

Jan. 29, 1957

N. L. PELLERIN ET AL

2,779,937

WASHING MACHINE CONTROLLER

Filed Sept. 7, 1954

2 Sheets-Sheet 1

FIG. 1.

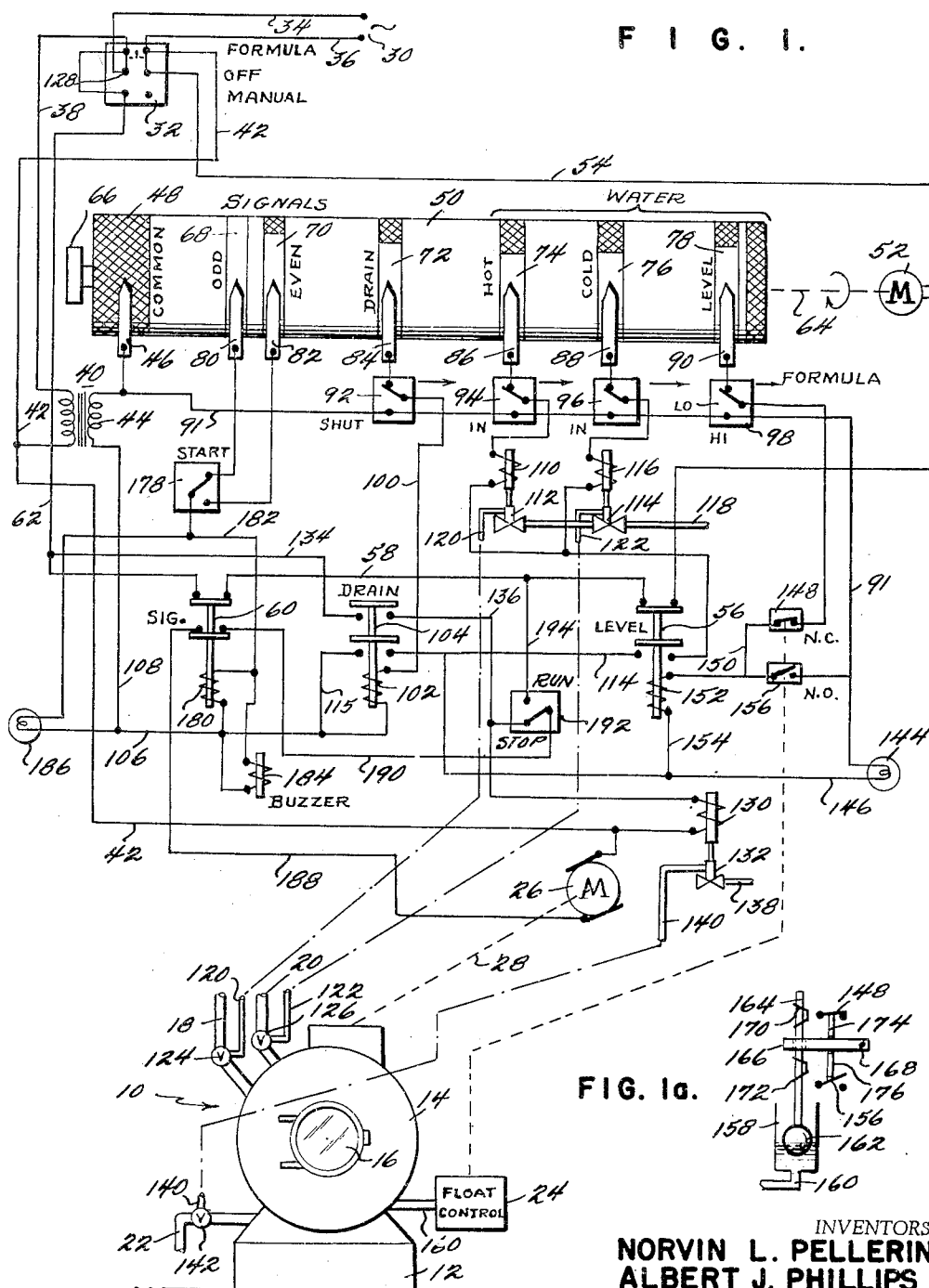


FIG. 1a.

