

July 26, 1949.

W. F. OLIVER
WATER CONTROL MECHANISM FOR
AUTOMATIC WASHING MACHINES

2,477,415

Filed Sept. 27, 1946

4 Sheets-Sheet 1

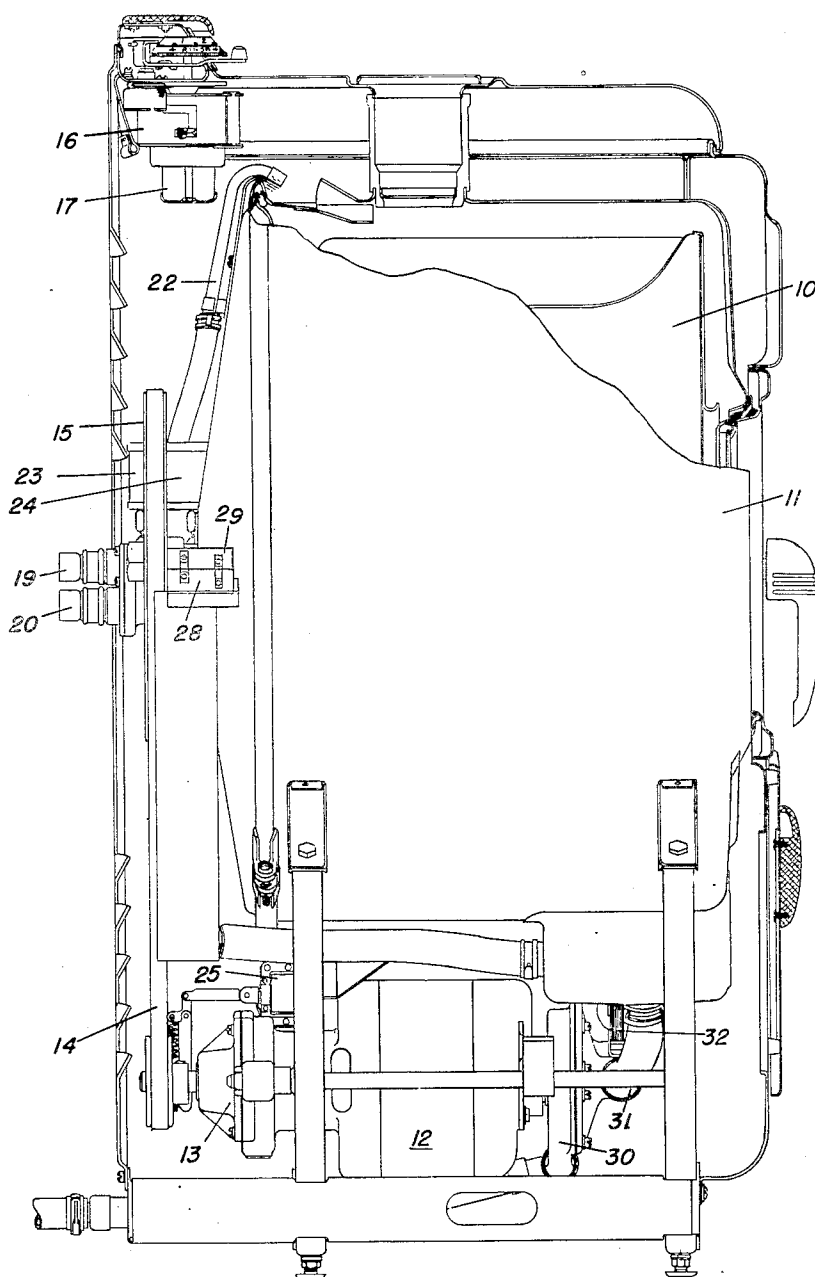


FIG. 1

