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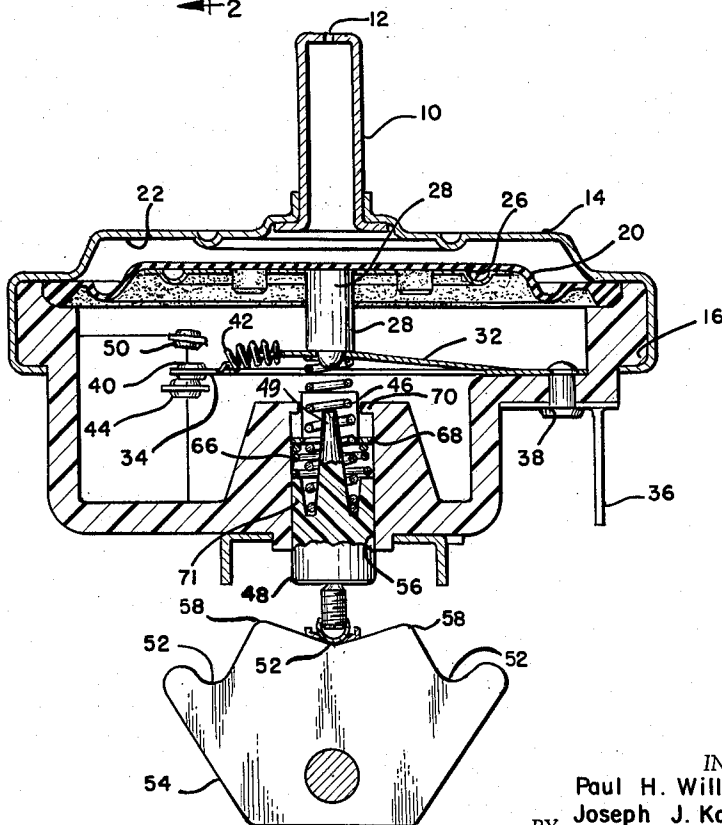
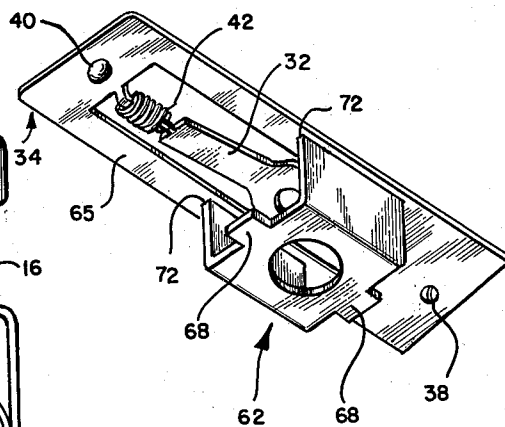
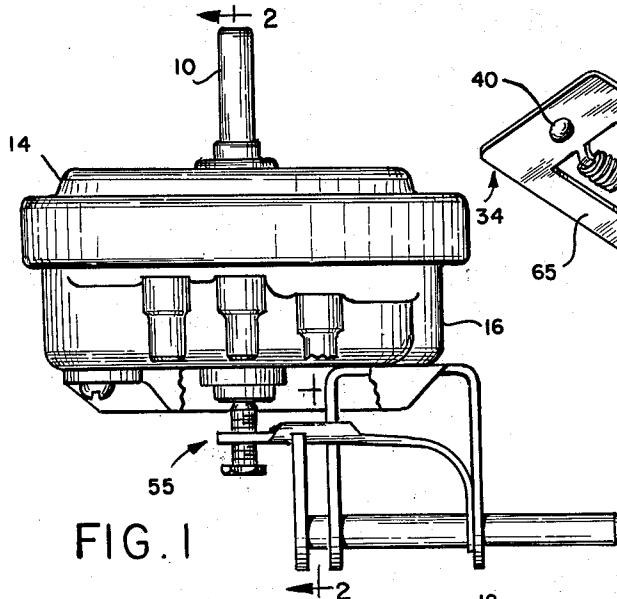
P. H. WILLIAMS ETAL

