

Dec. 9, 1947.

H. F. BARIFFI

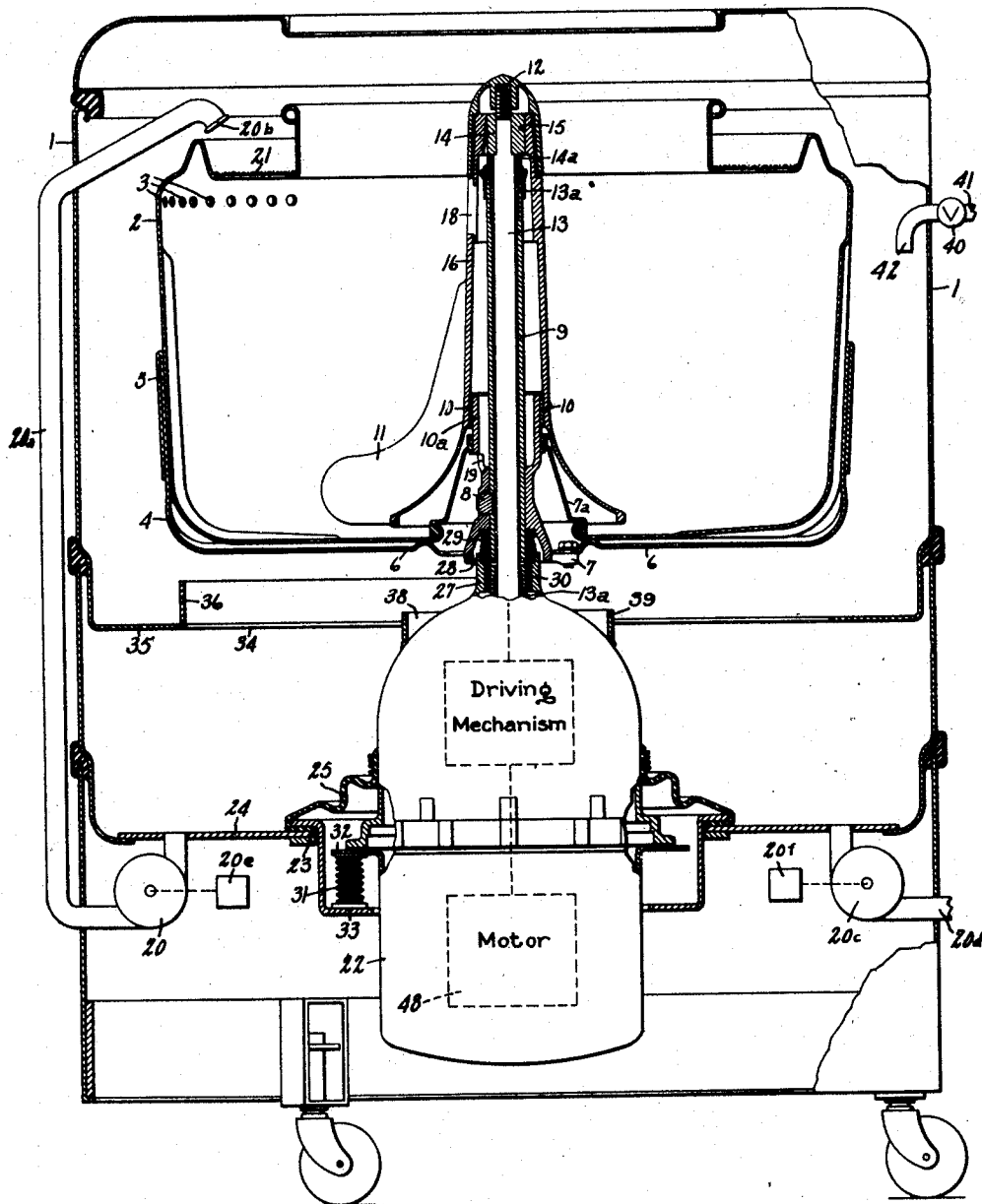
2,432,271

LIQUID OVERFLOW CONTROL MEANS FOR WASHING MACHINES

Filed Aug. 25, 1944

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 2.