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4 Sheets-Sheet 2

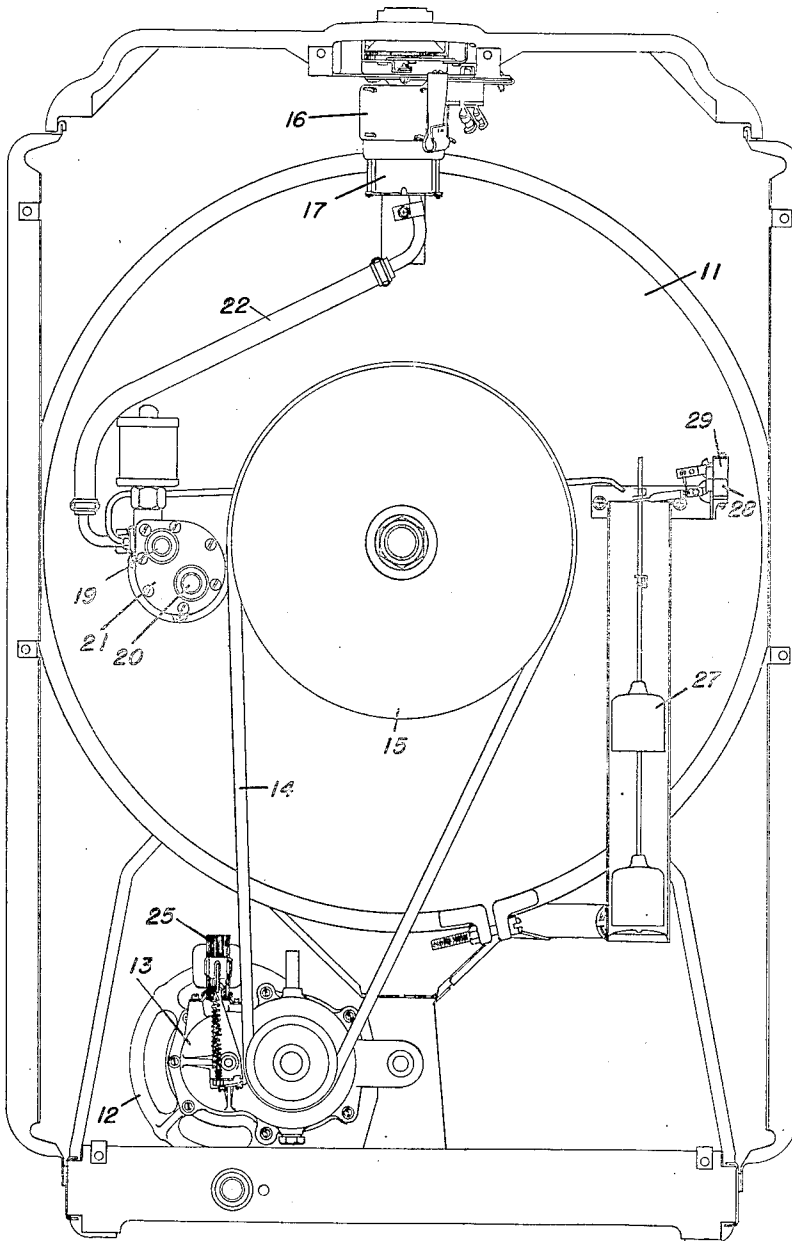


FIG. 2

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4 Sheets-Sheet 3

