

Oct. 22, 1940.

K. CLARK

2,218,698

WASHING MACHINE

Filed Aug. 9, 1937

3 Sheets-Sheet 1

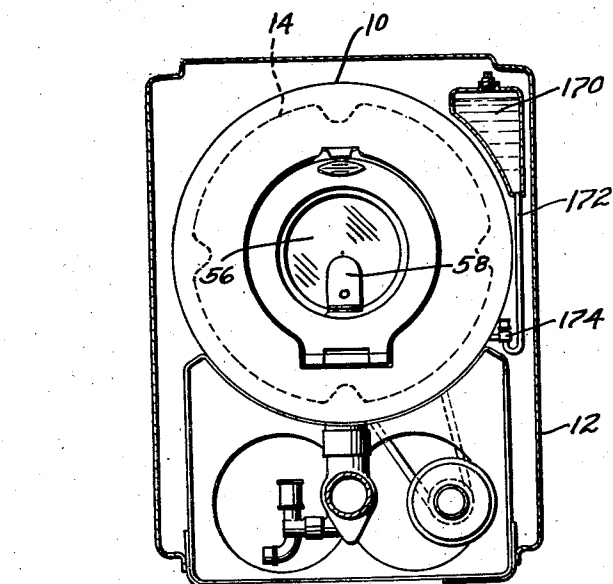
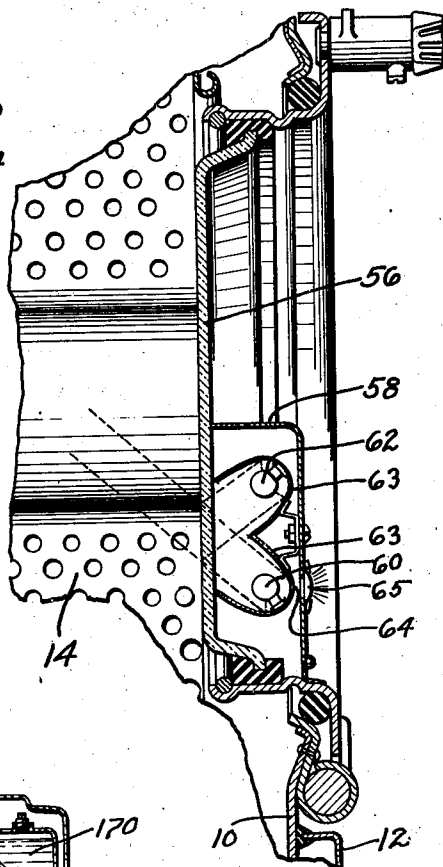
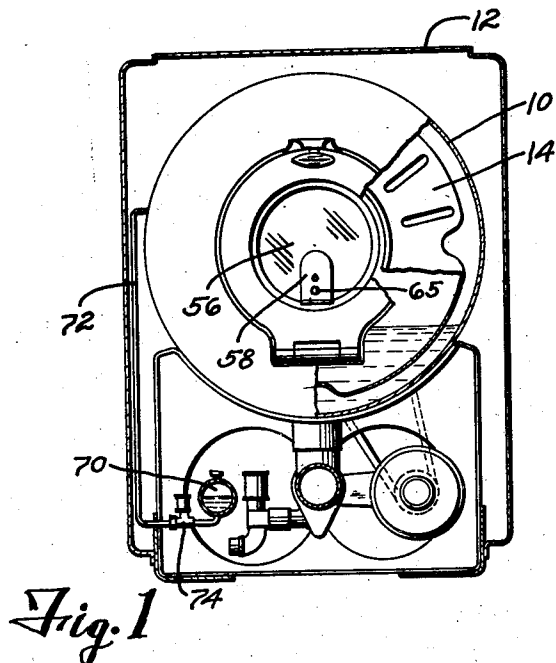


Fig. 2

Fig. 4

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Oct. 22, 1940.