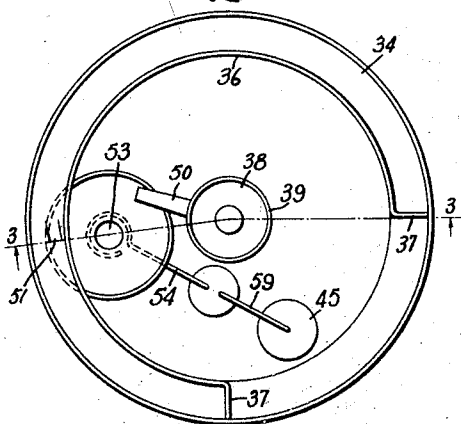


Fig. 4.

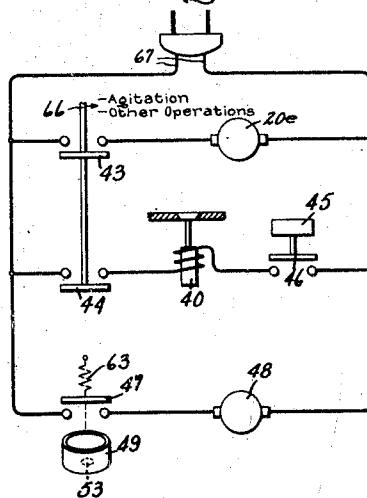


Fig. 3.

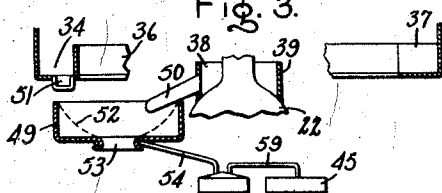


Fig. 5.

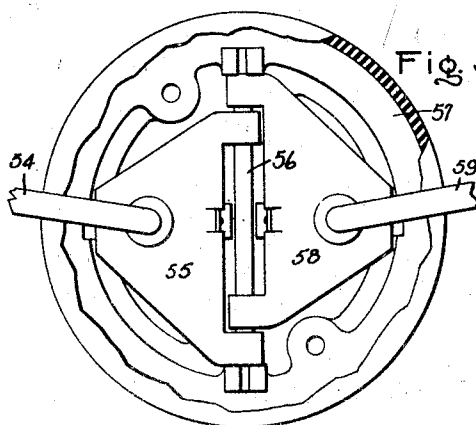
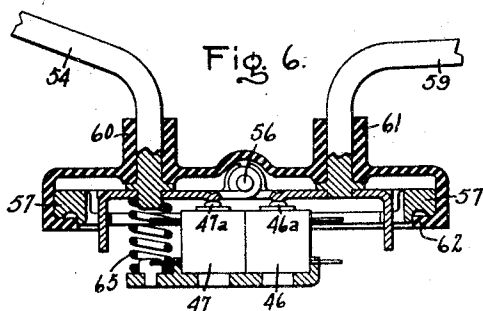


Fig. 6.



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UNITED STATES PATENT OFFICE

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LIQUID OVERFLOW CONTROL MEANS FOR
WASHING MACHINESHerbert F. Bariffi, Hamden, Conn., assignor to
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Application August 25, 1944, Serial No. 551,183

13 Claims. (Cl. 68—23)

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The present invention relates to washing machines of the type in which clothes are washed and centrifugally dried in a spinner basket sufficiently imperforate to hold the wash water during washing.

The object of my invention is to provide an arrangement which insures the proper supply of water for washing and prevents damage to the clothes which might result from washing with insufficient water. For a consideration of what I believe novel and my invention attention is directed to the following description and the claims appended thereto.

In the drawings Fig. 1 is a sectional elevation of a washing machine embodying my invention; Fig. 2 is a top plan view of the lower part of the machine; Fig. 3 is a section on line 3—3 of Fig. 2; Fig. 4 is a fragmentary control diagram showing the part of the control necessary for an understanding of the present invention; Fig. 5 is an enlarged plan view partly broken away of the support for the float and overflow cup; and Fig. 6 is a sectional elevation of the parts shown in Fig. 5.

