaphragm, which is attached to the drain pipe or pump casing and adapted to operate a microswitch in the motor control circuit of the pump whenever water within the drain pipe exceeds a predetermined level. However, trouble with this system has been encountered, because as soon as the pump runs, it sucks water out of the drain pipe and this substantially reduces the pressure adjacent the diaphragm, so that the microswitch is momentarily released. The resultant cyclic operation or chattering of the microswitch is detrimental to both the pump and microswitch.

SUMMARY OF THE INVENTION

The present invention relates to controls for electrically operated pumps of the type adapted for use in draining laundry tubs or the like.

The preferred form of the control of the present invention comprises a diaphragm operated control device operable to complete an electrical circuit through the motor of a pump in response to a sensed increase in air pressure, and a conduit for interconnecting the control device to a drain pipe to be drained by operation of the pump. When water rises in the drain pipe to a point above the level of the inlet to the conduit, air is trapped within the conduit and subsequently compressed to an extent determined by the height to which water rises therein; the increase in air pressure within the conduit being sensed by the control device for the purpose of initiating operation of the pump.

Sudden fluctuations in the pressure of the air to which the control device is exposed, due to sudden variations in the height of water in the drain pipe, is positively prevented by providing an air bleed orifice arranged intermediate the control device and the maximum height that water may rise within the conduit. As a result, operation of the pump will be continuous until water within the drain falls below a predetermined level, which is determined by controlling the pressure setting of the control device and the delay introduced by the air bleed orifice.

The utilization of the pressure of air entrapped within a conduit to indicate the height of water present within a drain pipe permits the control device to be conveniently positioned at a suitable point relatively remote from the drain pipe and prevents damage to the moving or electrical components thereof, which might otherwise result from contact with the water being drained.

Another important feature of the present invention is that the conduit is self cleaning at the end of each pump operational cycle, so as to prevent the control from being rendered inoperative by accumulations of lint, dirt, or other foreign objects present within the drain water.

Moreover, it is a particularly important feature of the present invention that the control is completely separate from the pump to be controlled, and thus may be quickly and inexpensively installed in both new and existing drain installations.

DRAWINGS

The nature and mode of the present invention will be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is a schematic view showing the control of the present invention associated with a laundry tub drain pump;

FIG. 2 is an enlarged, sectional view of the area designated as FIG. 2 in FIG. 1; and

FIG. 3 is a view similar to FIG. 2, but showing an alternative embodiment of the present invention.

DETAILED DESCRIPTION

As by way of environmental setting, reference is made to FIG. 1, wherein a conventional cellar laundry tub 1 is shown as being located at a level below a sewer line 2, and a conventional electrically operated pump 3 is shown as being employed to lift water from drain 4 to the level of the sewer line. For the purpose of the present discussion, tub 1 and drain 4 may be considered as forming a single reservoir to be drained by operation of pump 3.

Heretofore in many installations, pump 3 would be operated whenever it was necessary to drain tub 1 by merely plugging an electric cord 5 from the pump motor, not shown, into a convenient electrical outlet 6. Of course, it is also well known to provide more sophisticated systems, wherein the electric motor of the pump is automatically controlled by suitable water pressure responsive microswitches, not shown, included as an integral part of either the casing of pump 3 or drain pipe 4, or by float controls positioned within the laundry tub.

The present invention relates to a novel control for pump 3, which is generally designated as 10 in FIG. 1. Control 10 includes in combination a control device 12 and a conduit 14, which serves to place control device 12 in fluid communication with drain pipe 4.

The specific structural details of control device 12 forms no part of the present construction. Therefore it is shown schematically as including a casing 16, in which is disposed a resiliently deformable diaphragm 18 having a threadably adjustable actuator button 20 and a microswitch 22; and a casing mounted electrical circuit control box 24, into which microswitch 22 is electrically connected. Included as part of control box 24 is a female plug 26, which is adapted to removably receive pump motor cord 5; an electrical outlet line or cord 28, which is normally connected into electrical outlet 6; and an electrical circuit, not shown, for establishing an electrical circuit between plug 26 and cord 28 upon operation of microswitch 22, due to engagement thereof by actuator button 20. Preferably, control box 24 would include one or more fuses, not shown, in order to prevent damage to microswitch 22 and/or the motor of pump 3. Also, a toggle or like switch 30 may be provided to permit a user to electrically bypass microswitch 22 should it become inoperative and manually control operation of pump 3.

By referring to the drawings, it will be understood that diaphragm 18 cooperates with casing 16 to define a cavity 32 arranged in fluid flow communication with drain pipe 4, via a flow path 34, which is defined by opening 36 of casing mounted conduit connector 38 and conduit 14.