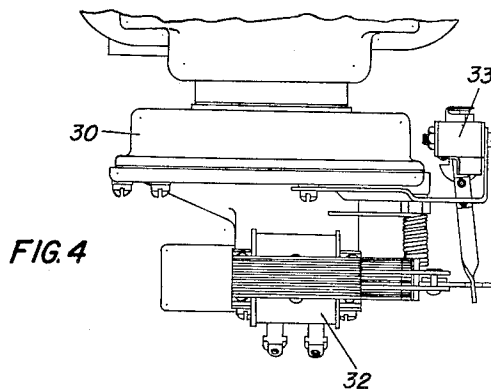


FIG. 4

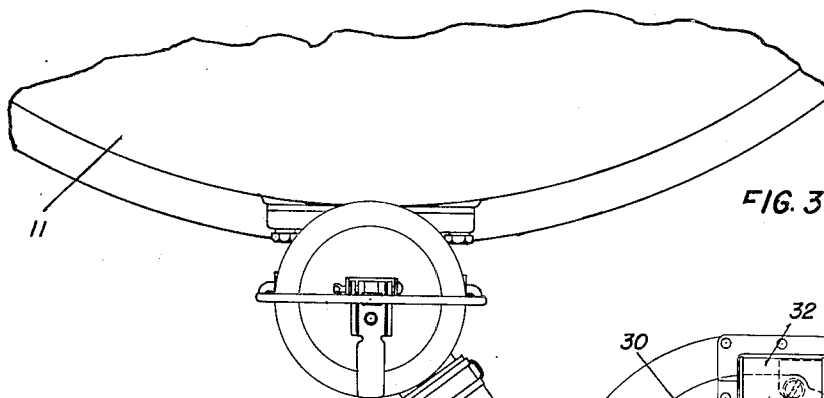


FIG. 3

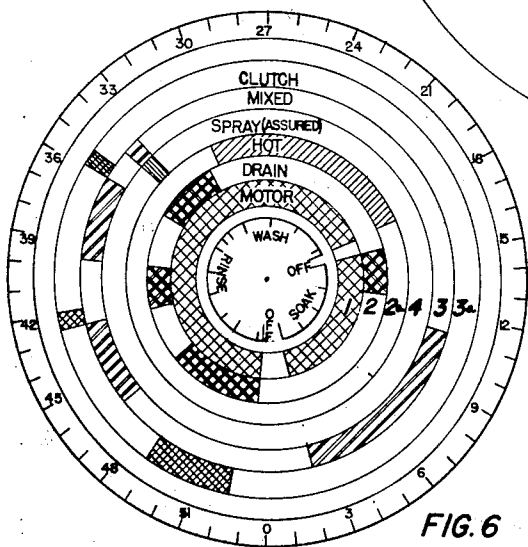
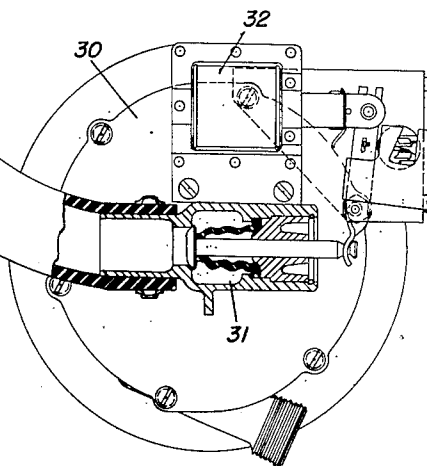