Referring to Fig. 1 of the drawing, there is shown a washing machine of the construction shown in application Serial No. 551,096, filed August 25, 1944, having an outer casing or tub 1 in the upper part of which is located a spinner basket 2 having centrifugal discharge openings 3 at the region of greatest diameter which during washing are at or slightly above the liquid level. The spinner basket is non-rotatably seated in a carrier 4 having annular walls 5 surrounding the basket and serving as a balance ring and having radial arms 6 bolted to a carrier hub 7 fixed by a clamp 8 to a tubular shaft 9 for driving the spinner basket. The space between the basket and the hub is sealed by a rubber sleeve 7a having its upper end fixed to the hub and its lower end fixed to the basket. At the upper end of the hub is a journal 10a cooperating with a bearing 10 in the lower end of a bladed oscillatory agitator 11 fastened by a nut 12 to the upper end of a drive shaft 13 journaled in bearings 13a in the spinner shaft 9. The shaft 13 has fixed thereto an agitator drive nut 14 fitting in a complementary socket 15 in the agitator hub 16. A shaft seal 14a is provided between the upper ends of the spinner and agitator shafts 9 and 13.

In the agitator hub 16 slightly below the wash water level in the spinner basket are drain passages 18 leading to the space between the spinner shaft 9 and the agitator hub 16. The water

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draining through these passages flows through the space between the shaft 9 and the agitator hub and through passages 19 in the carrier hub 7 to the bottom of the outer casing 1 whence it is pumped onto an annular filter 21 on the rim of the spinner basket by a circulating pump 20. The pump has its inlet connected to the lowermost part of the casing and its discharge connected to a conduit 20a having a nozzle 20b directed onto the filter. The pump is operated during washing so the wash water is continually withdrawn from the spinner basket through the passages 18 and 19 and openings 3 and returned to the basket through the filter 21. The continuous circulation and filtering of the water removes lint and other particles and keeps the wash water clean for washing. There is also provided a drain pump 20c having its inlet connected to the lowermost part of the outer casing 1 and its discharge connected to a conduit 20d leading to a drain. The pumps 20, 20c are driven by separate motors 20e, 20f.

The concentric spinner and agitator drive shafts 9 and 13 are driven by suitable mechanism (for example that disclosed in the aforesaid application) enclosed within a sealed mechanism casing 22 having its upper end projecting through opening 23 in the bottom wall of the outer casing. The space between the casing 22 and the wall 24 is sealed by a flexible annular rubber ring 25 having its inner edge clamped to the casing 22 and its outer edge clamped to the wall 24. The upper end of the casing 22, which is above the maximum water level in the outer casing 1, is provided with a reduced hub 27 which projects within a skirt 28 at the lower end of the hub 7 and is provided with a seal 29 and a sleeve bearing 30 for the spinner shaft 9.

During both washing and centrifugal drying the upper part of the mechanism casing 22 is cooled by the wash water. During washing, the wash water falls onto the upper end of the casing from the passages 19. During centrifugal drying, the wash water discharged through the centrifugal discharge openings 3 falls into the bottom of the outer casing and partially submerges the upper end of the mechanism casing.

The spinner basket and the associated driving mechanism contained within the casing 22 are resiliently supported by springs 31 arranged between a flange 32 on the casing 22 and a supporting flange 33 depending from the bottom wall 24 of the outer casing. The springs permit gyratory movement of the spinner basket during centrifugal drying so that the spinner basket rotates

substantially about its center of mass, and also permit lateral movement of the casing 22 which lowers the node of vibration. The stiffness of the springs is such that the critical speed is of the order of 100 R. P. M., which is substantially below the centrifugal drying speed of 1200 R. P. M.

During washing, the spinner basket assumes a tilted position due to uneven distribution of clothes so that the overflow from the centrifugal discharge openings 3 during washing occurs primarily on the side toward which the spinner basket is tilted. The overflow through the openings 3 falls into a trough 34 which, as shown in Fig. 2, surrounds substantially three-quarters of the circumference of the spinner basket. The trough is formed by a flange 35 extending inwardly from the outer casing and having inner and end walls 36, 37. The construction of the trough is such that in any position of the spinner basket during washing, a substantial proportion of the water overflowing the spinner basket falls into the trough. Overflow from the spinner basket through the passages 18 and 19 in the agitator and spinner hubs falls onto the upper end of the casing 22 and is collected in a reservoir 38 formed by an annular wall 39 at the upper end of the casing 22. The collecting of water in the reservoir 38 provides for a better heat transfer and improves the water cooling of the driving mechanism contained within the sealed casing 22.