3,110,784

PRESSURE SWITCH CONTACTS

Filed July 1, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

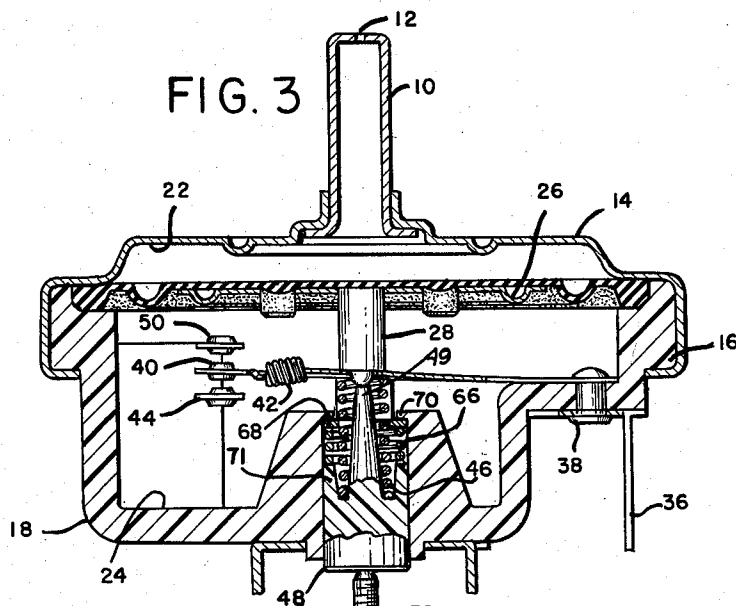
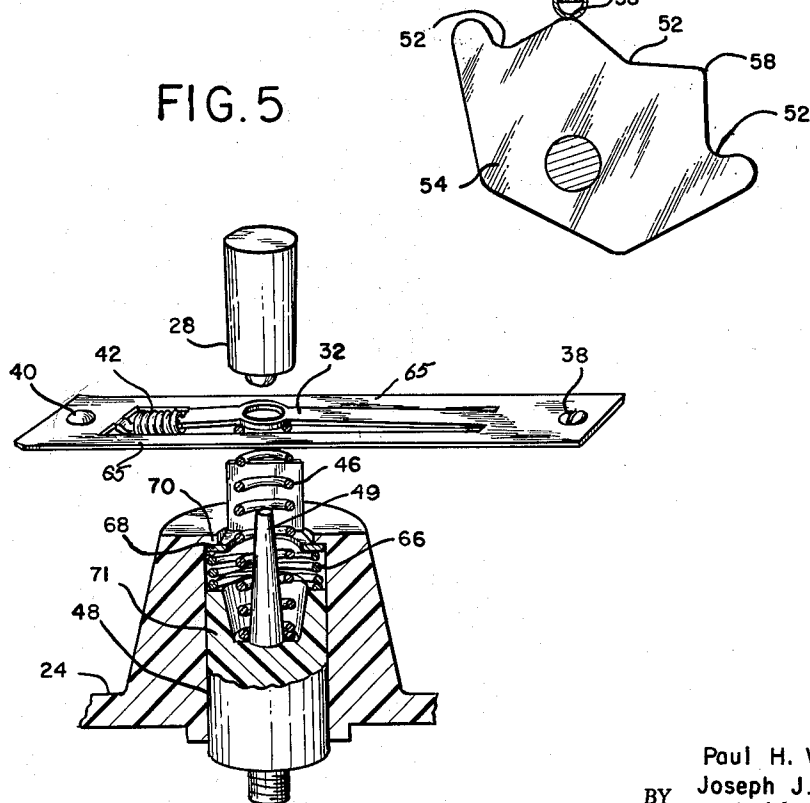


FIG. 5



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PRESSURE SWITCH CONTACTS

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12 Claims. (Cl. 200—83)

This invention relates to pressure switches of the type used to determine the water level in washing machines and the like.

Pressure switches of the general type shown here have a diaphragm subjected to water pressure to actuate a switch when a predetermined pressure (corresponding to a desired water level) obtains. The usual operation is to have the switch continue the filling of the container until it reaches the desired level, whereupon the control shuts off water flow and continues the washing machine cycle. Therefore, the function of the pressure switch is to signal when the desired level is reached. The level is selected by manually actuating a cam which varies the bias on the diaphragm opposing the water pressure. The cam is preferably shaped as in Beller Patent Ser. No. 2,934,618 and is provided with lobes which act to reset the switch to its normal (not full) position between different settings. It is possible, however, to "hang-up" the Beller selector on a lobe with the result that the switch is held closed—calling for water and unable to open—allowing the water to continue to flow, causing a flooding condition.

The primary object of this invention is to prevent locking of the pressure switch in the fill position under the aforementioned conditions.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the single embodiment shown in the drawings, in which:

FIG. 1 is a side elevation of a fluid pressure responsive switch;

FIG. 2 is taken on line 2—2 of FIG. 1 showing the switch in the closed position;

FIG. 3 is similar to FIG. 2 showing the switch in the neutral or inoperative position;

FIG. 4 shows the plunger extension used to lock the switch in neutral; and

FIG. 5 is a fragmentary exploded perspective further illustrating the arrangement of the parts.

