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[54] **LIQUID LEVEL CONTROL**
8 Claims, 4 Drawing Figs.

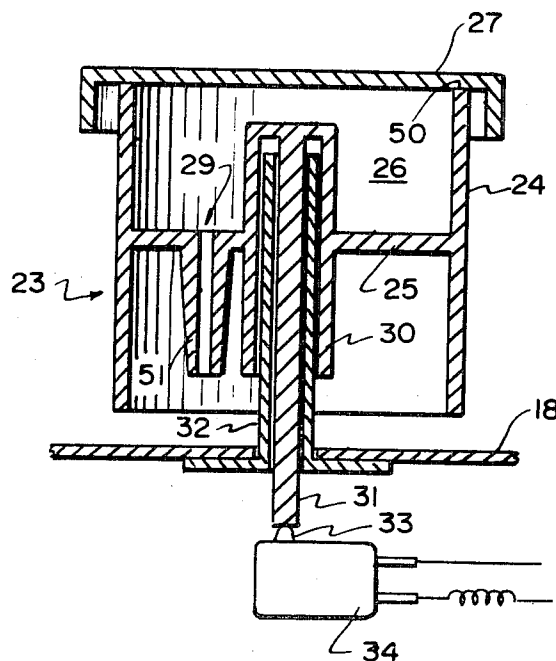
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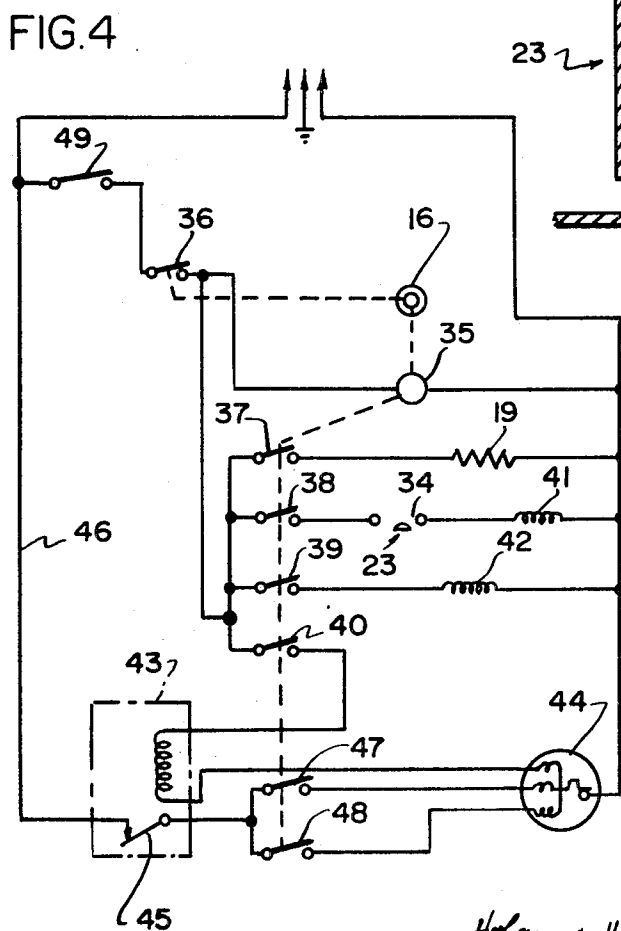
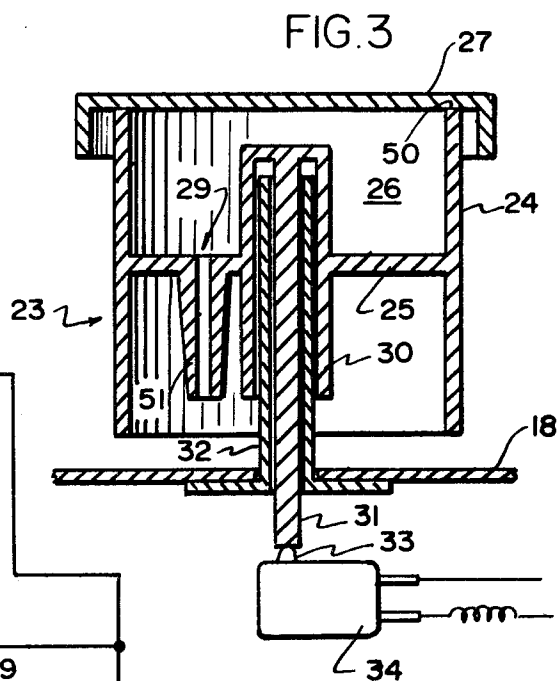
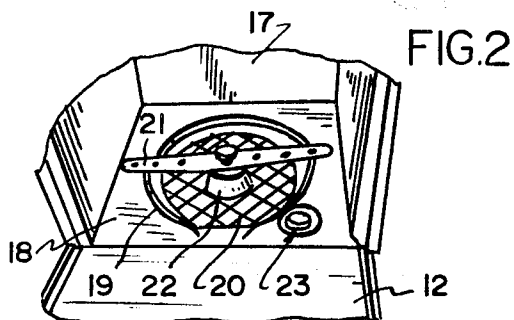
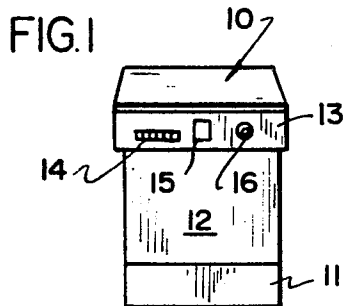
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ABSTRACT: A variable liquid level control apparatus for a liquid receiving device such as a dishwasher, laundry appliance or the like in which the flow of liquid into a liquid-receiving chamber is terminated by a float with the float having a plurality of buoyant compartments and a device for closing at least one of these compartments, as desired, to increase the buoyancy of the float with the resulting lowering of the terminating level of the liquid. Thus with all compartments closed the float has greater buoyancy with the result that only a relatively small amount of liquid is admitted to the liquid-receiving chamber while when at least one compartment is open to receive liquid from the chamber the buoyancy is reduced so that a larger amount of liquid is admitted before the float terminates the supplying of the liquid.