INVENTORS
NORVIN L. PELLERIN
ALBERT J. PHILLIPS
FRANCIS X. LEVY

BY

Parker and Uhlsh
ATTORNEYS

Jan. 29, 1957

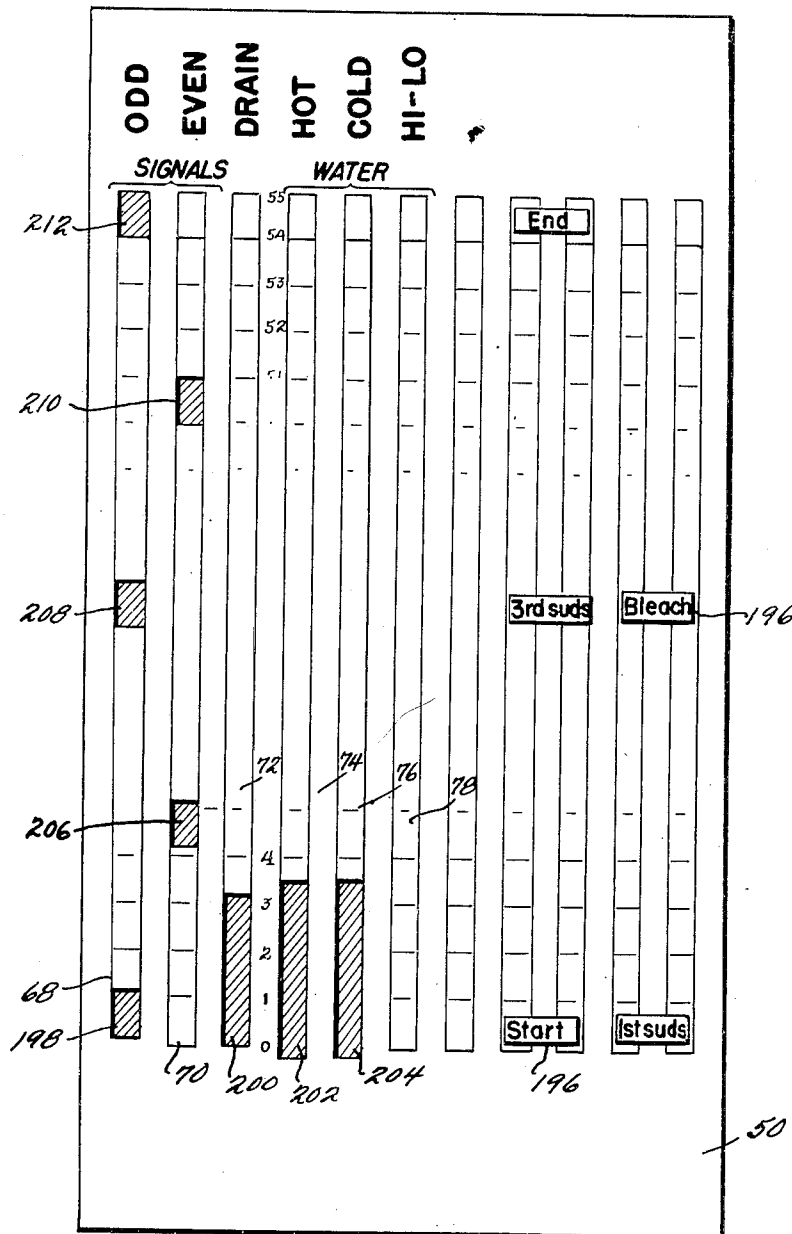
N. L. PELLERIN ET AL
WASHING MACHINE CONTROLLER

2,779,937

Filed Sept. 7, 1954

2 Sheets-Sheet 2

FIG. 2.



INVENTORS

NORVIN L. PELLERIN
ALBERT J. PHILLIPS
FRANCIS X. LEVY

BY

Parker and Walsh

ATTORNEYS

1

2,779,937

WASHING MACHINE CONTROLLER

Norvin L. Pellerin, Albert J. Phillips, and Francis X. Levy,
New Orleans, La., assignors to Pellerin Milner Corporation,
New Orleans, La., a corporation of Louisiana

Application September 7, 1954, Serial No. 454,532

15 Claims. (Cl. 340—265)

This invention relates to a system for controlling washing machines or the like and more particularly to a controller which may be employed either for automatic or manual operation of a washing machine. While the invention may be utilized either in home or commercial laundering apparatus, it is intended for utilization primarily in apparatus of the latter type.

In commercial laundering practice a batch of clothes or other material to be cleaned is subjected to a laundering cycle comprising a plurality of sequential operations. In general, the cleaning process takes place in water having a predetermined temperature and level. Laundering agents such as soap, bleach, blue and sour are required at different times throughout the laundering cycle, and the duration of the individual operations as well as the need for a particular supply is determined by the characteristics of the clothes to be laundered. In most instances a single washing formula, that is, a particular cycle of operations, will satisfy the requirements of the majority of commercial laundering jobs. However, it is occasionally necessary to vary the formula because a particular batch of clothes is especially soiled or has other peculiar characteristics. Furthermore, it is desirable to be able to employ several standard formulae where the clothes to be laundered fall into several categories.

To satisfy the needs of commercial laundering, many devices have been proposed in the prior art to control the operation of a washing machine in accordance with a predetermined formula. In some instances attempts have been made to provide washing machine controllers in which the laundering agents are injected automatically into the machine at predetermined intervals. In more moderate laundering operations, however, controllers have been employed in which the initiation, duration, and termination of the operations which constitute the laundering cycle are controlled automatically, but in which the laundering agents are added by an operator who is informed of the need for such agents by a suitable signal. The system of the present invention falls within the latter category. This invention constitutes an improvement of the apparatus of the prior art and provides a simple, reliable, yet versatile controller for a washing machine.