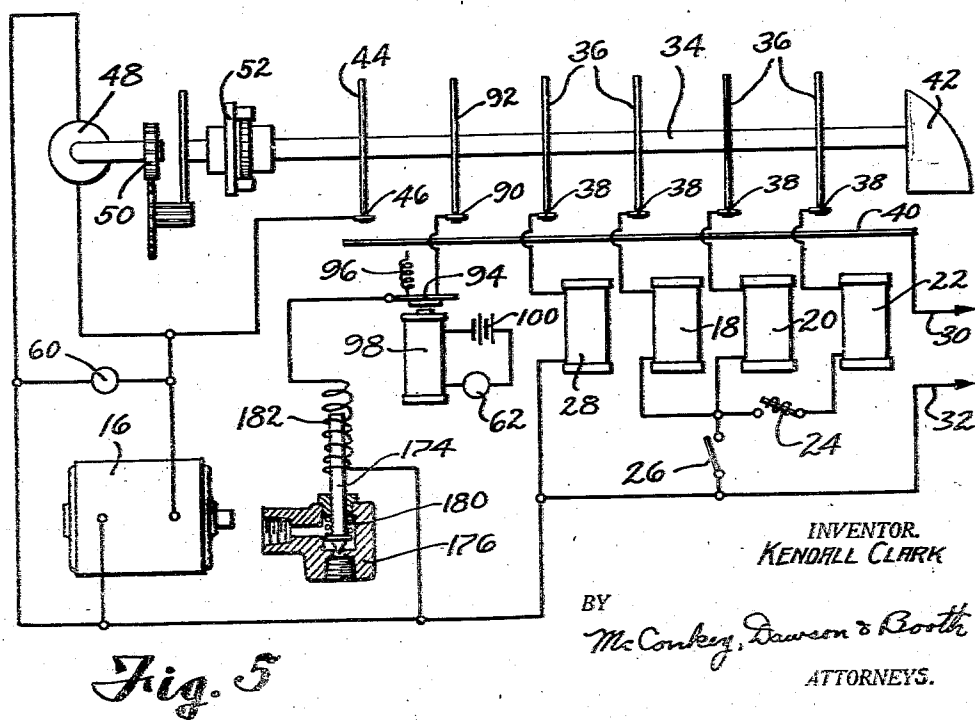
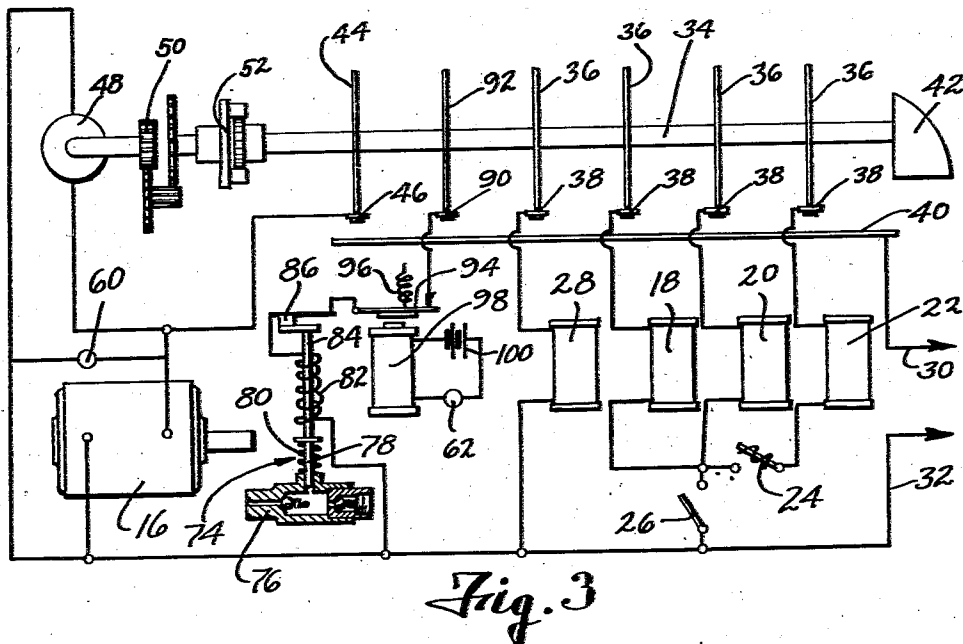
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WASHING MACHINE