Water is supplied to the machine through a solenoid valve 40 in a water supply conduit 41 having a discharge nozzle 42 directed against the part of the flange 35 between the ends 37 of the trough. The flange is slightly below the bottom of the spinner basket, and the water discharged onto the flange 35 splatters over the side and bottom walls of the spinner basket, quenching the soapsuds which may interfere with the centrifugal drying.

Whenever the machine is to be used for washing, a switch 43 is closed, energizing the circulating pump motor 20e and a switch 44 is closed energizing the solenoid valve 40 and causing a supply of water through the nozzle 42 to the bottom of the outer casing. The amount of water supplied is controlled by a float 45 which opens a switch 46 whenever the water level in the bottom of the outer casing exceeds a small amount (e. g., 1"). The water level in the bottom of the outer casing is maintained at the level necessary to open the switch 46 by the accumulation of water in excess of that required to fill the spinner basket to overflowing. If at the start of the washing operation there is some water in the bottom of the outer casing, the water supply will not start until the float switch 46 is closed. With this control it is therefore impossible to supply an excess of water to the machine.

Because the presence of an amount of water in the bottom of the outer casing sufficient to open the float switch 46 is not always an indication that the spinner basket is filled to the proper level for washing, an auxiliary switch 47 is provided in the circuit to the main driving motor 48 which is closed by water overflowing from the spinner basket. The switch 47 is operated by a cup 49 arranged to receive water overflowing the spinner basket from tangentially directed nozzles 50 and 51 leading respectively from the reservoir 39 and the trough 34. The tangential discharge of water from the nozzles 50, 51 sets up a whirling vortex motion of water in the cup which assumes a level indicated by dotted line 52 (Fig. 3). At the

center of the cup is a large drain opening 53 (e. g., 1" in diameter) which, due to its large diameter will not clog. The vortex action induced by the tangential discharge decreases the drainage through the opening 53 and therefore increases the amount of water retained in the cup. With a 6" diameter cup having a drain opening 1" in diameter, the vortex action increases the amount of water retained in the cup from $\frac{1}{4}$ lb. to $1\frac{1}{4}$ lb. The cup is carried by an arm 54 fixed to a hinge 55 pivoted on a hinge pin 56 in a plate 57 fastened to and covering a registering opening in the bottom wall 24 of the outer casing. Also hinged on the hinge pin 56 is a hinge 58 to which is fixed an arm 59 carrying the float 45. On the upper side of the plate 57 is a rubber sealing member having integral sleeves 60, 61 sealed to the arms 54, 59 and having an inwardly extending flange 62 clamped between the plate 57 and the wall 24 to provide a gasket. The switches 46 and 47 are mounted on the under side of the plate 57 and have operating members 46a and 47a arranged in operative relation to the hinges 55 and 58. The switch 46 is opened whenever the float is raised due to the presence of 1" or more of water in the bottom of the outer casing. The switch 47 is closed whenever the weight of water in the cup 49 is sufficient to overcome the pressure of a spring 65 on the under side of the hinge 55 which tends to maintain the cup in an elevated position. The tension of the spring 65 is adjusted so that the switch is closed only when the overflow from the basket is sufficient to maintain the cup filled. The presence of this overflow is an indication that the basket is filled to the proper or at least the minimum desired level for washing.

The specific lever and switch mounting structure shown in Figs. 5 and 6 is not claimed herein, it forming subject matter invented by Thomas T. Woodson and claimed in his application, Serial No. 651,156, filed March 1, 1946, and assigned to the same assignee as my instant application.

Although two constructions are shown for collecting the overflow from the spinner basket, the trough 34 and the reservoir 38, only one of these constructions is necessary. The trough 34, being fed from a large number of the centrifugal discharge openings 3, is more reliably responsive to the water level in the spinner basket. Due to the large number of centrifugal discharge openings the rate of flow of each opening is slow, and it is unlikely that a sufficient number of the openings will be restricted by clothing to prevent proper operation of the overflow control of agitation. The disadvantage of the trough is that it also receives the liquid centrifugally discharged from the spinner basket so that if the machine is shifted from centrifugal drying to washing at a time when the trough is filled with centrifugally discharged liquid as distinguished from overflowing liquid, the presence of this liquid in the trough would cause the closure of the switch 47 and permit operation of the agitator until the liquid drained from the trough. By properly sloping the trough, this false agitation can be minimized. The reservoir 38 is not subject to this defect since it is filled solely by liquid flowing through the openings 18 and 19. These openings are relatively few in number and of small area, and hence the rate of flow through the openings is relatively slow. It is possible that small articles of clothing may be drawn against the openings and reduce the flow below that required to maintain the switch 47 closed. This would cause the opera-

tion of the agitator to stop and the agitation would be resumed after the obstruction had cleared. Another disadvantage of this construction is the inaccessibility of the drain passages from the openings 18 for inspection and cleaning. Despite these disadvantages this latter construction is probably preferable.