Referring more particularly to the drawings, the fluid pressure responsive device includes pressure tube 10 secured to cup 14 which is mounted on the shoulder 16 of an insulated housing 18. Diaphragm 20 is clamped between the housing and the cup and divides the housing into a pressure chamber 22 and a switch chamber 24. The pressure tube is provided with orifice 12 so that the pressure chamber will be in communication with the fluid being measured. Diaphragm pad 26 has a downwardly extending stud 28 having a reduced lower end portion which projects through a cooperating hole in tongue 32 of switch blade 34. One end of the blade is secured to external contact 36 by rivet 38 and is provided with double contact 40 on its free end. Barrel spring 42 is compressed between the tongue and the blade to normally bias the double contact into engagement with upper switch contact 44 which is connected in the water fill circuit.

When water is run into the machine, pressure will build up in chamber 22 pushing the diaphragm down and compressing spring 46 between stud 28 and cylinder 48. The tongue will move down with the stud compressing the barrel spring until it passes the plane of the blade, snapping the blade upward with the double contact en-

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gaging upper switch contact 50 which is connected to the operating circuit. The water level is determined by the compressive force of spring 46 which is manually set by rotating cam 54 until the desired valley 52 engages cam follower 55 moving cylinder 48 up or down in hole 56 in the housing. Lobes 58 are provided on the cam between the valleys to reset the switch when the cam is rotated by pushing the cylinder up and causing projection 60 to push the tongue up until the blade snaps back into engagement with the fill contact 44.

In the prior Beller device it was possible in some instances for the cam follower 55 on the cylinder to "hang up" on the lobes with the projection 60 holding the tongue down so that it could not respond to the pressure on the diaphragm, thus preventing interruption of the fill circuit and allowing the machine to overfill and flood the area. To prevent this situation bracket 62 is mounted in hole 56 to normally rest on overtravel spring 66 positioned between the bracket and flange 71 of cylinder 48 (see FIG. 2). In this position the bracket has no effect on the switch operation but when the reset cam 54 is rotated to bring a lobe 58 under the follower 55 the cylinder moves up and raises the bracket until tabs 68 about the underside of flange 70 (with spring 66 accommodating overtravel of the cylinder while holding the bracket firmly against the flange). At this time the positive reset pin 49 forces diaphragm pin 28 upwardly so spring 46 can move the tongue 32 overcenter to tend to trip the switch back to contact 44. With the bracket positioned as shown in FIGS. 3 and 5, however, the legs 72 of the bracket prevent the rails 65 of the blade 34 from moving down, thus acting to hold the switch in an incompletely tripped position as shown in FIG. 3. This incompletely tripped position is held as long as the lobe 58 is under the follower, thus preventing machine operation so long as the reset is "hung-up."

The contacts 44 and 50 are located a relatively small distance apart so that a small motion of blade 34 will open one circuit and close the other. Since the mounts for these contacts and flange 70 are molded with the housing, the vertical distance between them can be very accurately determined. With this relationship known, the sides of the bracket can be easily made equal to the distance from the flange to a horizontal line drawn between the contacts. Since these relationships are all predetermined, the bracket lends itself readily to mass production type fabrication.

In operation, cam 54 is manually rotated to the desired level. Normally, the cylinder will be aligned with the valley 52 which has been selected, providing the proper pressure on the spring 46. When the pressure in chamber 22 is sufficient to move the diaphragm down, the bias of the barrel spring on the switch blade will be reversed, snapping the switch from contact 44 to contact 50 to open the water fill circuit. When the pressure on the diaphragm is reduced, spring 46 will push the tongue upward, again reversing the bias of the barrel spring on the blade and closing the water fill circuit for the next cycle. If the pressure is maintained in the pressure chamber and it is desirable to obtain a higher water level, the cam is rotated and lobes 58 will raise cylinder 48, causing pin 49 to push the tongue up, snapping the blade down. Bracket 62 will also move upward, preventing the blade from engaging contact 44. If the cylinder hangs up in this position, the water fill circuit will be open and water will not flow. It can be seen that the switch blade will always be biased in the down direction when the cam is rotated for resetting, due to the action of the plunger, so that the fill circuit will be closed whenever the resetting motion is properly completed.

Although but a single embodiment of the present invention has been illustrated and described, it will be ap-

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parent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. A manually adjustable condition responsive device operated in accordance with a condition comprising, control means, a member movable to operate said control means in response to a change in said condition, loading means exerting a force on and opposing movement of said member in one direction, cam means operatively connected to the loading means and having multiple elevations each providing a different bias on the loading means, reset portions between adjacent elevation portions of the cam, reset means operated by the reset portions, and means operative while the reset portion is effective on the reset means to prevent resetting and allowing completion of reset when the reset portion is not effective.