In a preferred form of the invention, the operation of the controller depends upon a formula chart which controls the sequence of operations, and the exact nature of which is predetermined in accordance with the needs of a particular laundering cycle. The formula chart moves under the impetus of a timer motor and cooperates with a plurality of electrical switch fingers to control the operation of the washing machine. In accordance with the predetermined formula on the chart, the operation of hot and cold water valves as well as a drain valve is controlled. In addition, the water level is varied in accordance with the chart formula, and a signal is operated when the washing machine requires attention, as when supplies or laundering agents are required. The timer motor will automatically stop while the controller is signalling and while the washing machine is filling with water, thus assuring a complete and accurate washing

2

cycle for each load. The washing machine motor will also stop while the controller is signalling, and at the end of the laundering cycle. In addition, the operator may adjust the controller so that the washer motor stops while the washer is draining (to prevent felting or shrinkage of delicate fabrics), or runs while draining (for normal work classifications). Furthermore, the formula may be substantially modified (without the necessity of changing the formula chart) by manipulating water level switches and hot and cold water switches during the automatic cycle. Moreover, the controller provides for completely manual operation so that the occasional dye job or unusual washing jobs may be handled without changing formula charts.

The controller of the present invention incorporates a unique alarm circuit. The circuit includes a pair of switch fingers cooperating with the formula chart, and the chart is designed so that the fingers are alternately operative to energize the alarm signal. A cancelling switch for deenergizing the signal connects the switch fingers into the alarm circuit alternately. In addition, a relay in the alarm circuit arrests the movement of the formula chart and stops the washer motor until the alarm has been cancelled by the operator. In this manner compliance with the predetermined laundering cycle is insured, and the continuing operation of the controller and washing machine in the absence of the proper washing agent is prevented.

Accordingly it is the primary object of the present invention to provide an improved washing machine controller.

Another object of the invention is to provide a washing machine controller which is actuated by a formula chart cut in accordance with a predetermined laundering cycle.

A further object of the invention is to provide a washing machine controller which affords either automatic or manual operation, as desired.

An additional object of the invention is to provide a washing machine controller of the type in which a formula chart is employed, having means for varying the formula during the laundering cycle without varying the formula chart.

Still another object of the invention is to provide an improved washing machine controller in which the admission of hot and cold water to the washing machine, the level of the water in the washing machine, and the draining of the washing machine, are controlled.

A more specific object of the invention is to provide a washing machine controller including a timer motor which is stopped while water is admitted to the machine and until a preselected level is obtained, and including means whereby the washing machine motor may be controlled to stop or run while the machine is draining.

A still further object of the invention is to provide an improved alarm circuit.

An additional object of the invention is to provide an alarm circuit which may be actuated alternately by a pair of actuators and in which the cancelling of the alarm is effected by making the alarm circuit responsive alternately to the actuators.

Yet another object of the invention is to provide a washing machine controller incorporating a unique alarm system which prevents the continued operation of the controller and stops the washer motor until the alarm signal is cancelled.

These and other objects of the invention will become more apparent in the following detailed description of the invention when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a partly schematic diagram of a preferred form of the invention;

Figure 1a is a detail of the water level control utilized in Figure 1; and

Figure 2 is an illustration of the type of formula chart which may be utilized according to the invention.

Referring now to Figure 1, reference numeral 10 designates generally a washing machine provided with a suitable base 12, a washing enclosure 14 (which may, for example, comprise a cylindrical tumbling basket), a door 16, hot and cold water pipes 18, 20 respectively, a drain pipe 22, a water level float control 24, and a washer motor 26, which for purposes of clarity is illustrated with the controller circuit and is shown coupled to the washing machine by dash line 28, which represents a suitable mechanical coupling. The washing machine per se may be any of the conventional types, and requires no further description.

The washing machine and controller are energized from a standard source of alternating current 30, which may be a standard 110 volt supply, for example. A master double pole double throw switch 32 having a "formula" position, a center "off" position, and a "manual" position, controls the energization of the controller and the washing machine motor. The switch is illustrated in the "formula" position. The lead-in wires 34, 36 are connected respectively to a center "off" terminal and a "formula" terminal as illustrated. When the master switch is in the position illustrated, one side of the A. C. source is connected through wire 34, master switch 32, and wire 38, to one side of the primary winding of a power transformer 40. The other side of the source is connected through wire 36 and wire 42, to the other side of the primary winding. When switch 32 is in its "off" position, the circuit to wire 34 is broken.