FIG. 6



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4 Sheets-Sheet 4

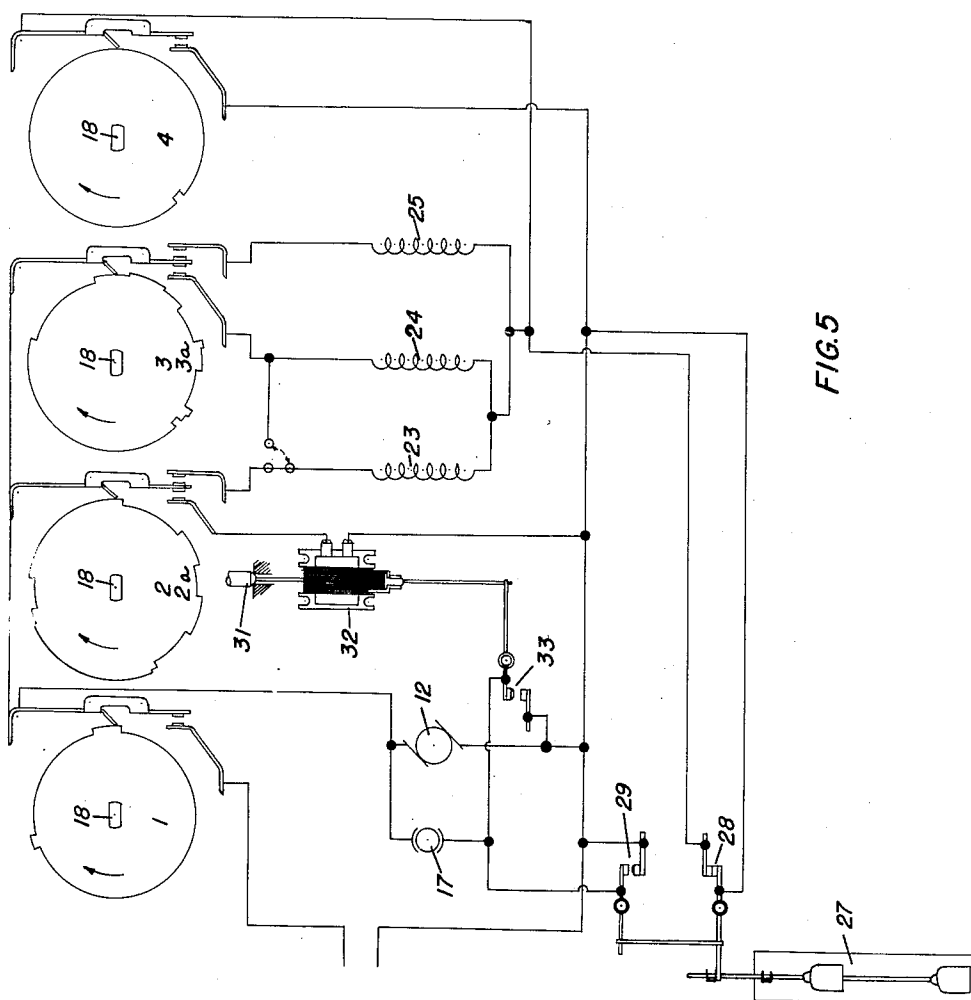


FIG. 5

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UNITED STATES PATENT OFFICE

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WATER CONTROL MECHANISM FOR
AUTOMATIC WASHING MACHINES

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In Mexico July 19, 1946

5 Claims. (Cl. 137—68)

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This invention relates to water control mechanism for automatic washing machines particularly to means for interrupting the drive of the timer mechanism during the time that the machine is filling with water.

In automatic washing machines for domestic use having sequential timers comprising switch mechanisms closing circuits in proper time relationship for carrying through a predetermined cycle of operations including filling the tub with water followed by washing operations, draining and subsequent refilling for rinsing, the mechanisms for tub filling operations are designed to operate with water under sufficient pressure so that the machine will be filled to the desired level in an allocated amount of time. However, having set up a definite time relationship for a given set of conditions in a cycle for normal water pressure it sometimes happens that in locations where water pressures fluctuate and are often reduced below the normal amount then the time allocated for filling the machine is not sufficient to obtain the required amount of water. In order that the machine may be capable of operating under these low pressure conditions to obtain sufficient water and also to be capable of operating under the normal time cycle when water pressure is normal it is advantageous that the timer drive mechanism be stopped after water begins to flow and during the time that the machine is filling with water and to rely upon mechanism responsive to water level to start the timer mechanism and to shut off the water.

It is therefore a primary object of the present invention to provide mechanism which will automatically interrupt the timer drive during the time that the machine is filling with water and again start the timer mechanism after the filling operation is accomplished.

The above and other objects of the invention will appear more fully from the following more detailed description and by reference to the accompanying drawings forming a part hereof and wherein.

Figure 1 is a side view of the machine of the type on which the mechanism is installed.

Figure 2 is a rear view of the machine showing the general arrangement.

