April 9, 1968 R. G. HARTSHORN ET AL 3,376,720

WASHING MACHINE STERILIZATION

Filed Sept. 9, 1965 2 Sheets-Sheet 1

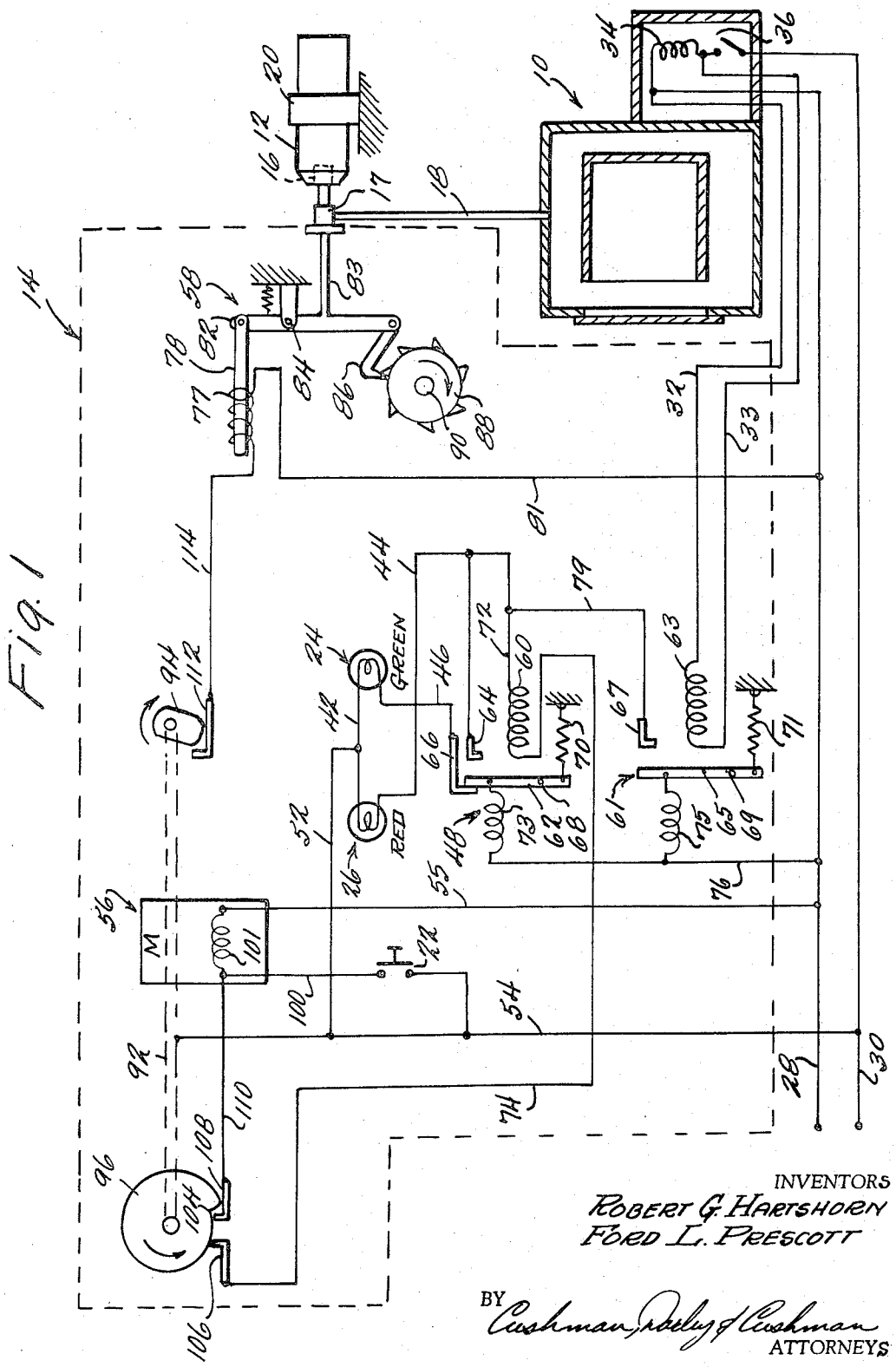


Fig. 1

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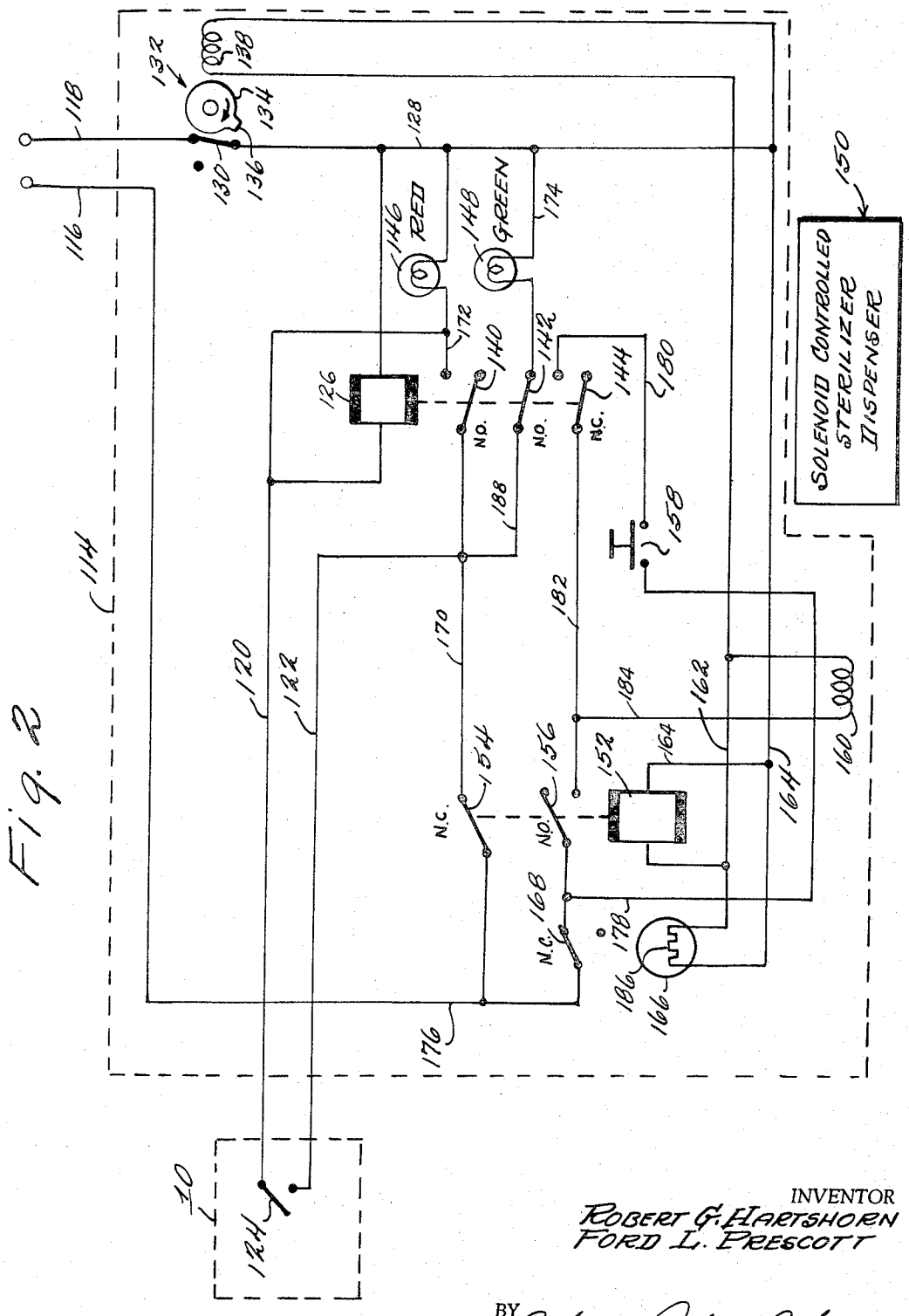


Fig. 2

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WASHING MACHINE STERILIZATION

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19 Claims. (Cl. 68—12)

This invention relates to the sterilization of automatic clothes washing machines and in particular to a device for injecting a sterilizing agent into an automatic washing machine between cycles.

It has been found that, contrary to popular belief, the interior of an automatic clothes washing machine does not remain free of bacterial contamination even when the machine is used at frequent intervals. Laboratory analysis of water passed from a machine between cycles and of swabbings taken from the interior of the machine have shown that a machine may be highly contaminated with a wide variety of organisms which were previously carried into the machine with dirty clothes. The opportunity for the spread of disease is therefore present, and this fact is of particular importance in the operation of coin-operated laundry machines, self-service or other types of community or public installations where each washing machine is used by a large number of people.

It is the broad object of the present invention to provide apparatus for rapidly and effectively disinfecting a washing machine between uses.

