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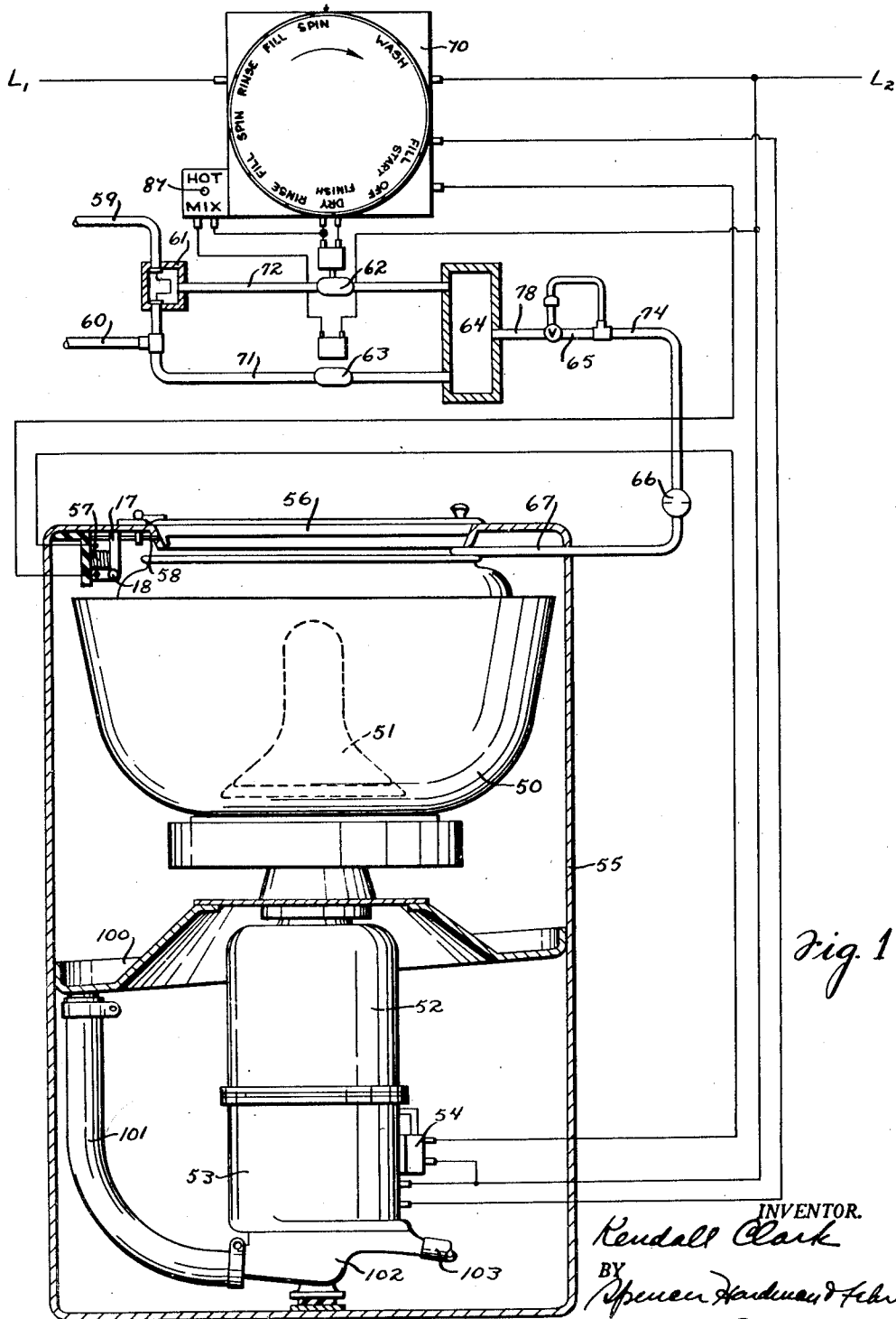
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CONTROL SWITCH MEANS FOR CLOTHES-WASHING MACHINES