Transformer 40 may be designed so as to produce 24 volts, for example, across its secondary winding 44. One terminal of the secondary winding is connected to a common switch finger 46, which is biased against the conductive surface of a chart drum 48, upon which the formula chart 50 is wrapped. The drum may be formed of a conductive mesh material, and the chart may be attached to the drum in any convenient manner as described, for example, in the copending application of Norvin L. Pellerin, filed July 19, 1954, Serial No. 444,086, for Timing and Controlling Apparatus.

The drum is driven by a timer motor 52, which is energized through a circuit including wire 36, switch 32, wire 54, the closed upper contacts of a water level relay 56, wire 58, the closed upper contacts of a signal relay 60, wire 62, jumper wire 128, switch 32, and wire 34. The timer motor is connected to drum 50 by any suitable mechanical coupling, as designated by dash line 64. The drum is also provided with a knob 66 so that it may be rotated manually.

Chart 50 may be formed of any suitable non-conductive material, such as heavy plasticized paper, and is provided with a plurality of tracks 68, 70, 72, 74, 76 and 78, outlined thereon in ink. As will appear more fully hereinafter, tracks 68 and 70 are the odd and even signal tracks, track 72 is the drain track, tracks 74 and 76 are the hot and cold water tracks respectively, and track 78 is the water level track. The material of each track may be cut away at predetermined locations so as to expose the mesh surface of drum 48. Each of the tracks co-operates with an associated switch finger, such as fingers 80, 82, 84, 86, 88 and 90. These fingers are identical with common finger 46, and additional tracks and fingers may be provided when needed, to control additional elements. Fingers 80 through 90 are insulated from the surface of drum 48 by the chart material and may be formed of metallic spring material biased against the chart so that when the chart is cut away at the various tracks, the fingers will engage the conductive surface of the drum. As will appear below, the circuit for fingers 80 through 90 is completed through common finger 46.

One terminal of secondary winding 44 of power trans-

former 40 is also connected to one terminal of a plurality of single pole double throw switches 92, 94, 96 and 98. Another terminal of each switch is connected to an associated switch finger (84, 86, 88, 90) as illustrated. The switches are shown in the "formula" position, that is, the position in which the switch arms are connected to the associated formula chart fingers. Switch 92 is the drain valve switch and has a center "open" position and a bottom "shut" position. Switches 94 and 96 are the hot and cold water valve switches and have center "off" positions and bottom "in" positions. Switch 98 is the water level switch and has a center "low" position and a bottom "high" position.

The switch arm and center terminal of switch 92 are connected by wire 100 to the field coil 102 of a drain relay 104. The other side of the field coil is connected through wire 106 and wire 108 to secondary 44 of transformer 40. With switch 92 in the "formula" position, it will be appreciated that when switch finger 84 contacts the surface of drum 48, a circuit is completed from one side of secondary 44 through common finger 46, finger 84, switch 92, field coil 102, back to the secondary winding.

Energization of drain relay 104 causes its contacts to close and completes a circuit through the field coil 130 of a pilot solenoid valve 132 as follows: from one side of A. C. source 30 through wire 34, switch 32, jumper wire 128, wire 62, wire 134, the closed upper contacts of drain relay 104, wire 136, field coil 130, wire 42, wire 36, back to the other side of the A. C. source 30. Upon energization of pilot solenoid valve 132 compressed air is passed from a suitable source through pipe 138 and pipe 140 to a drain valve 142, which may be a conventional diaphragm-controlled valve closed by fluid pressure. This closes the drain valve and prevents the liquid in the washing machine from draining through pipe 22. Upon energization of drain relay 104, an indicator lamp 144 is energized from one side of secondary winding 44 through wire 91, wire 146, the closed lower contacts of relay 104, wire 115, wire 106, and wire 108 back to secondary winding 44. Thus when lamp 144 is lit a positive indication is given that the drain valve is closed.

The switch arm and center terminal of switch 94 are connected to the field coil 110 of a hot water pilot solenoid valve 112 and then to a lower pair of contacts of level relay 56, through wire 114, a lower pair of contacts of drain relay 104, wire 115 and wire 106 to secondary winding 44. It will be appreciated that with switch 94 in the "formula position," when the lower contacts of relays 56 and 104 are closed and finger 86 engages the surface of drum 48, a circuit is completed from secondary winding 44 through common finger 46, finger 86, switch 94, field winding 110, wire 114, wire 115, wire 106, back to the secondary winding 44. Similarly, the switch arm and center terminal of switch 96 are connected to the field winding 116 of a cold water pilot solenoid valve 114 and then through the circuit just described. When pilot solenoid valves 112, 114 are energized, compressed air from a suitable supply is admitted from pipe 118 to pipes 120, 122 respectively and then to a pair of water valves 124, 126 respectively. The water valves may be conventional diaphragm-controlled valves opened by fluid pressure. Upon such actuation, water from supply pipes 18, 20 is admitted to washing machine 10. Of course water pressure may be employed to actuate the valves instead of air pressure, and field windings 110, 116 may be employed to actuate valves 124, 126 directly. This may also be the case with the drain pilot solenoid valve 132 and drain valve 142.