In Fig. 4 is shown that part of the washing machine control necessary for an understanding of the present invention. The control is diagrammatically illustrated as having a member 66 which is movable manually or automatically to positions in which the agitator operates, which may be washing, rinsing, or soaking, and to other positions in which other operations take place. The member 66 is illustrated as having only two positions, but it will be understood that in actual practice it may have more positions. In the position (or positions) in which the agitator is to operate, the member 66 closes the switch 43, connecting the circulating pump motor 20e across the power supply 67 and also closes the switch 44, connecting the solenoid valve 40 and the float switch 46 across the power supply. The starting of the circulating pump causes the pumping of water from the bottom of the outer casing into the spinner basket. Whenever the water level in the outer casing is less than 1", the float switch 46 is closed and the solenoid valve 40 is energized to open the water supply conduit 41. As soon as the water level in the outer casing rises to 1", the float switch 46 is opened and the supply of water is shut off. When the spinner basket is filled to the proper level for agitating the overflow through either the centrifugal discharge openings 3 or the passages 18 and 19 causes the filling of the cup 49, which closes the switch 47 in circuit with the main driving motor 48. Until the overflow from the spinner basket is at a rate sufficient to maintain the switch 47 closed, the agitator is stationary. It is therefore impossible to operate the agitator until the spinner basket is filled to the proper level.

As pointed out above, pump 20 is operated to continuously circulate water during the washing period. To keep the washing machine agitator operating, this circulation must be sufficient so that the overflow to cup 49 will maintain the switch 47 closed. Thus the cup functions not only to insure that the spinner basket is filled initially to the desired level for washing but also that throughout the washing period it is continuously maintained so filled. If at any time during the washing operation overflow falls below a predetermined amount, indicating that the level in the basket is low, switch 47 will open, stopping the motor 48 until the level is again established.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine, a tub, a liquid holding clothes receptacle in the tub in which a washing operation is performed, means for circulating liquid from the tub to the receptacle from which the liquid overflows back to the tub, a motor for effecting a washing operation in the tub, an electric circuit for the motor, a switch for said circuit, and means actuated by overflow liquid from said receptacle for actuating said switch whereby washing operation can begin and continue only when there is overflow from the receptacle back to the tub.

2. In a washing machine, a tub, a liquid holding clothes receptacle in the tub in which a washing operation is performed, means for circulating liquid from the tub to the receptacle from which the liquid overflows back to the tub,

a motor for effecting a washing operation in the tub, an electric circuit for the motor, a switch for said circuit, a movable member for actuating said switch, and means for receiving overflow liquid from the receptacle and directing it to said movable member to effect movement of said member whereby washing operation can begin and continue only when there is overflow from the receptacle back to the tub to effect movement of the movable member to actuate said switch.

3. In a washing machine, a liquid holding clothes receptacle having an overflow for liquid in excess of the desired minimum amount, agitating means for washing, a cup having a center drain opening, means for directing overflowing liquid tangentially into the cup whereby a whirling motion is set up moving liquid outward from said drain opening, and means responsive to the weight of the cup and contents for controlling operation of the agitating means.

4. In a washing machine, a tub, a spinner basket having centrifugal discharge passages at the region of the desired liquid level in the basket for washing, washing means for clothes in the basket, means including said discharge passages for maintaining a continuous circulation and overflow of liquid during the washing operation, a trough for receiving liquid overflowing through said passages, a drain in the trough, a cup for receiving the trough drainage, and means responsive to the weight of the cup and contents for controlling the operation of the washing means.

5. In a washing machine, a tub, a spinner basket having centrifugal discharge passages at the region of the desired liquid level in the basket for washing, washing means for clothes in the basket, means for resiliently supporting the basket for gyratory movement during spinning of such stiffness that the basket may assume a tilted position during washing, a trough on the tub arranged to receive overflow through the centrifugal discharge openings in any position of the basket during washing, and means actuated by a predetermined drainage from the trough for controlling the washing means.