Filed Nov. 4, 1944

2 Sheets-Sheet 1



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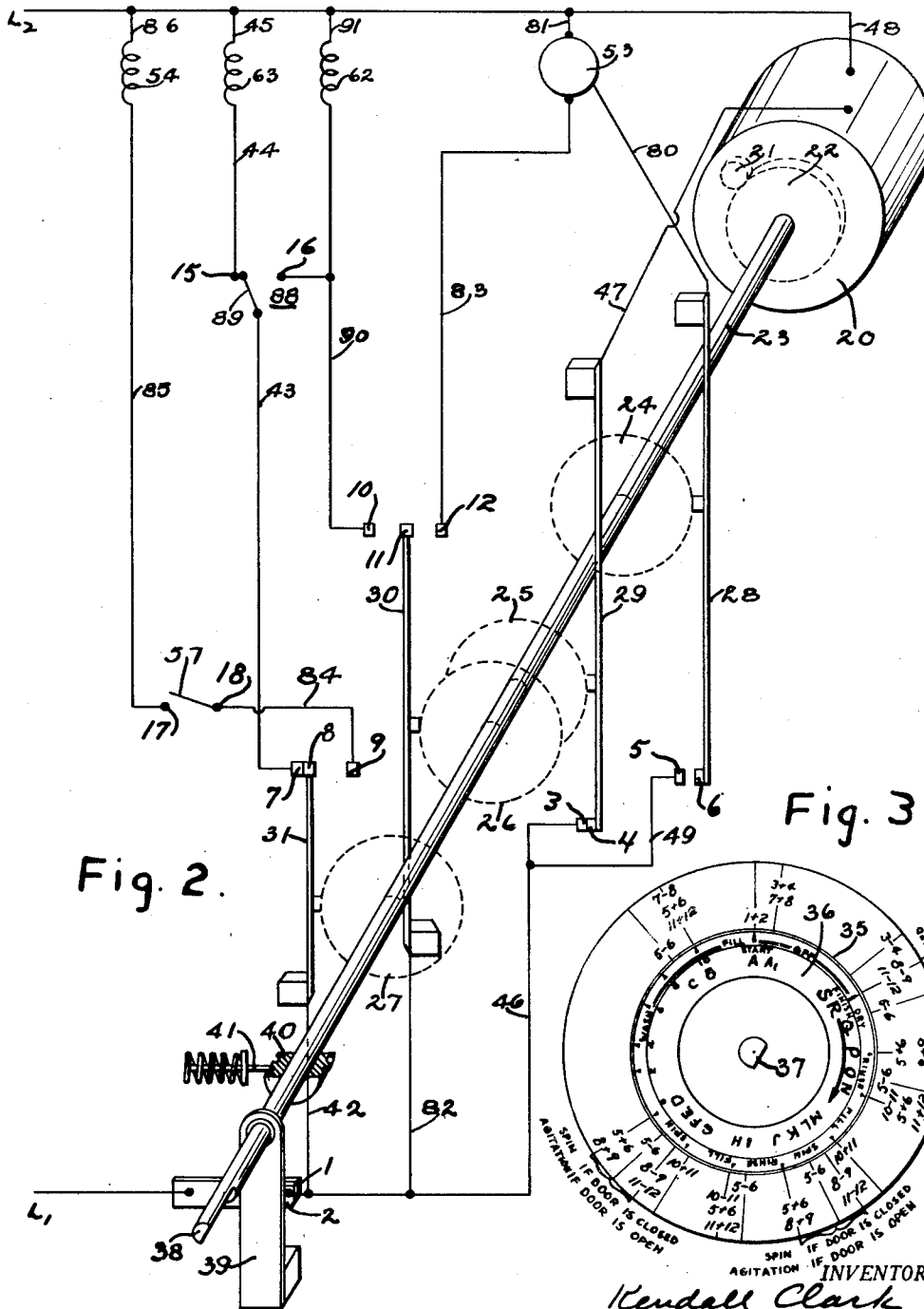


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE

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CONTROL SWITCH MEANS FOR CLOTHES-WASHING MACHINES

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2 Claims. (Cl. 171-97)

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This invention relates to washing machines, and more particularly to the automatic control of such washing machines.

An object of this invention is to provide a centrifugal washing machine with a control such that when the access door is opened, the centrifugal action is automatically stopped or prevented.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic representation of the washing machine and its controls;

Fig. 2 is a diagrammatic representation of the timer control, in combination with the electrical elements of the machine; and

Fig. 3 is a diagrammatic representation of the control knob for the timer, together with a diagram of the position of the contacts at various times.