The switch arm and center terminal of switch 98 are connected to a normally closed single pole single throw switch 148, through wire 150 to the field coil 152 of level relay 56, and then through wire 154, wire 146, the lower contacts of drain relay 104, wire 115, wire 106, wire 108, to one side of secondary winding 44. The

circuit from the other side of the secondary winding is completed through common finger 46 and finger 90. Switch 148 is associated with a second single pole single throw switch 156 which is normally open. This switch connects field winding 152 of relay 56 directly to wire 91. Switches 148 and 156 are operated by the float control mechanism 24 associated with the washing machine. One such mechanism is shown in Figure 1a. It includes a vessel 158 which receives liquid through pipe 160 from the interior of the washing machine. The level of the washing solution in vessel 158 is always representative of the level of the solution in the washing machine. A float 162 fixed to a vertical shaft 164 is arranged in vessel 158. When the level of the water changes, the vertical motion of float 162 is transmitted to shaft 164. Shaft 164 passes loosely through an arm 166 which is pivoted about a point 168.

A pair of clips 170, 172 is provided on shaft 164 to cause arm 166 to move about pivot point 168. These clips are adjustable on shaft 164 and may be placed at any level commensurate with the water level desired. Clip 170 engages arm 166 when shaft 164 moves downward, as the water level falls, and causes the arm to pivot downward about point 168, while clip 172 engages arm 166 as shaft 164 moves upward, when the water level rises, and causes the arm to pivot in the opposite direction about point 168. Switches 148, 156 are provided with a pair of actuating plungers 174, 176, respectively, which are engageable with arm 166. When arm 166 is moved upward by clip 172, plunger 174 opens normally closed switch 148. When arm 166 is moved downward by clip 170, plunger 176 closes normally open switch 156. Thus clip 170 controls low level switch 156, while clip 172 controls high level switch 148. Switches 148 and 156 may be spring-biased to their normal positions.

With switch 98 in the "formula" position as illustrated, it will be appreciated that when finger 90 engages the surface of drum 48, level relay 56 will remain energized as long as switch 148 is closed. Switch 148 will also control the energization of relay 56 if switch 98 is in its bottom "high" position, but if switch 98 is in its center "low" position, or if there is no slot in track 78 when switch 98 is in its "formula" position, then switch 156 will control the energization of relay 56.

When the washing machine is drained, float 162 moves to its low position, and clip 170 closes switch 156. As water is admitted, the level in vessel 158 rises until clip 170 releases arm 166, and switch 156 opens. If the energization circuit for relay 56 is completed only through switch 156, then the opening of this switch deenergizes the relay and closes the water valves. However, if the circuit for relay 56 is also completed through switch 148, then the opening of switch 156 is ineffectual, and the water level rises until clip 172 engages arm 166 and opens switch 148. Clips 170, 172 may thus be adjusted along rod 164 to adjust the respective low and high water levels.

Springs fingers 80, 82 form a part of the alarm circuit. They are coupled respectively to two terminals of a single pole double throw switch 178, the switch arm of which is connected to the field coil 180 of signal relay 60 through wire 182. The other side of the field coil is connected through wire 106 and wire 108 to one side of secondary winding 44. Track 68 of formula chart 50 associated with finger 80 has been designated the odd signal track, while track 70 associated with finger 82 has been designated the even signal track. These tracks are alternately effective to operate the alarm circuit depending upon the position of switch 178. With switch 178 in the position shown, track 68 is enabled to energize the alarm circuit by completing the circuit from field coil 180 of the signal relay through wire 182, switch 178, finger 80, the surface of drum 48, common finger 46, back to secondary wind-

ing 44. Thus if a cut-away portion of track 68 reaches finger 80 when switch 178 is in the position shown, relay 60 will be energized. When switch 178 is in its alternate position, that is connected to finger 82, track 70 is enabled to energize signal relay 60. In the practice of the invention, slots are alternately cut in tracks 68 and 70 where alarms are necessary to designate the need for laundering agents or the end of the cycle. The first slot may be cut in the odd track, and switch 178 is initially placed in the position illustrated, which may be designated the start position. When the slot in track 68 reaches finger 80 signal relay 60 will be energized, and it will be necessary for the operator to throw switch 178 to its alternate position to deenergize the relay. The next alarm will occur, of course, when the alternate slot in track 70 reaches finger 82, and the cancellation of this alarm will require the operator to throw switch 178 to the position illustrated. Field coil 180 of relay 60 is in parallel with a buzzer 184 and a signal lamp 186. Thus when relay 60 is energized, buzzer 184 and lamp 186 will operate to give an alarm signal.