Figure 3 is a view of the pump and drain valve and the connections to the tub together with the special switch mechanism employed with this invention.

Figure 4 is a top view of the mechanism shown in Figure 3.

Figure 5 is a wiring diagram showing the gen-

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eral arrangement of the several parts necessary to accomplish the results desired.

Figure 6 is a diagram showing the cycle of operations of the machine.

Referring to the drawings, Figures 1 and 2 show a washing machine of the so-called automatic cycle type in which a perforated clothes containing cylinder 10 is mounted for rotation in a tub 11. The cylinder 10 is rotated from a driving motor 12 through a transmission 13 and a belt drive 14 from the transmission to a pulley 15 connected to rotate the cylinder 10. A timer assembly 16 driven by a synchronous electric motor 17 (Figures 1 and 2) carries a plurality of cams on a single shaft 18 (Figure 5), the four cams numbered 1, 2, 3 and 4 on the shaft 18 being shown diagrammatically in Figure 5. The shaft 18 is rotated by the synchronous motor 17 and is carried in the housing of the timer 16.

For the purpose of furnishing water to the tub, hot and cold water inlet connections 19 and 20, from suitable supply of water under pressure, are provided, which connections feed into a thermostatically operated water mixing valve 21. The mixed water from this mixing valve is fed into the top of the tub through an inlet conduit 22 shown in Figure 1. Controls for the water mixing valve 21 include a hot water solenoid 23 the actuation of which causes hot water to be fed directly from the hot water conduit 19 into the tub 11 and a mixed water control solenoid 24 the actuation of which causes mixed water to be fed into tub 11 at a temperature determined by the thermostatic control of the valve 21. The cylinder 10 is rotated at a relatively slow speed of about 60 R. P. M. for washing operations and such a slow speed is accomplished through the gear ratio afforded by the transmission 13. However, the transmission 13 is also provided with a second gear ratio affording a higher speed of rotation for centrifugally extracting water from the clothes carried in the perforated cylinder 10 by a higher speed of rotation. This higher speed of rotation is put in operation by actuation of shifter solenoid 25 shown in the diagrammatic view of Figure 5.

A drain assembly for draining water from the tub is provided comprising a continuously rotating drain pump 30, a drain valve 31 and a solenoid 32 for opening the drain valve to allow water from the tub to flow into the rotating drain pump.

A float chamber and float assembly 27 indicates water level in the tub and connection of the float to a snap switch 28 controls water flow as will be further explained below.

The washing machine mechanism so far de-

scribed is of the general type shown in U. S. Patent Number Re. 22,375 and the cycle of operation preferred for the several units is that shown in the cycle diagram of Figure 6. As shown in that diagram the several mechanisms controlled by the four cams numbered 1, 2, 3 and 4 in Figure 5 are actuated by closing circuits for the time shown by the arcuate shaded portions of Figure 6. The complete circumference of any concentric circular arc represents the rotation of the timer cam for one revolution and the numerals on the outer dial represent time in minutes from the zero position at the bottom of the dial reading counter-clockwise around the dial as shown. It is thereby possible to determine by inspection of Figure 6 that during the soak operation, for instance, the mixed water solenoid 24 is actuated by closing the circuit thereto during the portion of the arc 3 shown while the motor 12 is in operation continuously as shown by the arc 1 and the drain valve 31 is open for the time shown by the arc 2. Continuing counterclockwise around the several arcs the contacts controlling the several units are closed for the times shown by the shaded portions. These closed circuit times correspond to the closing of contacts by cams 1, 2, 3 and 4 on Figure 5. In case of the two water control solenoids 23 and 24, however, as well as the shifter solenoid 25 controlling the clutch, a series connection is provided with the float snap switch 28 controlled by the water level float 27 on the tub and this float switch 28 is opened when the tub is filled to the desired level and therefore interrupts the circuit to the water control solenoids and stops the flow of water regardless of whether or not the timer controlled circuit is actuated. This snap switch 28 remains open until the water has drained from the tub when it is again actuated by the float as shown and therefore the shifter solenoid controlling the shift from low to high speed for the transmission 13 cannot be actuated until the switch 28 is thus closed by the float position corresponding to the low level of the water in the tub.