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3 Sheets-Sheet 3

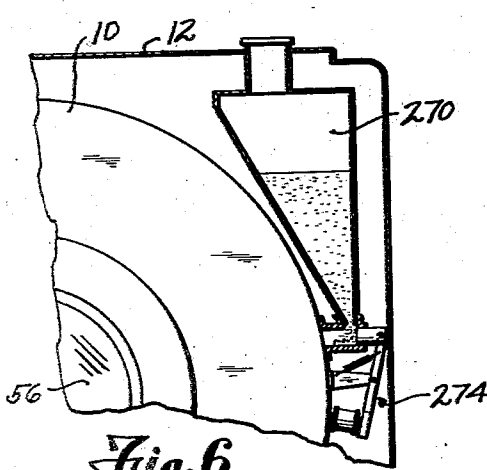


Fig. 6

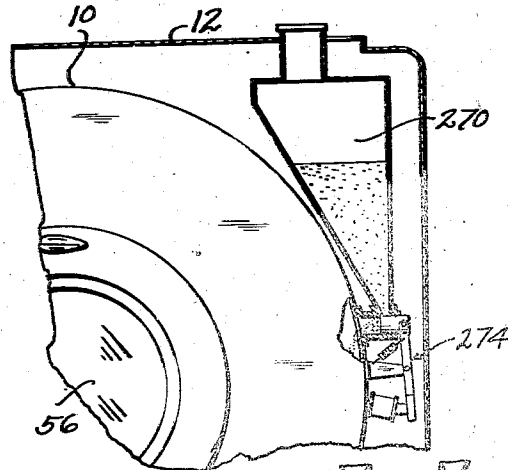


Fig. 7

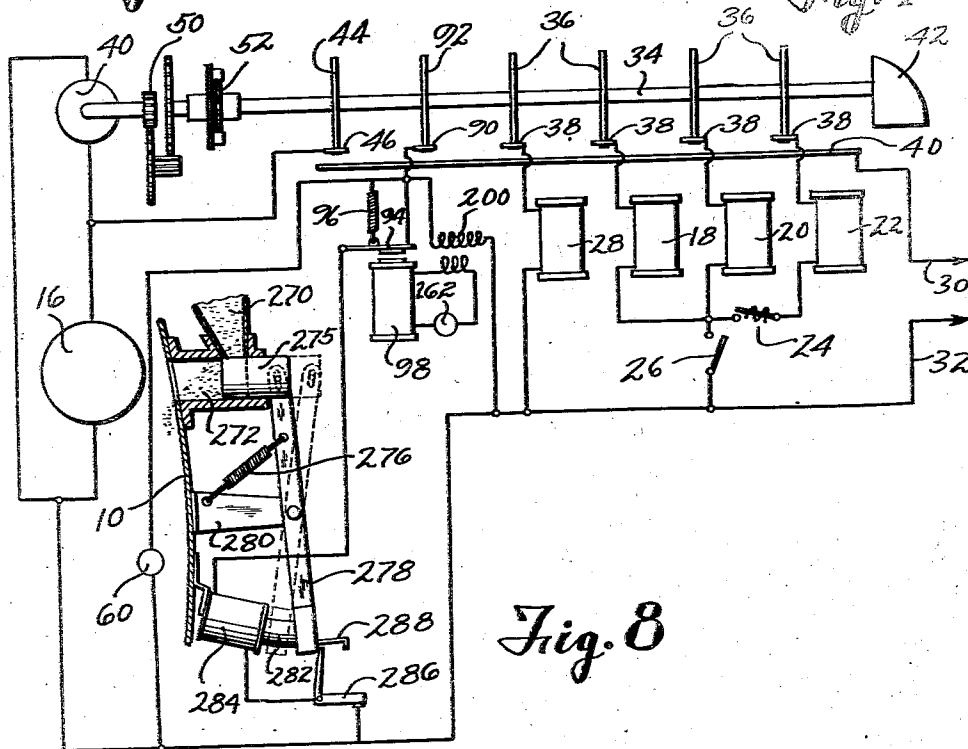


Fig. 8

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UNITED STATES PATENT OFFICE

2,218,698

WASHING MACHINE

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Application August 9, 1937, Serial No. 158,027

11 Claims. (Cl. 68—17)

This invention relates to washing machines and the like, and is illustrated as embodied in an automatic machine driven through a predetermined cycle to wash and dry a load of clothes or other materials.

In machines of this character, and especially those in domestic use, no way has yet been found to predetermine the amount of soap and like materials which must be added to the water. This is because the amount of such materials required varies a great deal with the hardness and other chemical characteristics of the water, and is affected to some extent by the character and size of the load of clothes to be washed. It has been customary therefore, especially in domestic machines, to vary the amount of soap materials by adding them slowly to the solution while directly observing the formation of the suds in the solution.

It is an object of the present invention to control the addition of such soap materials automatically in accordance with a direct measurement of a characteristic or condition of the solution, as for example in accordance with the changes produced in the solution when an adequate suds is formed. The change most readily taken advantage of for this purpose is in the light-reflecting or diffusing quality of the suds. Thus a light may be directed into the tub above the level of the water and when the suds formed on the surface of the water rises up to the level of the light beam the solution of suds will reflect or diffuse a large part of the light directed into it.