From the foregoing, it will be understood that when liquid, such as water, rises in drain pipe 4 to a point above the level of the conduit inlet 40, which defines the lower end of flow path 34, air is trapped within the flow path and subsequently compressed to an extent determined by the height to which water rises within conduit 14. Of course, diaphragm 18 is deformed upwardly as the trapped air is compressed with the result that actuator button 20 is moved into operative engagement with microswitch 22. The closing of microswitch 22 establishes an electrical operating circuit through the motor of pump 3, which is maintained until actuator button 22 is removed from engagement with the microswitch, due to reduction in the height of water within drain pipe 4. It will be noted that conduit 14 is arranged such that when laundry tub 1 is filled to its maximum height, as indicated in FIG. 1, the water will rise in conduit 14 only to the level indicated at 42, whereby water damage to the moving and/or electrical components of the control is positively prevented.

In the arrangement shown, the pressure at which control 10 responds and thus the height of water presence within the drain pipe 4 necessary to effect operation of pump 3 may be readily controlled by threadably adjusting actuator button 20 relative to diaphragm 18. This is a particularly important feature of the present control in that it permits pump 3 to be shut

off after laundry tub 1 is completely drained, but before the height of water within drain pipe 4 is reduced to the point where the pump would run dry.

In the simplest form of the invention, flow path 34 would be of sufficiently small cross sectional size so as to provide an air bleed orifice tending to insure relatively slow changes in diaphragm operating pressures within cavity 32, regardless of rapid fluctuations in height of water within drain pipe 4. Thus, cyclic operation or chattering of microswitch 22 is prevented.

In the preferred form of the present invention, which is best shown in FIG. 2, conduit 14 has an internal diameter, which is sufficiently large so as to effectively prevent clogging thereof by lint, dirt particles or other small foreign objects present in the drain water. In this arrangement conduit 14 is joined to connector 38 by a fitting 44, which is axially bored as at 46, so as to provide an air bleed opening within flow path 34. Fitting 44 is also provided with a threadably adjustable screw 48 for the purpose of varying the size of orifice 46, and thus the rate of change of diaphragm operating pressures within cavity 32. Of course, fitting 44 would be positioned above the maximum level to which water may rise within conduit 14 so as to prevent blockage of air bleed orifice 46.

Fitting 44 and conduit 14 may as desired, be formed of a metal such as copper, or of a plastic such as polyethalene. Depending upon the material from which conduit 14 and fitting 44 are fabricated, they may be fixed to each other, connector 38 and drain pipe 4 by any conventional means, including adhesives; frictional or mechanical clamps; mechanical joints such as threads; and by means of welding or brazing.

FIG. 3 illustrates an alternative form of the present invention, wherein conduit 14 is directly fixed to connector 38 and opening 36' sized to define an air bleed orifice.

It will be understood that various changes in the construction of our pump control may be made without departing from the spirit of the present invention. Thus, as by way of example, the air cavity bounded by the diaphragm operator may be replaced by a bellows or a movable piston operator. Also, any conventional arrangement may be employed to effect adjustment of the response of the control. Additionally, it will be apparent that while the control of the present invention has been disclosed with particular reference to cellar laundry tub drain pumps, it has utility in controlling operation of pumps employed to empty diverse reservoirs, such as a cellar drainage pump.

I claim:

1. A drainage system for basement installations which include a laundry tub or like device having a water-receiving body into which water is periodically dumped, as from a washing machine, said tub having a drain opening in the bottom thereof below sewer level, said system comprising in combination:

a pump disposed below said tub having a sewer-connected outlet, and a drain conduit connecting said drain opening with the inlet of said pump, said pump having a capacity to drain said tub at a selected rapid rate;

a control switch assembly for said pump disposed at a level above the top of said tub, said control switch assembly comprising a normally open switch having an actuator and a deformable diaphragm normally spaced from said actuator, a body member defining a recess, said diaphragm closing said recess and defining therewith a relatively large cavity for entrapping air;

an air column tube leading from said drain conduit upwardly to said cavity whereby rising level of water in said tub compresses air in said tube and forces it into said cavity, said tube being of a diameter with respect to the volume of said cavity to allow water to rise to a selected level in said tube before said switch is operated, said selected level being below the top of said tub; and

a restriction device defining an air bleed passage above said selected level and of diameter sufficiently smaller than that of said tube as to create a pressure lag in said cavity in response to draining of said tub at said selected rapid rate so that water drops below said selected level in the tube, and said switch is returned to normally open condition only after said pump has completely drained said tub.

2. A drainage system as defined in claim 1 including means for selectively varying the size of said air bleed passage.

3. A drainage system as defined in claim 2 including a manually actuated switch connected in parallel with said control switch selectively to actuate said pump by hand.

4. A drainage system as defined in claim 1 including a manually actuated switch connected in parallel with said control switch selectively to actuate said pump by hand.

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