When signal relay 60 is energized, both pairs of its contacts are opened. The upper contacts are in the energization circuit of timer motor 52, and the opening of these contacts therefore deenergizes the timer motor. Thus the formula chart stops advancing whenever a signal occurs and does not commence advancing until the operator cancels the alarm. It is therefore impossible for the washing machine to proceed through subsequent operations until the need for a supply has been recognized. The lower contacts of signal relay 60 are in the energization circuit of washer motor 26. This circuit may be traced from A. C. source 30 through wire 36, wire 42, through the motor, wire 188, the lower contacts of signal relay 60, wire 190, to a single pole double throw switch 192. The upper contact of switch 192, designated the "run" contact, continues the energization circuit of motor 26 through wire 194, wire 58, the upper contacts of signal relay 60, wire 62, jumper wire 128, switch 32, and wire 34, back to the other side of A. C. source 30. The lower contact of switch 192, designated the "stop" contact, completes the circuit to wire 62 through wire 136, the upper contacts of drain relay 104, and wire 134.

It will thus be appreciated that when signal relay 60 is energized, thereby opening its contacts, washer motor 26 is deenergized. Moreover, when switch 192 is in the stop position the washer motor is deenergized whenever drain relay 104 is deenergized. It will be recalled that deenergization of the drain relay opens drain valve 142. Thus the operator may select the position of switch 192 so that the washer motor either runs or stops while the machine is draining.

Level relay 56 also controls the energization of timer motor 52, since its upper contacts are in this circuit. Thus when the level relay is energized, thereby opening its upper contacts, the timer motor is deenergized, stopping the advance of the formula chart. The level relay will remain energized until the proper water level has been obtained. As indicated previously, the lower contacts of level relay 56 control the energization of the water valve pilot solenoids 112, 114. The lower contacts of drain relay 104 are also in the energization circuit for the solenoids. It is thus impossible to energize the water valves when the drain relay is deenergized, that is when the drain valve is open. Moreover, the water valves will remain open only so long as the level relay 56 is energized, and when the water has reached desired level, as determined by the operation of switches 148, 156, level relay 56 will be deenergized, thereby breaking the circuit for opening the water valves.

With switch 98 in the formula position, as illustrated, the water levels for the various operations will be determined by the formula chart. If a slot is cut out of track 78, for a particular laundering operation, the water level will be high, and in the absence of a slot in track 78 the

water level will be low. The operator may override the formula chart by simply manipulating switch 98 during the laundering cycle. This does not necessitate changing the formula chart. Thus if switch 98 is placed in its "low" or center position, all operations thereafter will take place in low level water regardless of the formula chart. On the other hand, if switch 98 is placed in its "high" or bottom position, all operations thereafter will take place in high level water, and if when the switch is thrown the water is at the low level, the machine will immediately fill to the high level.

Water switches 94, 96 may also be manipulated to vary the formula. With both switches in the "formula" position, as illustrated, the admission of water will be controlled by the chart, and the field coils 110, 116 of pilot solenoid valves 112, 114 will be connected to one side of secondary winding 44 whenever the associated spring fingers 86, 88 make contact with the surface of drum 48, that is, when a cut-out slot in either track 74 or 76 reaches the associated spring finger. Thus for luke-warm water both tracks are slotted, and for hot or cold water only the "hot" or "cold" track is slotted. If both switches are placed in the "in" position, all operations will take place in lukewarm water, regardless of the formula chart, for whenever the water valve circuits are completed upon energization of level relay 56, both field windings 110, 116 will be connected through wire 91 to secondary winding 44, and both the water valves will be opened. If switch 94 is placed in the "formula" position, as illustrated, and switch 96 is placed in the "in" position, all of the operations which according to the formula chart would take place in hot water will now take place in lukewarm water, since the cold water valve will be opened whenever water is called for by operation of level relay 56. It will be appreciated that all of the operations which according to the formula chart would take place in cold water or lukewarm water will continue as before. If the positions of switches 94 and 96 are reversed, all the operations which according to the formula chart would take place in cold water will take place in lukewarm water, while the hot water and lukewarm water operations called for by the chart will remain as before.

If switch 94 is placed in the "in" position and switch 96 is placed in the center "off" position, all washing operations will take place in hot water. Conversely, if switch 96 is placed in the "in" position and switch 94 in the center "off" position, all washing operations will take place in cold water. It should be noted however, that in automatic operation if one of the switches 94, 96 is placed in the "off" position, the other switch must be placed in the "in" position. If this were not done, and the other switch were placed in the "formula" position rather than in the "in" position, when the formula chart called for water corresponding only to the switch in the "off" position, no water would be admitted to the machine, and timer motor 52 would cease to operate, because level relay 56 would not be deenergized.