It is a more specific object of this invention to provide apparatus for injecting an aerosol of a sterilizing agent into a washing area between uses. The aerosol rapidly diffuses into the entire interior of the washing machine, and its use is therefore preferred over the use of a liquid agent which would require some sort of agitation to assure contact with all interior parts of the machine.

It is another object to provide an attachment for an existing washing machine, the attachment comprising electrically operated dispensing means for injecting a sterilizing agent into a washing machine between uses and visual indicator means for indicating to the user whether or not the dispensing means has operated.

It is another object to provide a washing machine attachment of the above kind which is designed to disperse the sterilizing agent from a conventional aerosol container of the push valve type.

It is another object of the present invention to provide a washing machine sterilizing device comprising dispensing means for dispensing a sterilizing agent from a source thereof to the machine, an electric circuit for actuating the dispensing means upon manual operation of a push-button or the like, automatic means for disrupting current to the circuit upon completion of the operation of the dispensing means and for again supplying current to the circuit in response to a predetermined condition in the washing machine. This arrangement prevents tampering with the device, because once sterilizing agent has been dispensed into the machine no more agent can be dispensed until the machine has completed a full cycle.

In one embodiment of the present invention there is provided an attachment for an existing washing machine, the attachment having an electrical circuit for actuating, under the control of the user, the valve from a source of aerosol or solution under pressure such as a conventional aerosol container filled with a disinfecting or sterilizing agent. A red indicator light is provided to receive current from the circuit when the machine has completed the last operation in its cycle and when the dispensing mechanism has not yet been operated.

When the user of the machine sees the red light and wishes to sterilize the machine, he presses a manual button on the attachment. This causes the electrical circuit to activate a timing motor and a solenoid, the latter serving when activated to open the valve of the aerosol container. Operation of the timing motor deactivates the solenoid after a predetermined short time interval and subsequently activates a green indicator light and deactivates the red indicator light after a further time interval during which the sterilizing agency performs its intended function. The circuit is interconnected with the final spin control of the washing machine.

In another embodiment of the invention, when the user sees the red light, he pushes a button as in the first-mentioned embodiment to commence sterilization of the machine. This energizes (1) a relay which turns off the red and green lights, (2) a solenoid coil, which causes the sterilizing agent to be dispensed, (3) a counter or other device which indicates the amount of fluid remaining in the container, and (4) a time delay means which controls the amount of time that fluid is dispensed, and (5) a time delay means which controls a signal indicating that the machine has been disinfected. After sterilization, the relay is de-energized by the time delay means, thereby turning the green light on and de-activating the control device for the sterilizing dispenser until the end of the complete washing machine cycle at which time the dispenser is reset ready for the customer to disinfect the washing machine prior to its next use.

The invention will be further understood from the following detailed description in conjunction with the drawings in which:

FIGURE 1 is a schematic diagram illustrating one embodiment of the electrical and mechanical features of the present invention; and

FIGURE 2 is a schematic diagram illustrating a second embodiment.

Referring to FIGURE 1 there is shown in schematic form a conventional automatic washing machine **10** of the side load type, a pressurized aerosol container **12** of a sterilizing agent and a control device **14** for dispensing aerosol from the container **12** into the machine **10** in accordance with the principles of the present invention. The aerosol container **12** is of a conventional type having a unitary push-to-open valve **16**. The valve **16** is fitted with an integral plastic cap **17** and capillary tube **18** of which the tube **18** extends into the washing machine for conducting aerosol from the valve to the interior of the machine **10**. The point of entry of the capillary tube **18** into the machine **10** and the location of the aerosol container **12** are of no particular significance so long as the length of the capillary tube **18** does not destroy the dispersed nature of the sterilizing agent. The tube **18** may be up to about two feet in length if necessary. In the construction illustrated the aerosol container **12** is supported on a fixed bracket **20** or the like.

The control device **14** includes a manually operable button **22** which is preferably of the momentary contact, push-button type, a green indicator light **24** and a red indicator light **26**, all of which will normally be mounted on a control panel (not shown) in view of the user of the machine. The circuits associated with these elements are conveniently arranged in a housing (not shown) of suitable construction. The aerosol container bracket **20** may be secured to the housing, the latter mounted immediately adjacent the washing machine **10**. It will be understood, however, that the aerosol container **12** and the control device **14** may be disposed remote from each other so long as some means is provided for actuating the aerosol valve **16** in accordance with the operation of the control device **14**.