6. In a washing machine, a spinner basket having a hub at the center, an agitator having a hub surrounding the spinner basket hub, a casing below the spinner basket hub containing mechanism for operating the agitator and for rotating the spinner basket, drain passages leading through the agitator hub from the desired wash liquid level and through the spinner basket hub to said casing, walls on the casing defining a reservoir collecting the drainage from said passages, a drain from said reservoir, and means responsive to the rate of drainage from said reservoir for controlling the operation of said agitator.

7. In a washing machine, a tub, a spinner basket therein having overflow openings for liquid in excess of the desired minimum for washing, a pump for pumping liquid from the tub to the basket, means for supplying liquid to the machine, means responsive to a predetermined accumulation of liquid in the tub for shutting off the liquid supply, washing means in the basket, and means actuated by a predetermined overflow from the basket during washing for controlling the operation of the washing means.

8. In a washing machine, a tub, a spinner basket therein having overflow openings for liquid in excess of the desired minimum for washing, a pump for pumping liquid from the tub to the basket to effect continuous circulation of liquid

during washing, washing means in the basket, and means actuated by a predetermined overflow from the basket for controlling the operation of the washing means.

9. In a washing machine, a tub, means for supplying liquid to the tub, a spinner basket in the tub having overflow openings for liquid in excess of the desired minimum for washing, said tub having storage space for the liquid contents of the basket whereby wash water is usable for a plurality of loads of clothes, a pump for pumping liquid from the tub to the basket to effect continuous circulation of liquid during washing, washing means in the basket, means actuated by a predetermined overflow from the basket for controlling the operation of the washing means, and a control movable to a washing position in which the pump, the liquid supply, and the washing means are conditioned for operation.

10. In a liquid flow responsive device, a movable cup into which the receiving liquid flows, means for setting up a vortex within the cup, a drain in the cup at the center of the vortex whereby the amount of liquid retained in the cup is increased by the vortex action, and control means responsive to movement of the cup due to the amount of liquid in the cup.

11. In a liquid flow responsive device, a movable cup, a tangential inlet to the cup for liquid whereby a vortex is set up in the cup, a drain in the cup at the center of the vortex whereby the amount of liquid retained in the cup is increased by the vortex action, and control means responsive to movement of the cup due to the amount of liquid in the cup.

12. In a washing machine, the combination of a tub, a basket in the tub in which a washing operation is performed, a driving motor, a pump for circulating liquid from the tub to the basket from which it overflows back to the tub, a valve through which liquid is supplied to the tub, control means comprising a motor circuit, a liquid supply valve circuit and a circulating pump cir-

cuit, switch means for closing simultaneously the circulating pump circuit and the supply valve circuit, a float operated switch in the supply valve circuit which is opened when the water level in the machine reaches a predetermined high level, and an overflow switch in the motor circuit which is closed when the overflow reaches a predetermined amount.

13. In a washing machine, the combination of a tub, a clothes receptacle in the tub, washing means in the clothes receptacle, a motor for operating the washing means, a circulating pump for circulating liquid from the tub to the receptacle during washing, a liquid supply valve, electric circuits for the motor, the circulating pump and the liquid supply valve, switch means for closing the circulating pump circuit and the liquid supply valve circuit, an overflow switch in the motor circuit which is closed by overflow of liquid from the receptacle to the tub, and a float switch in the liquid supply valve circuit which is opened when the volume of liquid in the tub reaches a predetermined level.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

	Number	Name	Date
	2,233,561	Kalle	Mar. 4, 1941
	2,018,361	Henszey	Oct. 22, 1935
	2,161,604	Watts	June 6, 1939
35	2,258,227	Skinner	Oct. 7, 1941
	2,142,927	Walker	Jan. 3, 1939
	1,891,842	Schmidt	Dec. 20, 1932
	2,296,262	Breckenridge	Sept. 22, 1942
	2,298,905	Skinner	Oct. 13, 1942
40	2,341,897	Bariffi	Feb. 15, 1944
	2,155,868	Pauly	Apr. 25, 1939
	1,601,380	Swerdfeger	Sept. 28, 1926
	1,840,101	Jespersen	Jan. 5, 1932