Accordingly, in my preferred arrangement I utilize the reflected or diffused light as a measure of the suds formation, exposing to that light a light-sensitive cell which controls a circuit which shuts off the supply of soap material. Preferably the arrangement is used in a machine driven automatically under the control of a cyclic switch, and the cyclic switch is provided with a contact for initiating the supply of soap materials at the beginning of the cycle.

In the illustrated arrangement this contact of the cyclic switch is in series with a switch controlled by the light-sensitive cell, and remains closed only for a short period at the beginning of the cycle, so that throughout the remainder of the cycle the soap-supplying means is rendered inoperative by the cyclic switch regardless of the light affecting the cell.

The above and other objects of the invention, including various novel combinations and desirable particular constructions, will be apparent from the following description of the illustrative embodiments shown in the accompanying drawings, in which:

Figure 1 is a rather diagrammatic view of an automatic washing machine, partly in vertical

section and partly in front elevation, with soap materials supplied by an electric pump;

Figure 2 is a partial vertical section through the clothes door of the machine, showing the arrangement of the light-sensitive means;

Figure 3 is a wiring diagram of the machine;

Figure 4 is a view corresponding to Figure 1, but having the soap material supplied by gravity under the control of an electric valve;

Figure 5 is a wiring diagram of the machine of Figure 4;

Figures 6 and 7 are views of a modification in which a feeder particularly adapted to dry powdered soap material is employed, the two views showing the feeder in two positions; and

Figure 8 is a wiring diagram of the machine of Figures 6 and 7.

The machine illustrated includes a horizontal cylindrical tub 10 having at its front end an opening for the introduction of clothes, and which is supported in a suitable cabinet 12. Within the tub 10 is rotatably mounted a perforated clothes cylinder or drum 14, driven through a two-speed transmission by a motor 16 (Figure 3). The transmission is controlled, as to its speed, by a solenoid 18, the drum 14 being driven at low speed for washing and at high speed for extracting and drying.