The mechanism above described has been used on automatic washing machines and was adequate when sufficient pressure was available to assure sufficient flow of water to fill the tub during the time that the timer control cam provides a closed circuit to the solenoid, the float switch being depended upon to open the circuit to stop the flow of water when the tub becomes filled to proper level before the expiration of the time allocated on cycle chart Figure 6 cam 2A or 3. However, it is sometimes the case where the water pressure is not adequate or fluctuates during operation, the time allocated on the timer dial for closing the circuit to the water control solenoid is not sufficient and therefore the timer dial control will shut off the water flow before the required level has been reached. In such case the float control switch 28 never has a chance to operate since the tub is not sufficiently filled to cause such operation. In order to provide for such conditions and still maintain the same type of mechanism for normal operation some means to cause the circuit to the synchronous motor 17 to be interrupted and cause rotation of the timer cams to stop during the time that the tub is filling with water will provide a satisfactory operation with low water pressure since the tub will begin to fill with water after the circuit to the solenoid is closed and the timer rotation will stop and after the tub is filled to the desired point the float switch 28 will shut off the circuit to the

water controlled solenoid 23 or 24. If the timer motor 17 is again started in its rotation after the tub is filled the switch controlled by the timer continues to be closed but the circuit to the water inlet solenoids 23 and 24 would be interrupted by the float switch 28 and the washing or rinsing operation would be continued, it being immaterial that the timer controlled switch would be closed since the series located switch would be open.

In order to accomplish this result of interrupting the circuit to the timer motor 17 a second snap switch unit 29 is provided adjacent the float switch 28. This second snap switch 29 is identical with the float switch 28 but is so connected that when the float switch 28 is open the switch 29 is closed and when the switch 28 is closed the switch 29 is open. Another switch 33 is necessary and is mounted to be actuated with the drain solenoid 32 and so is arranged that when the drain solenoid is closed this switch 33 is open and when the drain solenoid 32 is actuated to open the drain valve 31 the switch 33 is closed. Each of these switches 29 and 33 are connected in a separate circuit either of which circuit will feed current to the synchronous timer motor 17 as shown in diagram Figure 5, so that with the switches connected as above described the float operated switch 29 will be open when the float control is at the bottom of the tub indicating an empty tub and will remain open until the tub is filled with water. Likewise when the drain valve 31 is closed the switch 33 will also be open and therefore during the operation of filling the tub no current will be available for rotation of the timer motor 17. However, immediately on the filling of the tub with water, that is when the float reaches the top of its stroke the switch 29 will be closed by operation of the float and will start the timer motor in operation. Thus at any time when the drain valve is closed and the machine becomes empty of water the timer motor will stop and will not start again until the tub is filled to desired level. It is of course important that the control to the solenoid water valve be such that the circuit to the solenoids 23 and 24 controlled by cams 2A and 3 will be closed in proper sequence so that the water valve will be supplying water to the tub when the timer is stopped. It is therefore apparent that provision has been made to complete a circuit to the timer motor by either of two separate switches 29 or 33, the closing of either of which will provide current but the necessity remains that both switches must be open before the circuit to the timer motor will be interrupted. The relationship of the several mechanisms is such that in operating ranges with driving motor 12 operating and whenever the drain valve is closed and the float is at the bottom of its travel or moving from the low level position to the filled position then the water valve will also be actuated to feed water into the machine and under such conditions the above description has explained that the circuit to the timer motor is interrupted and the cams cease to rotate. Water therefore flows into the tub and continues to flow until float switch 28 and float operated switch 29 respectively shut off the circuit to valve solenoid 23 or 24 and close the circuit to timer motor 17 to again start the timer cams 1, 2, 3 and 4 in rotation. Washing or rinsing operations will then continue with full quantity of water assured regardless of the time

required for water to flow to fill the tub to the required level.