The control device **14** receives electric current in part

from conventional supply lines 28 and 30 of which line 28 is the hot line and line 30 is the ground line. Current is also supplied under certain conditions through lines 32 and 33 leading from the washing machine 10. The latter, as is conventional, is provided with a control circuit for sequentially carrying out the wash, rinse and spin operations. The washer control circuit conventionally includes a time-controlled switch for effecting the final spin operation. This switch is illustrated in part by a solenoid 34 and in part by a control or switching means 36 which activates the solenoid 34 by connecting it to the house lines 28 and 30 only during the spin cycle. The lines 32 and 33 to the aerosol control device 14 become energized when switching means 36 is closed at the initiation of the spin cycle, line 32 being connected to line 28 and line 33 being connected to line 30 through switching means 36.

Within the control device 14 the circuit for the red and green indicator lights 24 and 26 includes a line 42 interconnecting one terminal of each light and a line 44 connected to the other terminal of the red light 26. The other terminal of the green light 24 is connected by a line 46 to a contact 66 of a solenoid operated switch arrangement 48. The line 42 which interconnects the lights 24 and 26 is grounded to the house line 30 through a line 52 which connects with the line 54.

The motor control cam 96 is a disk of electrically conductive material mounted directly on the shaft 92 and provided with a V-shaped notch 104 cut in its periphery. A pair of spaced apart flexible contact elements 106 and 108 are fixedly mounted adjacent the cam 96 in such a position that their free ends can reside within the notch 104 without engaging the cam 96. At the same time the contact elements 106 and 108 are mounted sufficiently close to the cam 96 that they both engage the latter when it rotates away from the position illustrated in the drawing. The contact 108 connects directly with the motor wire 100 by the means of a wire 110, and the contact 106 connects with the coil 60 of switch arrangement 48 by means of wire 74.

The aerosol valve control cam 94 is an electrically conductive element mounted directly on the motor shaft 92 for periodic engagement with a fixed flexible contact 112. As shown the cam 94 is mounted eccentrically on the shaft and has a generally rounded protrusion which will engage the contact 112 during a relatively small fraction of each revolution of the shaft 92. The contact 112 connects with the hot line 28 through line 114 and aerosol solenoid coil 77.

The solenoid switch arrangement 48 controls the indicator lights 24 and 26. As shown the arrangement includes a solenoid coil 60 and a solenoid arm 62 which is movable between spaced apart contacts 64 and 66. The arm is pivoted intermediate its ends at 68 and is biased into engagement with the contact 66 by a spring 70. The solenoid coil 60 is connected between the contact 64 and contact element 106 respectively by lines 72 and 74. The contact arm 62 connects with the hot line 28 through a line 76, which is connected to arm 62 by a flexible lead 73. The contact 66 is connected to the line 46 from the indicator light circuit, and the contact 64 connects with line 72.

Solenoid switch arrangement 61 is also provided to actuate solenoid 48 during the spin cycle or at least to actuate solenoid 48 at the initiation of the spin cycle. Solenoid 48 will remain energized after initial actuation until it is de-energized by the action of cam 96, as will be described hereinafter. Solenoid switch arrangement 61 includes a solenoid coil 63 and a solenoid arm 65 which is normally disconnected from contact 67 as shown in the drawing. The arm is pivoted intermediate its ends at 69 and is biased away from contact 67 by a spring 71. The solenoid coil 63 is connected between lines 32 and 33. The contact arm 65 connects with the hot line 28 through line 76, which is connected to arm 65 by flexible lead 75. The contact 67 is connected to one side of coil 60 through line 79.

The aerosol actuator 58 includes a solenoid having a coil 77 and a plunger 78 which is pivotally connected to one end of an actuator arm 82. Projecting from the arm 82 is an extension 83 whose outer end engages the cap 17 which is fitted over the outer end of the aerosol valve 16. The arm is pivoted to a fixed bracket at 84 and carries a pawl 86 at the end opposite the attachment of the solenoid plunger 78. The free end of the pawl engages the toothed periphery of a ratchet wheel 88 which is rotatably mounted on a fixed axle 90. The pawl 86 and wheel 88 are arranged so that upon movement of the plunger 78 into the solenoid coil, rocking of the arm 82 will rotate the wheel 88 through a small arc.

The incremental rotation of the wheel 88 resulting from repeated operation of the solenoid plunger 78 will, in practice, be transmitted into a visual indication of the number of times the aerosol container has been tapped so that the latter can be replaced before it becomes empty. The wheel may be calibrated so as to give a direct indication or a gear train or other device may be operated by the wheel to give a remote indication.