The hot and cold water is supplied to the tub of the machine under the control of valves operated by solenoids 20 and 22, a thermostatic switch 24 being in series with one of these solenoids (e. g. the one controlling the cold water) to limit the temperature of the water in the machine. A float-controlled switch 26 is arranged in series with all three solenoids 20, 22, and 18, to cut off the water supply when the tub is filled to a predetermined level, and to prevent shifting the transmission into high when the tub contains water. There is also a drain having a valve controlled by a solenoid 28.

The above-described solenoids 18, 20, 22, and 28 are all arranged in circuits across the power lines 30—32, under the control of a cyclic timer switch which controls the machine automatically. This switch includes a shaft 34 having four cams 36 actuating spring contacts or switches 38 to cause them to engage or disengage a contact bar 40 connected to the line 30. The four contacts control the circuits to the line 32 through the four solenoids.

The shaft 34 has a handle 42, by which it can be advanced manually to initiate the cycle of the machine by causing a cam 44 to close a contact 46 and hold it closed until the completion of the cycle of the machine. The contact 46 controls a circuit through the motor 16 and also a parallel circuit through a small constant-speed motor 48 which drives the shaft 34 through suitable reduction gearing 50 and a ratchet 52.

The machine illustrated, as so far described, is more fully described and is claimed in Patent Number 2,165,884, issued to Rex Earl Bassett, Jr., and John W. Chamberlin, and in Patent Number 2,173,603, issued to Adiel Y. Dodge.

According to the present invention the glazed hinged clothes door 56 of the machine has arranged in front thereof, behind a metal cover or screen 58, an incandescent lamp or other source of light 60 and a light-sensitive photo-cell 62, each of which is provided with a reflector 63. The axes of the two reflectors 63 are arranged to intersect and form equal angles with the plane of the inner surface of the glass 58. Thus the light from lamp 60 will be directed into the tub of the machine, and will be reflected out into the light sensitive cell when the suds rise up to the point where the light from the lamp passes through the glass. Although the above-described arrangement of reflectors is preferred, an opaque wall separating the light sensitive cell from the direct rays of the light may be substituted therefor and sufficient light will be diffused around the wall by the suds to affect the cell. The lamp 60 can be included in any one of the circuits which is closed during the first part of the cycle of the machine, for example in the circuit of the motor 16.

I prefer to form a hole 64 in the reflector 63 containing the lamp 60, through which light may pass to a bullseye lens 65 mounted in the cover 58. This provides a visual indication of the proper functioning of the light.

In the arrangement of Figures 1 and 3 the soap material is in the form of a solution in a reservoir 70 from which it is forced into the tub 10 through a conduit 72 by a pump 74. The pump is shown (Figure 3) as including a fitting 76 forming a pump chamber and having the necessary inwardly and outwardly opening check valves, and into which extends a plunger 78 reciprocated by the cooperative action of a spring 80 and a solenoid 82. The core 84 of the solenoid operates a suitable interrupter 86 which breaks the circuit every time the pump plunger is depressed by the solenoid, thereby allowing the spring 80 to raise it again.

The pump 74, or any equivalent electrically controlled pump, is connected across the lines 30 and 32 through two switches arranged in series, and one of which includes a contact 90 engaged, during the beginning of the cycle of the machine, with the contact bar 40 by a cam 92 on the shaft 34. The other switch includes an arm 94 normally held in closed position by a spring 96 and having an armature adapted to be attracted by an electro-magnet 98. The electro-magnet is included in an auxiliary circuit with a source of current 100 and with the light-sensitive cell or "electric eye" 62.

Thus when the suds formed in the machine reflects enough light on the cell 62, the switch 94 opens and breaks the circuit through the solenoid 82, regardless of the position of the switch 90. The switch 90 holds this circuit open for the major part of the cycle, after the short initial period allotted for the formation of the soap solution.