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LIQUID LEVEL CONTROL

SUMMARY OF THE INVENTION

One of the features of this invention is to provide a variable liquid level control for terminating the supplying of liquid to a chamber with this terminating being controlled by a float which is changed in buoyancy by selectively admitting liquid from the chamber to the float so that the termination is at a different level determined by the selective buoyancy.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a household dishwasher embodying the invention.

FIG. 2 is a fragmentary perspective view of a portion of the dishwasher with the front opening door in lowered position.

FIG. 3 is an enlarged vertical sectional view through a float device used in the embodiment of FIGS. 1 and 2.

FIG. 4 is a simplified wiring diagram of the automatic dishwasher of FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The dishwasher 10 illustrated in the accompanying drawings comprises a cabinet 11 having a front opening door 12 and an upper control panel 13 that contains a vent 14, a door-opening latch handle 15 and an automatic timer dial 16.

Forming a part of the cabinet 11 is an internal tub 17 having a bottom 18 with the interior of the tub being accessible by lowering the door 12 as shown in FIG. 2.

In the bottom of the tub there is located a customary electric heater 19 in the form of a curved rod, a filter screen 20 and a rotatable lower spray arm 21 rotated in a horizontal plane to spray liquid over the articles (not shown) retained within the tub. The spray arm 21 is mounted on top of a motorized pump 22 which supplies the arm 21 with liquid under pressure after this liquid has been filtered through the screen 20 all in the customary manner.

Located in the bottom 18 of the tub adjacent the rod heater 19 is a float-operated control device 23 for terminating the supply of liquid to the tub 17.

In the embodiment of this float device 23 illustrated in FIG. 3 the float 24 itself is of generally cylindrical shape with a cross partition 25 forming the bottom of an upper float compartment 26 having an open top selectively closed by a removable cover 27. The partition 25 also defines the top of a bottom float compartment 28 so that the partition 25 functions as the bottom wall of the top compartment 26 and the top wall of the lower compartment 28. A small bleed hole 29 is provided in this partition or wall 25. Surrounding bleed hole 29 and depending from wall 25 is cylindrical wall 51. Wall 51 prevents air in lower chamber 28 from escaping when cover 27 is removed and the dishwasher is filling with liquid. Bleed hole 29 is required to allow liquid in compartment 26 to drain at the end of the cycle. Bleed hole 29 is dimensioned so as to prevent liquid from draining from compartment 26 during the period liquid is being circulated by spray arm 21 while allowing liquid to drain at the end of the cycle when liquid is no longer being circulated.

Axially located in the float 24 is a vertical cylinder 30 open at its bottom end and closed at its top end and containing a vertically extending stem 31. This stem is arranged for vertical movement in a cylinder 32 that is mounted to extend upwardly from the tub bottom 18. The bottom of the stem 31 extends beneath the tub bottom 18, as shown in FIG. 3, and engages a movable plunger 33 on a control switch 34.

The wiring diagram for the dishwasher of the illustrated embodiment is shown in simplified form in FIG. 4. As shown here, the timer dial 16 is mechanically linked to the timer motor 35 and an on-off switch 36. The timer motor 35 is itself mechanically linked to a series of cam operated switches 37, 38, 39, 40, 47 and 48. These switches are of the customary type used in automatically controlled dishwashers and similar equipment.