The timing motor 56 is provided with a drive shaft 92 on which are fixed an aerosol valve control cam 94 and a motor control cam 96. For simplicity the drive shaft 92 is shown in side elevation in dotted lines and both cams are shown in profile. The motor receives current through a line 55 connected to the hot line 28 and is grounded through a circuit which includes a line 110, the motor control cam 96 and the motor shaft 92. The motor shaft 92 is also connected to the valve actuator solenoid 77 through a wire 114.

The elements illustrated in FIGURE 1 are shown in their at rest position which occurs during operation of the washing machine 10 prior to the final spin. At this stage the switching means 36 is open. Consequently, the energizing lines 32 and 33 from the washing machine 10 to the control device 14 are connected to the "hot line" 28 only. Therefore, there is no current available through the lines 32 and 33 to operate the solenoid 61. The green indicator light 24 is, however, activated by current flowing from the house hot line 28 through line 76, solenoid arm 62, contact 66 and line 46. The circuit is completed to the house ground line 30 through lines 42, 52 and 54.

When the washing machine 10 goes into its final spinning operation under the control of its control device 36, the final spin switch 36 is closed. This provides a path for current from the house hot line 28 and ground line 30 to the energizing lines 32 and 33.

Current then flows through solenoid coil 63 causing the arm 65 to pivot in contact with contact 67. This causes current to flow from line 28 through line 76, arm 61, contact 67, line 79, coil 60, line 74, contact 106, cam 96, and shaft 92 to ground line 30 from line 54.

The flow of current through coil 60 causes the solenoid arm 62 to pivot away from the contact 66 and into engagement with the contact 64. The arm 62 will be held in this position because current will now flow through the solenoid coil 60 by way of the house hot line 28, line 76, arm 62, contact 64, line 72 and to ground through line 74, contact 106, cam 96, shaft 92 and line 54. Simultaneously, the green indicator light 24 will become deactivated as a result of disengagement of the arm 62 with the contact 66, and the red indicator light 26 will become activated through contact 64 and line 44 with the ground connection occuring through lines 42, 52, and 54.

When the final spin of the washing machine 10 has been completed, the switching means 36 will open thereby breaking the initial circuit to the lines 32 and 33 de-energizing solenoid 61, but solenoid 48 is not de-energized because house current is holding the solenoid arm against the contact 64, as already described.

After spin cycle is completed, the next user of the washing machine will note that the red light is on; as

described before. To effectuate sterilization, he will press momentary contact push-button 22. Upon pressing the button 22 a motor energization circuit is established across lines 30 and 28 through line 54, the button 22, line 100, motor coil 101 and line 55. The motor 56 immediately starts and rotates the cam 96 in the direction of the arrow in the drawing thereby moving the notch 104 away from the contacts 106 and 108. The latter then engage the circular periphery of the cam 96 so as to hold the motor circuit through line 110, contact 108 and the cam 96. At this point manual release of the button 22 has no effect on the rotation of the cam 96.

The motor 56 continues to operate until the notch 104 in the cam 96 returns to the position shown in the drawing at which time the motor circuit is automatically broken by disengagement of the right hand wall of the notch 104 from the contact 108. It will be seen that the left hand wall of the notch 104 is inclined less steeply than the right hand wall so that the contact 106 will be in engagement with the cam 96 by the time the contact 108 breaks the motor circuit, thereby insuring an energizing path for solenoid 48 the next time the washer enters the spin cycle. In the illustrated embodiment the motor shaft 92 rotates at 2 r.p.m. with the result that the motor circuit is closed for 30 seconds.

Immediately prior to breaking of the motor circuit, as described above, the contact 106 will be aligned with the notch 104 thereby breaking the actuating circuit for solenoid 48. This causes arm 52 to return to its normal position where it contacts contact 66 resulting in the energization of the green light 24 and the de-energization of red light 26. With the green light on, the washing machine user knows that the sterilization process is complete and loading of clothes may be commenced.

Simultaneously with the rotation of the motor control cam 96, the aerosol control cam 94 will rotate clockwise as viewed in the drawing. During a small portion of its travel, beginning immediately upon rotation, the cam 94 engages the contact 112 and allows current to flow from line 31 through the aerosol control solenoid 77 to the grounded motor shaft 92. In the illustrated embodiment, the cam 94 is shaped to provide a 5 second activation with the result that the aerosol valve is opened for 5 seconds by movement of the arm 82. The cam 94 then comes to rest again in the position shown in the drawing because at this point the motor 56 will be deactivated as described heretofore.