2. A manually adjustable condition responsive device operating in accordance with a condition comprising, control means, a member movable to operate said control means in response to a change in said condition, loading means exerting a force on and opposing movement of said member in one direction, cam means manually operable to different positions to adjust the force exerted by said loading means on said member, the force exerted by said loading means on said member being different in different positions of said cam means, resetting means actuated by the cam means between the different positions of the cam means, said loading means including means for preventing resetting when the resetting means is effective and allowing completion of reset when the resetting means is not effective.

3. A manually adjustable condition responsive device operated in accordance with a condition comprising, control means, a member movable to operate said control means in response to a change in said condition, loading means exerting a force on and opposing movement of said member in one direction, cam means manually operable to different positions to adjust the force exerted by said loading means on said member, the force exerted by said loading means on said member being different in different positions of said cam, said loading means including means for preventing operation of the control means when the loading means is located between the different positions on the cam means.

4. A manually adjustable condition responsive device operated in accordance with a condition comprising, control means, a member movable to operate said control means in response to a change in said condition, loading means exerting a force upon and opposing movement of said member in one direction, a single multiple position cam manually operable to different positions thereof to adjust the forces exerted by said loading means on said member, the force exerted by said loading means on said member being different in different positions on said cam, a reset member operated by said single cam when and as it is manually moved between its multiple positions to operate said control means, said loading means including means for preventing operation of the control means when the loading means is located between the different positions on the cam.

5. A manually adjustable condition responsive device operated in accordance with a condition comprising, a housing having a top wall with a hole therethrough opening to the top of the housing, control means in said housing, an actuator in said housing movable to operate said control means in response to a change in said condition, a plunger slidably guided in said hole for endwise up-and-down motion, a first spring confined under compression between said plunger and said actuator, a sleeve slidably guided in said hole for endwise up-and-down motion,

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said sleeve operatively engaging said control means, a second spring confined under compression between said plunger and said sleeve, and cam means mounted on the outside of said top wall of said housing, said cam means acting upon said plunger and being manually operable to different positions to adjust the force exerted by said plunger on said actuator, the force exerted by said plunger on said sleeve between different positions of said cam member being sufficient to move the sleeve into contact with the control means to prevent operation of the control means, the force exerted by said plunger on said actuator being different in different positions of said cam means.

6. A manually adjustable condition responsive device according to claim 5 including resetting means operated by said cam means as said cam means is manually operated between its different positions to operate said control means.

7. A pressure switch comprising, a housing having a diaphragm therein adapted to be subjected to pressure variations, a switch in the housing and operatively connected to the diaphragm for actuation thereby between normal and actuated positions, a cam follower slidably mounted in the housing, a loading spring acting between the follower and the switch to oppose the movement of the diaphragm, a cam having multiple positions each of which locates the follower to load the spring for a different opposing force, the cam including re-set lobes between each position and acting on the follower, the follower including a reset member acting on the switch when a lobe is effective to positively move the switch in a direction returning it to its normal position, and means effective only when the reset member is effective to block return of the switch to said normal position.

8. A pressure switch according to claim 7 in which the means comprises a rigid member limiting the switch motion toward the normal position so that when so limited the switch is biased to said normal position but held between its positions.

9. A pressure switch according to claim 8 including a second spring acting between the follower and the rigid member and effective to seat the rigid member against a fixed stop for effective limiting of the switch motion only when a lobe is effective, said second spring being compressible to take up any overtravel of the follower with respect to the rigid member during resetting.

10. A pressure switch comprising, a housing including a diaphragm movable in response to pressure variations, a snap acting switch of the type having elements stressed by an overcenter spring with one element carrying a contact movable between normal and actuated positions, an operative connection between the diaphragm and the switch, a spring for loading the diaphragm, manually operable means for determining the degree of compression of the spring and actuable to select any one of a plurality of compressive loads, reset means operative whenever the compressive load on the spring is changed to positively act on the switch to move it overcenter in a direction returning the contact to its normal position, and means operative only when the reset means is effective to prevent movement of the contact to the normal position and to hold it in a position between said contact positions whereby movement to the normal position can occur only when the reset means has become inoperative.

11. A pressure switch according to claim 10 in which the manual means includes a plunger mounted in the housing, the loading spring being compressed between the switch and the plunger, said last named means comprising a rigid member operative to seat against a housing portion and a second spring acting between the plunger and the rigid member and effective to yieldably hold the rigid member seated as the plunger moves to reset the switch, said member acting against one of the switch elements during resetting to prevent completion of movement of the contact to its normal position.

12. A pressure switch according to claim 11 in which the manual means includes a multi-position cam having valleys determining the position of the plunger and the force of the loading spring, said valleys being separated by reset lobes, the reset means comprising a rigid projection carried by the plunger to actuate the switch in a re-
setting direction when one of the lobes acts on the plunger.

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