Figure 2 illustrates a formula chart of the type employed in the invention. A partial washing cycle is shown on the chart by the cross hatched cut-outs. A plurality of adhesive labels, such as labels 196, may be affixed to the chart to indicate to the operator the progress of the washing cycle and the particular supply required. A slot 198 is cut in the beginning of signal track 68 so as to cause an alarm indicative of the need for a first supply. Slot 200 in drain track 72 causes the energization of the drain relay while slots 202, 204 in the water tracks 74, 76 respectively, cause the energization of the hot and cold water valve solenoids and thus provide for the admission of lukewarm water to the machine. Since no slot is cut in water level track 78 at the beginning of the chart, the initial operation will take place in low level water. Successive slots 206, 208, 210, and 212 cut in tracks 68, 70 alternately will cause the alarm circuit to operate at pre-

determined times. Slot 212 indicates the end of the laundering cycle.

Referring now to Figure 1, a typical cycle of automatic operation will be described. After the formula chart is placed on the drum, the operator turns knob 66 until the beginning of the chart is aligned with the switch fingers. Switches 92 to 98 are placed in the "formula" position, switch 178 is placed in the start position, and switch 192 is placed either in the "run" or "stop" position. When master switch 32 is moved to the "formula" position, drain finger 84 engages the surface of drum 48 through a slot in track 72, such as slot 200 illustrated in Figure 2. This completes the circuit for drain relay 104, causing the drain valve to close and energizing indicator lamp 144. Since there is no water in the machine, clip 170 of the float control mechanism closes switch 156, thereby energizing level relay 56. If slots are cut in both of tracks 74, 76, both the hot and cold water valves are opened, and water is admitted to the machine. If no slot is cut in "level" track 78, the water valves are closed when switch 156 of the level control opens, thereby deenergizing relay 56.

When "level" relay 56 is deenergized, the closing of its upper contacts completes the circuit for timer motor 52, which advances chart 50. Fifteen seconds later, "odd" signal finger 80 drops into a slot and energizes signal relay 60, which opens its contacts and deenergizes timer motor 52 and washer motor 26. Simultaneously, signals 144 and 186 inform the operator of the need for a first supply. After filling this need, the operator throws switch 178 to its alternate position, cancelling the alarm and reenergizing motors 26 and 52.

Approximately five minutes later, drain finger 84 comes out of its slot, thereby deenergizing drain relay 104 and lamp 144, and opening drain valve 142. The washer motor will run or stop while the machine is draining depending upon the position of switch 192. Water drains from the machine for approximately thirty seconds, after which, drain finger 84 drops into another slot in track 72, again closing the drain valve and energizing lamp 144. Level relay 56 was energized when the water level dropped, and upon energization of drain relay 104, water valve pilot solenoids 112, 114 are again energized to open the water valves assuming that slots are cut in the associated tracks 74, 76. The timer motor, deenergized until the desired water level is obtained, is again energized upon the deenergization of level relay 56, and the chart advances until "even" signal finger 82 falls into a slot in track 70. The alarm circuit is again energized until switch 178 is thrown to its first position. Succeeding operations are similar to the foregoing until at last the end of the cycle is reached as indicated by the alarm circuit when one of the alarm fingers falls into an associated slot.

To use the controller manually, master switch 32 is placed in its "manual" position. This breaks the circuit from A. C. source 30 through wire 34 to timer motor 52. Switches 92—98 are placed in their center or bottom positions to prevent spurious operations which might occur if a switch were in the "formula" position and the corresponding finger were engaging the surface of drum 48. Drain valve relay 104 may then be energized by moving switch 92 to the "shut" position and drain valve 142 will close. Level relay 56 will be energized in the absence of water in the washing machine, and hot and/or cold water may be admitted by simply placing either or both of switches 94, 96 in the "in" position. The water level may be determined by placing switch 98 in the "low" or "high" position. Laundering agents may be added as desired. Washing will continue until drain valve switch 92 is moved to its center "open" position. The position of switch 192 may be selected so that washing machine motor 26 either runs or stops while the machine is draining, as set forth previously. After the

machine is drained, successive operations may be carried on in the same manner.

In the employment of the invention, the controller elements may be mounted in a suitable housing on the washing machine. The indicator lamps and the manually actuable switches may be located outside the housing for the convenience of the operator. The housing may be provided with a window through which the switch fingers and the labels on the chart may be seen. While a drum type formula switch having a separate common finger has been shown, it will be appreciated that other types such as the disc type or the type which mechanically actuates individual switches could be used.

While a preferred embodiment of the invention has been shown and described, it will be clear to those skilled in the art that this embodiment may be substantially modified without departing from the principles of the invention, the scope of which is defined in the following claims.

We claim:

1. In a controller for a washing machine having a water inlet valve, a drain valve, and means responsive to the water level in said machine; a plurality of switch elements, a source of electrical potential, timer means for connecting said switch elements to one terminal of said source at predetermined times and for predetermined intervals in accordance with a laundering formula, electric means for controlling the operation of said water inlet valve, means for connecting said electric means to one of said switch elements, electric means for controlling the operation of said drain valve, means for connecting said last-mentioned means to another of said switch elements, and means including said drain valve controlling means and said water level responsive means for connecting said inlet valve controlling means to another terminal of said source.