The following summary of the operation in the environment of a coin-operated washing machine will further illustrate the advantages of the invention. Assuming that the washing machine has been treated with sterilizing agent and is not in operation, the green light 24 will be on and will notify a prospective user of this condition. The user will then place the clothes to be washed in the machine and will start the automatic cycle in the usual manner. When the machine begins its final spin operation, the green light will go out and the red light will go on. Upon completion of the final spin the user removes the clothes from the machine. At this time or a future time the button 22 is pressed to start the timing motor 56 and open the aerosol valve 16. After 5 seconds the injection of aerosol ceases and after 30 seconds the green light goes on to indicate that the machine is again ready for use. During this 30 second interval, the sterilizing agent is permitted to act thereby insuring sterilization of the machine before the green light goes on.

Having now described the structure and operation of the embodiment of the present invention as shown in FIGURE 1, a description will now be given of the structure and operation of the embodiment as shown in FIGURE 2. Since pertinent features of the invention such as the solenoid controlled aerosol dispenser have been described with respect to FIGURE 1, this feature will be only briefly described in the following description. Like numerals in FIGURES 1 and 2 refer to the same element or device.

Energizing power is provided from lines 116 and 118 which are connected to a source of electrical energy at 110 volts, 60 cycles for example. Wires 120 and 122 connect switch 124, which is external to the control device 114. The switch 124 may be electrically or mechanically actuated such as by a cam which closes the contact of switch 124 just prior to the termination of the spin dry cycle or at any other time of the operation cycle. The switch 124 is similar to the switch 36 and is located in the washing machine 10. The relay 126 is connected at one of its energizing terminals to line 120 and at the other terminal to line 128. Line 128 connects to line 118 through the normally closed contact 130. Contact 130 is under the control of an electronic impulse counter generally indicated at 132. The last wheel 134 of this counter is provided with a pin 136 which transfers contact 130 when wheel 134 reaches the last position, the movement of the wheel being under the control of energy applied to coil 138.

Relay 126 controls contacts 140, 142 and 144 which are ganged together. Relay 126 is illustrated in its unenergized condition, therefore contact 140 is normally open. The transfer of contact 140 to its closed position causes red light 146 to be energized from lines 116 and 118 as will be discussed hereinafter. Contact 142 is normally closed and therefore green light 148 is normally energized from lines 116 and 118 when switch 124 has been operated. The transfer of contact 144 from its normally open position establishes a momentary energizing path for the solenoid controlled dispenser shown in block form at 150, which, of course, corresponds to the aerosol dispensing apparatus as shown in FIGURE 1. The operation on transfer of contact 144 will be described in more detail hereinafter.

Relay 152 controls contacts 154 and 156. Contact 154 is normally closed and completes the energizing path for relay 126 and green light 148 from lines 116 and 118. Contact 156 is normally open. Transfer of contact 156 holds relay 152 in its energized position after it has been energized by the momentary depression of switch button 158, as will be described hereinafter.

Coil 160 is connected to wires 162 and 164, the energization of coil 160 (which corresponds to coil 77 of FIGURE 1) resulting in the dispensing of sterilizing or sanitizing agent. Time delay relay or means 166 is also energized from wires 162 and 164, the normally closed contact 168 being transferred upon energization of the time delay relay 116 for a period of time corresponding to the quantity of sterilizing or sanitizing agent to be applied to the washing machine for thorough sterilization.

Operation of the control device 114 for regulating the dispenser 150 will now be described. When the cam operated switch 124 is operated thereby closing its contact, an energizing path for relay 126 is completed from line 116, contact 154, switch 124, line 120 to line 128, contact 130 and line 118. The energization of relay 126 transfers the contacts 140 through 144. Relay 126 is held in its energized position after the contact 124 breaks from its momentary contact. The holding path for maintaining the energization of relay 126 is from line 176, contact 154, line 170, contact 140, line 172 to line 128, contact 130 and line 118. Red light 146 is energized from line 116, contact 154, contact 140 to line 172, contact 130 and line 118. Green light 148 is disconnected from the lines 116 and 118 by the transfer of contact 142. The transfer of contact 144 conditions control device 114 so that when the start push button 158 is momentarily closed the application of the sanitizing agent will commence.

At this point the red light is on, indicating to the user that the washing machine must be sanitized before another wash can be done. Further, the washing machine user must push button 158 to initiate the sterilization operation. Upon operation of push button 158, relay 152 is

energized from lines 116 and 118 through the following path: lines 116, line 176, contact 168, line 178, push button 158, line 180, contact 144, line 182, line 184, line 162, relay 152, line 164, line 128, contact 130 and line 118. The energization or relay 152 transfers contacts 154 and 156. The transfer of contact 156 holds the energizing path for relay 152 from line 176, contact 168, to line 184, line 162, relay 152, line 164 and line 128. Since time delay relay 166, solenoid coil 160 and counter coil 138 are all connected in parallel with energizing relay 152 by lines 162 and 128, all of these elements will also be energized upon the energization of relay 152.