The arrangement of Figures 4 and 5 differs from that of Figures 1 and 3 in that the reservoir 170 for the concentrated solution of soap material is above the water level in the machine, and empties into the machine by gravity through a conduit 172 under the control of a valve 174. The valve 174 is opened by drawing it upwardly

off a seat in a fitting 176 (Figure 5) by energizing a solenoid 182 acting against the resistance of a spring 180, the solenoid being connected across the lines 30, 32 in series with the two switches 94, 90.

In the modification of Figures 6-8 inclusive the reservoir 270 is adapted to contain powdered soap which descends by gravity into a soap feeder 274 comprising a transverse passage 272 communicating with the tub 10 and the bottom 10 of the reservoir, and a plunger 276 normally positioned in the passage 272 to cut off the communication between the reservoir and the passage. A spring 278 acting through a lever 279 pivoted on a bracket 280 serves to hold the plunger in, or return it to, this normal position.

A solenoid core 282 secured to the other end of the lever 279 is adapted to be attracted by a solenoid coil 284 to withdraw the plunger against the spring 278. A switch 286 for controlling the solenoid is provided and arranged e. g. to be engaged by the lever 279 to close it when the lever is in normal position and to be engaged by a hook 288 secured to the lever to open it when the lever is in the opposite position.

The solenoid coil 284 and switch 286 are connected in series with the light sensitive cell relay 96-98 and the contact 90. With the contact 90 closed and the relay 96-98 closed, the plunger reciprocates under the alternate influence of the spring 278 and the solenoid coil 284, and on each reciprocation a charge of soap descends by gravity into the passage 272 and is pushed into the tub 10. It is to be understood that any equivalent electrically energized feeder might be employed and yet be within the scope of my invention.

In the wiring diagram of Figure 8 I have illustrated the use of a light sensitive cell 262 capable of being energized by alternating current supplied by a transformer 200 connected between the lines 30 and 32 in series with contact 90 and in parallel with the feeder and relay switch. The lamp 60 is similarly connected, so as to be illuminated only during the period provided for feeding soap.

In operation, the machine is loaded with clothes, the door 56 is closed and locked, and the handle 42 is turned manually to close the contact 46, thus energizing the motors 16 and 48 and the light 60. The machine then fills to a predetermined level with water, while soap material solution is at the same time being discharged into the water in the machine, and while the rotation of the drum 14 causes the clothes to agitate the water.

Upon the formation of the desired suds, the switch 94 is opened by the photo-sensitive cell 62. Thereafter the switch 90 is opened, and remains open for the balance of the cycle of the machine.

The machine then continues its washing operation for a predetermined period, then drains off the wash water, rinses one or more times by injecting clean water with the drain valve open, and finally speeds up to dry the clothes by centrifugal extraction. The machine then comes to rest with its cycle completed.

I have used the term "soap material" herein as a convenient term including generically all chemical reagents which it is desired to add to the solution in the machine.

While three illustrative embodiments have been described in detail, it is not my intention to limit the scope of the invention to those particular

embodiments, or otherwise than by the terms of the appended claims.

I claim:

1. A washing machine comprising a container having means for introducing water therein, means for introducing soap material into the water to form a suds extending above the original water level in the container, means for directing light into the container into said suds, and means actuated by the reflection of light from said light directing means from suds in said container for cutting off the introduction of soap material when the suds formation extends above said original water level.
2. A washing machine having automatic control means and comprising a container having means for introducing water therein, means for washing and drying materials in the machine in a cycle controlled by said automatic means, means for introducing soap material into the water under the control of the automatic means at the beginning of the cycle to form a suds, means for directing light into the container, and means actuated by the reflection of light from said light directing means from suds in said container for cutting off the introduction of soap material regardless of the control of the automatic means.
3. A washing machine comprising means for introducing water, means for introducing soap material, automatic control means controlling the operation of the water introducing means and the soap material introducing means, means for causing the machine to operate to agitate the water and soap material to form a suds above the liquid level, and means sensitive to said suds in the machine for suspending the operation of the soap material introducing means regardless of said automatic control means.
4. A washing machine comprising means for introducing liquid and soap material to form a washing solution in the machine and for agitating the solution to form a suds above the liquid level, automatic control means controlling the operation of the soap material introducing means, and means sensitive to said suds for suspending the operation of the soap material introducing means regardless of said automatic control means.
5. A washing machine comprising means for introducing soap material to form a washing solution in the machine and for forming a suds from said solution, automatic control means controlling the operation of the soap material introducing means, and means sensitive to the formation of a predetermined level of suds for suspending the operation of the soap material introducing means regardless of the automatic control means.
6. A washing machine having a container for a washing solution, means for introducing soap material into said solution and means for agitating the solution with the soap material to form a suds above the liquid level in the container, means for directing light into the suds above the liquid level of the solution, a light-sensitive cell mounted beside said last named means and exposed to light from said directing means reflected from said solution, a control circuit for the soap-material introducing means and a switch in said control circuit controlled by said cell.
7. A washing machine having a container for a washing solution, means cooperating with said container to form a suds from the solution, a

source of supply of soap material, means for causing soap material to be introduced into said container from said source, a control circuit for said last-named means, and a device sensitive to the presence of suds above the level of the solution in the container to control the control circuit for causing the introduction of said soap material to be suspended.

8. A washing machine having a glazed door for the introduction of work and a container for a washing solution to act on the work, means for introducing soap material into said container, a lamp mounted in front of said door and having means for directing its light through the door into said solution, a light-sensitive cell in front of said door and acted on by light reflected through the door from said solution, and a control circuit for the soap material introducing means having included therein and controlled by said cell.

9. In a washing machine having control mechanism and electrically controlled inlet and drain valves, means for supplying soap material to the machine to form therein a suds above the liquid level and an electrical control circuit therefor including two switches in series with each other, a cyclic motor-driven timer switch for the valves and motor including cam means for closing one of said two switches for a short period at the beginning of the cycle of the machine and then opening it for the remainder of said cycle, the second of said two switches normally being closed, and means sensitive to said suds in said machine and operative to open said second switch when the correct amount of soap material has been introduced.

10. In a washing machine having control mechanism and a container for a washing solution electrically controlled and inlet and drain valves for said container, means for supplying soap material to the container to form therein a suds above the liquid level, an electrical control circuit therefor including two switches in series with each other, a cyclic motor-driven timer switch for the valves including cam means for closing one of said two switches for a short period at the beginning of the cycle of the machine and then opening it for the remainder of said cycle, the second of said two switches normally being closed, and means sensitive to the level of the suds formed in said machine and operative to open said second switch.

11. In a washing machine having control mechanism and a container for a washing solution and electrically-controlled inlet and drain valves for said container, means for supplying soap material to the container to form therein a suds above the liquid level, an electrical control circuit therefor including two switches in series with each other, a cyclic motor-driven timer switch for the valves and motor including cam means for closing one of said two switches for a short period at the beginning of the cycle of the machine and then opening it for the remainder of said cycle, the second of said two switches normally being closed, means for directing light into the container, a light-sensitive cell exposed to light reflected from said suds, and an electrical circuit containing and controlled by said cell and containing means for opening said second switch when the correct amount of soap material has been introduced.

KENDALL CLARK.

CERTIFICATE OF CORRECTION.

Patent No. 2,218,698.

October 22, 1940.

KENDALL CLARK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, lines 23, 40, and 57, claims 9, 10, and 11 respectively, before the word "means" insert --the combination of--; lines 28 and 62, claims 9 and 11 respectively, strike out "and motor"; line 39, claim 10, for "electrically controlled and" read --and electrically controlled--; line 50, same claim 10, strike out "the" second occurrence; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of March, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)