2. In the controller of claim 1, said washing machine including an electric washer motor; means including switch means for selectively rendering said washer motor controllable or non-controllable by said drain valve controlling means.

3. In the controller of claim 2, an alarm circuit including an indicator, means for connecting said indicator to another of said switch elements, and means connected to said indicator for controlling said washer motor.

4. In the controller of claim 1, said timer means including an electric timer motor, and means including said water level responsive means for controlling said timer motor.

5. In the controller of claim 4, an alarm circuit including an indicator, means for connecting said indicator to another of said switch elements, and means connected to said indicator for controlling said timer motor.

6. In a controller for a washing machine having an electric washer motor, a water inlet valve, a drain valve, and means responsive to the water level in said machine; a source of electric potential, a plurality of switch elements, timer means including an electric motor for connecting said elements to one terminal of said source at predetermined times and for predetermined intervals in accordance with a laundering cycle, electric means connected to one of said switch elements for controlling said water inlet valve, electric means connected to another of said switch elements for controlling said drain valve, means including said drain valve controlling means and said water level responsive means for connecting said water valve controlling means to another terminal of said source, alarm means including an indicator and means for connecting said indicator to another of said switch elements, means including said water level responsive means and said alarm means for controlling said timer motor, and means including said alarm means for controlling said washer motor.

7. In the controller of claim 6, switch means for se-

lectively rendering said washer motor controllable or uncontrollable by said drain valve controlling means.

8. In a controller for a washing machine or the like which includes hot and cold water inlet valves and a drain valve; a plurality of switch elements; a source of potential, means for automatically connecting said elements to said source at predetermined times and for predetermined intervals, a plurality of manual switches, each of said switches including a first terminal connected to an associated one of said elements, a second terminal connected to said source, a third terminal, and means for connecting said third terminal selectively to said first and second terminals, electric means for controlling said hot and cold water valves and said drain valve, each of said electric means being connected to a third terminal of an associated one of said switches, and means for completing a circuit from said electric means back to said source.

9. In the controller of claim 8, each said switches including means for isolating said third terminal from both said first and second terminals.

10. In the controller of claim 8, said automatic connecting means comprising a movable surface having predetermined areas of conductivity and other areas relatively non-conductive, said switch elements comprising conductive fingers biased against said surface and aligned with predetermined areas.

11. In the controller of claim 8, said means for completing the circuit of said water valve control means including a relay, a first switch for connecting the coil of said relay to the third terminal of an associated one of said manual switches, a second switch for connecting the coil of said relay to the second terminal of said last-mentioned manual switch, and means for operating said first and second switches in accordance with the level of the water in said washing machine.

12. A controller for controlling the operation of a device and for producing an alarm signal at predetermined times within the operating cycle of said device, comprising first switch means connected to said device for controlling its operation, means for actuating said switch means at predetermined times, an alarm circuit, second and third switch means, means operative selectively to connect said second and third switch means in said alarm circuit alternately, and means for actuating said second and third switch means alternately and in timed relationship with the actuation of said first switch means.

13. The controller of claim 12, including means for preventing succeeding actuation of said first switch means while either of said second and third switch means is actuated and connected in said alarm circuit.

14. In a device of the type described, a pair of switch elements, means for connecting said elements to one terminal of a source of electric potential alternately, an indicator, means for connecting said indicator to another terminal of said source, means for connecting said indicator alternately to said switch elements said means for connecting said elements to said one terminal comprising a movable surface having a pair of tracks aligned respectively with and engaging respectively said elements, each track having alternate areas of conductivity and non-conductivity, drive means for moving said surface, and means for preventing energization of said drive means when said indicator is energized from said source.

15. In mechanism of the type described, a pair of switch elements, timer apparatus for connecting said elements to one terminal of a source of electrical potential alternately and after predetermined intervals, an indicator, a conductor for connecting said indicator to another terminal of said source, a device for connecting said indicator alternately to said switch elements, and means connected to said indicator and responding to the connection of one of said elements to said one terminal while that

11

element is connected to said indicator, for interrupting the operation of said timer apparatus.

References Cited in the file of this patent

UNITED STATES PATENTS

2,155,271 Jones ----- Apr. 18, 1939
2,357,909 Ridge ----- Sept. 12, 1944

2,420,481
2,561,631
2,570,148
2,588,774
2,654,239
2,692,604

5

12

Jackson et al. ----- May 13, 1947
Negri ----- July 24, 1951
Neuroth et al. ----- Oct. 2, 1951
Smith ----- Mar. 11, 1952
Welch et al. ----- Oct. 6, 1953
Walker ----- Oct. 26, 1954