The energization of coil 138 actuates the counter 132 thereby moving the counter one notch.

As mentioned above, contact 154 transfers simultaneously with contact 156, the transfer of contact 154 de-energizes relay 126 and causes contacts 140, 142 and 144 to return to their normally unenergized positions thereby turning off both lights 146 and 148 during the period of time that sterilization is taking place.

The energization of coil 160 actuates the solenoid controlled sanitizing dispenser in a manner exactly like that described in FIGURE 1.

When a predetermined time interval, as established by time delay relay 166, elapses, contact 168 will transfer thereby de-energizing the solenoid coil 160 and terminating the application of sterilizing fluid. Contacts 154 and 156 are returned to their normally unenergized positions. Therefore, green light 148 is turned on, it being energized from line 116, contact 154, line 188, contact 142 to line 174, contact 130 and line 118. The energization of green light 148 indicates that the sanitizing action is over and that the washing operation may be started.

The cooling down period of the time delay relay may be approximately 20 seconds and is therefore the reset time interval of the unit. At this stage in the sequence of events, relay 126 is already de-energized so that contact 144 has transferred to its normally open position thereby preventing actuation of control device 114 through operation of start button 158.

To prevent a false indication of sanitation when the source of aerosol or sanitation fluid is empty, the electronic impulse counter 132 is arranged so that it will open the normally closed contact 130 connected in series with the source of power to the unit 114. Contact 130 is opened by the pin 136 on the last wheel 134 of the counter 132 after a predetermined number of sanitation cycles have taken place. The number of sanitation cycles multiplied by the quantity of sanitizing fluid released per cycle equals the liquid capacity of sanitizing fluid originally charged into an aerosol bomb or other source of sanitation fluid. When the counter opens the contact 130 an "Empty" indication may be provided on the counter dial. The sanitation unit remains in the inoperable position until the empty fluid container has been replaced and the electric impulse counter has been manually reset to "O," thereby transferring the contact 130 to its normally closed position.

Summarizing the operation of the embodiment shown in FIGURE 2 will further illustrate the advantages gained by use of the invention. The red light 146 will go on at sometime during the final spin period of the washing machine cycle. The red light warns the user that the machine should be sanitized before it is used for washing purposes again.

By merely pushing button 158 firmly, the washing machine is sanitized. After sanitization, the green light comes on indicating that the washing machine may be used. A dial is provided on the washing machine which provides a running indication of the amount of sanitizing fluids left in the container. When this indicator registers empty, a switch is operated which prevents supply of electrical energy to the control device and for the washing machine.

What is claimed is:

1. In combination with a clothes washing machine having an automatic wash cycle and a final spin: means associated with said machine for generating a signal at the completion of the wash and spin cycle; and a washing machine sterilizing arrangement adapted to introduce sterilizing agent into the interior of said washing machine between a final spin and the beginning of the next wash cycle, said arrangement including a source of sterilizing agent, valve means and conduit means associated with said source for retaining the sterilizing agent at said source when said valve means is closed and for conducting a portion of the sterilizing agent from said source and introducing the portion into the interior of said washing machine when said valve means is open; electric circuit means for operating valve means, said circuit means including means responsive to the occurrence of said washing machine signal for energizing said circuit means and further including timing means for opening said valve means for a predetermined length of time and then closing said valve means.

2. Apparatus as in claim 1 including indicator means for generating a visual signal when activated and means responsive to operation of said timing means for deactivating said indicator means after closing of said valve means whereby deactivation of said indicator means indicates that sterilizing agent has been introduced into said washing machine.

3. Apparatus as in claim 1 including first and second indicator means for generating different visual signals when activated, means responsive to said washing machine signal for deactivating said first indicator means and for activating said second indicator means and means responsive to operation of said timing means at a predetermined time after closing of said valve means to reactivate said first indicator means and to deactivate said second indicator means whereby said first indicator means will positively indicate a sterilized condition of the washing machine and whereby said second indicator means will positively indicate an unsterilized condition at the time of final spin.

4. Apparatus as in claim 1 including manually operable means for initiating operation of said timing means.

5. Apparatus as in claim 1 wherein said source of sterilizing agent is an internally pressurized container for producing an aerosol of sterilizing agent.