The cam-operated switch 37 when closed by the timer motor 35 energizes the heater 19. Switch 38 when closed energizes the operating solenoid 41 for a liquid supply valve (not shown) through the float operated device 23 which includes the switch 34 (FIG. 3). Cam-operated switch 39 controls the energization of a detergent dispenser solenoid 42. The cam-operated switch 40 is connected to a starting relay 43 and through it is connected to the run connection to the motor 44. The starting relay 43 actuates a switch 45 which is connected between one of the power supply lines 46 and a pair of cam-operated switches 47 and 48 which in turn are connected to the wash and drain start windings for the motor 44 in the customary manner.

As is evident from an examination of FIG. 4, the float-operated device 23 illustrated in enlarged detail in FIG. 3 terminates the inflow of liquid when the float rises to the point to release the plunger 33 and open the switch 34 which deenergizes the flow control solenoid 41 and thereby terminates the supply of the liquid to the liquid-receiving chamber or tub 17.

The operation of the illustrated embodiment is as follows. With the cover 27 removed from its position in FIG. 3 to expose the top compartment 26 the timer motor 35 closes the various switches 37-40 in proper and customary sequence. This includes closing the switch 38 which because switch 34 is closed by the float 24 holding the plunger 33 depressed energizes the solenoid 41 and admits liquid to the tub 17.

The incoming liquid is pumped through the spray arm 21 which immediately fills the open top 50 of the compartment 26 (the cover 27 having been previously removed) so that the float 24 has increased mass and has buoyancy only by reason of the bottom float compartment 28. The incoming liquid therefore at the preselected liquid level in the tub raises the float 24 to release the plunger 33 and open automatically the switch 34. This deenergizes the solenoid 41 and terminates the supplying of the liquid to the chamber at the preselected level. The washing cycle thereupon continues under the control of the timer including the timer motor 35 and the switches operated thereby.

In the event the required amount of liquid in the dishwasher is smaller than that customarily required the cover 27 is placed in position as shown in FIG. 3 thereby closing the top compartment 26 and preventing it from being filled with water by the rotating spray arm 21. This means that the float 24 now has two float compartments 26 and 28 and does not have the increased mass due to liquid in compartment 26 and thus has increased buoyancy. Under these conditions the float 24 rises to release the switch plunger 37 at a lower predetermined liquid level in the tub 17 with the result that the amount of liquid supplied to the tub is correspondingly less.

Thus the apparatus of this invention permits selecting one of two levels of liquid automatically maintained in the tub by merely removing or replacing a cover cap 27 to increase or decrease the number of float compartments as well as the mass of the float and thus the buoyancy of the apparatus.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the appended claims.

I claim:

1. A variable liquid level control apparatus for a liquid-receiving device, comprising: a liquid-receiving chamber; means for initiating and terminating the supplying of liquid to said chamber; a float device means buoyed up by liquid in said chamber to terminate said supplying at a terminating liquid level in said chamber corresponding to a desired volume of liquid, said float device means having a plurality of float compartments therein; and means for selectively closing one said compartment to the liquid in said chamber, thereby increasing the buoyancy of the float device means and lowering said terminating level.

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2. The apparatus of claim 1 wherein there are provided a pair of said compartments with said one compartment being at a higher level than the other.

3. The apparatus of claim 1 wherein said means for closing comprises a movable cover on said one compartment.

4. The apparatus of claim 1 wherein said liquid-receiving chamber contains liquid projecting means for providing a flow of projected liquid into the chamber and said float device means is in the path of said projected liquid to receive said projected liquid in the one compartment when it is open.

5. The apparatus of claim 4 wherein said liquid-containing device comprises a dishwasher having spray means as a part of the washing apparatus comprising said liquid-projecting means.

6. The apparatus of claim 1 wherein said float device means comprises a float mounted for substantially vertical movement

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on a guide member, said plurality of compartments are located at different levels with the more elevated compartment having a bottom wall, and there is provided a drainage opening means in said wall for draining liquid therefrom.

7. The apparatus of claim 6 wherein said elevated compartment is provided with a movable cover for selectively exposing it to receive liquid from said chamber.

8. The apparatus of claim 7 wherein said liquid-receiving chamber contains liquid-projecting means for providing a flow of projected liquid into the chamber and said float device means is in the path of said projected liquid to receive said projected liquid in the one compartment when it is open, and wherein said liquid-containing device comprises a dishwasher having spray means as a part of the washing apparatus comprising said liquid-projecting means.

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