This invention is distinct from and an improvement upon the invention disclosed in United States Patent 2,288,141 by Wallace F. Oliver, issued June 30, 1942.

Although the invention has been described by reference to a specific structure found practical in actual operation various modifications are possible without departing from the fundamental principles herein disclosed and such modification is contemplated within the scope of the following claims.

I claim:

1. In an automatic washing machine, an electromagnetic operated valve for admitting water to said machine, a water level responsive mechanism, a drain valve, electromagnetic means for opening said drain valve, an electric sequence switch mechanism for actuating said water inlet valve and said drain valve, an electric drive motor for operating said sequence switch, separate circuits to said electric drive motor, a snap action switch in each of said circuits, said electrical sequence switch arranged to open said inlet valve prior to the opening of either of said snap switches, one of said switches arranged to close on opening of said drain valve and the other of said switches arranged to close when said water level responsive means indicates a predetermined maximum water level.

2. In an automatic washing machine, an electric sequence switch for controlling a plurality of circuits, a water admission valve controlled by said sequence switch, an electric motor drive for said sequence switch, two circuits to said electric motor drive the closing of either of which will cause operation of said drive, a snap action switch in each of said circuits, said electrical sequence switch arranged to open said water admission valve prior to the opening of either of said snap switches, a drain valve for said washing machine, a water level responsive means for said machine, said drain valve opening one of said switches on closing of said valve and closing said switch on the opening of said valve, said water level responsive means connected to operate the other of said switches in the other of said circuits in such relation as to open said switch at the minimum water level and retain said switch in open position until a predetermined maximum water level is reached, whereby said electric drive means for said sequence switch is interrupted in its operation when said drain valve is closed and when said water level is in a position of minimum water level or in a position between minimum water level and maximum water level.

3. In an automatic washing machine, a drain valve, a water level responsive means, a sequence switch, a water admission valve controlled by said sequence switch, an electrical drive mechanism for said sequence switch, a snap action switch operated by said water level responsive

means to open a circuit to said drive mechanism at minimum water level and during time said water level is rising from minimum to maximum and closing said switch at maximum water level, a second snap switch also connecting a circuit for actuation of said drive mechanism controlled by actuation of said drain valve so that said switch is open when said drain valve is closed and said switch is closed on opening of said drain valve, said electrical sequence switch being arranged to open said water admission valve prior to the opening of either of said snap switches.

4. An automatic washing machine mechanism, a drain valve, mechanism for opening and closing said drain valve, a water level responsive means, mechanism to inject water into said washing machine when said water level responsive means is at a minimum level and during the time said water level responsive means is moving from a minimum to a maximum level, and during the time said drain valve is closed, a sequence switch for causing said operations, drive means for said sequence switch, a circuit to actuate said drive controlled to be opened when said drain valve is closed and a second switch also to actuate said drive and positioned to be opened when said water level responsive means is at a minimum or when moving from a minimum to a maximum whereby the drive for said sequence switch will be interrupted during filling of said machine with water.

5. In an automatic washing machine of the character described having an electrically controlled inlet valve for admitting water to said machine, a water level responsive mechanism, a draining mechanism, means for actuating said draining mechanism to remove water from said machine, an electric sequence switch mechanism, an electric drive for said sequence switch, two separate circuits each capable of actuating said electric drive, a snap action switch in each of said circuits, said electrical sequence switch being arranged to open said inlet valve prior to the opening of either of said snap switches one of said switches arranged to close on actuation of said draining mechanism to remove water from said machine and to be otherwise open and the other of said switches arranged to close when said water level responsive means reaches a predetermined high water level and to remain open from low water level to said predetermined higher water level during admission of water into said machine.

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REFERENCES CITED

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

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