6. An electric circuit for use with a clothes washing machine and adapted to actuate an electrically operated valve mechanism for introducing a sterilizing agent; valve connection means for connection to the electrically operated valve mechanism; washing machine connection means for connection to the washing machine to receive current during a predetermined period of washing machine operation; first and second indicating means for generating different visual signals when energized, said signals corresponding to a sterilized condition and a soiled condition, respectively; means responsive to energization of said washing machine connection for deactivating said first indicating means and for simultaneously activating said second indicator means; electric timing means; manually operable means for energizing said timing means and for simultaneously energizing said valve connection, said timing means being operable after a predetermined time to de-energize said valve connection and to subsequently re-energize said first indicator means and de-energize said second indicator means.

7. An attachment for an automatic clothes washing machine having a wash cycle and a final spin and adapted to introduce a mist of finely divided sterilizing agent into the interior of the machine from a valved aerosol container of the sterilizing agent between a final spin and the beginning of the next wash cycle, said attachment comprising: holder means for engaging and holding a valved aerosol container of sterilizing agent; electrically operated valve actuating means movable between first and second positions for opening and closing, respectively, the valve

of the aerosol container; and electric circuit means for supplying current to said valve actuating means, said circuit means including timing means, manually operable means for starting said timing means and for simutlaneously energizing said valve actuating means so as to move to said first position and means responsive to a predetermined period of operation of said timing means for de-energizing said valve actuating means.

8. In combination with an automatic clothes washing machine:

means associated with said machine for generating a signal at a predetermined time during the laundering operation; and

a washing machine sanitizing arrangement for introducing sanitizing agent into the interior of said washing machine between the end of the last cycle of one laundering operation and the beginning of the first cycle of the next laundering operation, said arrangement including,

valve means adapted to be operatively associated with a sanitizing agent source and adapted to retain the sanitizing agent at said source when said valve means is closed and to permit a portion of the sanitizing agent to be introduced into said washing machine when said valve means is open;

electric circuit means for operating said valve means, said circuit means including

means responsive to the occurrence of said signal for energizing said circuit means, and further including

timing means for opening said valve means for a predetermined length of time and then closing said valve means.

9. Apparatus as in claim 8 including,

indicator means for indicating whether the machine is in a sanitized or unsanitized state.

10. Apparatus as in claim 9 including,

electrical circuit means responsive to said signal for actuating said indicator means.

11. Apparatus as in claim 9 including,

means responsive to the operation of said timing means for actuating said indicator means to show that the washing machine has been subjected to a sanitizing operation.

12. Apparatus as in claim 9 including,

means for actuating said indicator means to show that the washing machine has been subjected to a sanitizing operation.

13. Apparatus as in claim 12 including,

means for indicating that the sanitizing agent must be replenished.

14. Apparatus as in claim 8 including,

first and second indicator means for indicating whether the washing machine is in a sanitized or unsanitized state,

means responsive to said signal for activating said first indicator means to show that the machine is in an unsanitized condition, and

means responsive to said timing means for activating said second indicator means after closing of said valve means to show that the washing machine has been subjected to a sanitizing operation.

15. Apparatus as in claim 14 wherein

said means for activating said first indicator means is also effective to deactivate said second indicator means.

16. Apparatus as in claim 8 including

means for initiating operation of said timing means.

17. Apparatus as in claim 8 including

means for indicating that the sanitizing agent must be replenished, said indicating means being responsive to the operation of said valve means.

18. In combination with an automatic clothes washing machine:

means associated with said machine for generating a signal at a predetermined time during the laundering operation; and

a washing machine sanitizing arrangement for introducing sanitizing agent into the interior of said washing machine between the end of the last cycle of one laundering operation and the beginning of the first cycle of the next laundering operation, said arrangement including,

valve means adapted to be operatively associated with a sanitizing agent source and adapted to retain the sanitizing agent at said source when said valve means is closed and to permit a portion of the sanitizing agent to be introduced into said wasing machine when said valve means is open; and

mechanical means for operating said valve means, and

means responsive to the occurrence of said signal for actuating said mechanical means.

19. Apparatus as in claim 8 including

indicator means for indicating whether the machine is in a sanitized or unsanitized state,

means responsive to said signal for operating said indicator means to show that the machine is in an unsanitized condition, and

means responsive to said timing means for operating said indicator means after closing of said valve means to show that the washing machine has been subjected to a sanitizing operation.

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WILLIAM I. PRICE, *Primary Examiner.*