A washing machine, according to this invention, includes a centrifugal basket 50, which may be centrifugally rotated to dry the clothes. An agitator 51 may be placed inside of the basket, for agitating the clothes prior to the centrifugal action. The basket or tub 50 and agitator 51 are actuated by power means such as a transmission 52, which is actuated by a motor 53, the transmission being controlled by a solenoid 54. When the motor 53 is energized, together with the solenoid 54, the agitator is not reciprocated; but the tub 50 is centrifugally rotated at a sufficient speed to wring the clothes. When the motor 53 is energized while the solenoid 54 is deenergized, the agitator 51 is reciprocated. When the solenoid 54 is deenergized while the tub 50 is rotating, a braking action is applied to the tub 50, to stop it quickly. Any type of motor and transmission may be used for accomplishing this purpose, such, for example, as is disclosed in my co-pending application S. N. 511,515, filed November 24, 1943, now matured as Patent Number 2,422,395, dated June 17, 1947, for Domestic appliance.

An access door 56 is provided in the cabinet 55 for introducing the clothes and detergent into the tub 50. A door switch 57, hinged at 18 and closing contacts at 17, is actuated by the rod 58 so that the contacts 17 are opened whenever the door 56 is opened, and vice versa.

A timer 70 is provided, which controls the flow of electrical power from the lines L₁ and L₂ to the various electrical elements of the washing machine.

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The washing machine is filled with water from the hot water connector 60 and a cold water connector 59. These connectors discharge into a thermostatic mixing valve 61. The hot water connector also discharges into a hot water line 71. The mixing valve 61 discharges into a mixed water line 72. The lines 71 and 72 are controlled by solenoid valves 63 and 62 respectively, and discharge into a common outlet chamber 64. This chamber is connected by a line 73 to a constant pressure valve 65, which maintains a constant pressure of water on the line 74, which in turn discharges through a fixed orifice 66 and a nozzle 67 at a constant flow rate into the tub 50. The arrangement is such that the timer 70 opens the selected solenoid valve 62 or 63 for a sufficient length of time so that the constant volume discharge of water at the nozzle 67 fills the tub 50 to the correct level during each filling operation. The position of the handle 87, of the selector switch 88 determines whether the movable contact 89 of the switch 88 contacts 15 or 16. When the handle 87 is on the indication "Hot," contact 89 engages 15, and the hot water solenoid 63 is energized for the first filling operation. During the second and third filling operations, the mixed water solenoid 62 is energized regardless of the position of contact 89.

Fig. 2 shows the timer construction diagrammatically. It includes a timer motor 20 which moves a small gear 21 intermittently, such as at one-half minute intervals. This gear in turn actuates a larger gear 22, which is fixed to a rotatable shaft 23. The shaft 23 carries a plurality of rotatable cams 24, 25, 26 and 27 which are in engagement with movable blades 28, 29, 30 and 31 respectively, and which carry movable contacts 6, 4, 11 and 8 respectively. The cams 24, 25, 26 and 27 have been indicated by dotted circles; but it is understood that they actually are irregularly shaped cams, so shaped that the movable contacts 6, 4, 11 and 8 are actuated at selected intervals of time, as indicated in Fig. 3. Fig. 3 shows the indications on the knob 36, which are inside of the circle 35. The numerals on the outside of circle 35 indicate the positions of the movable contacts at the various intervals of time, as the shaft 23 is rotated clockwise. The knob 36 is provided with an irregular orifice 37 which fits over the irregular end 38 of the shaft 23. The knob 36 is axially secured to the shaft 23, so that, when the knob 36 and shaft 23 are moved slightly axially, a master switch movable contact 2 is moved into and out of contact with master switch stationary contact 1. The movable contact 2 is

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carried by a movable blade 39 which has its upper end in axial engagement with the shaft 23. Whenever the knob 36 is pulled towards the operator, the contacts 1 and 2 are opened, and whenever the knob is pushed away from the operator, the contacts 1 and 2 are closed. A suitable snap acting mechanism is provided for allowing the shaft to be placed in these two axial positions. This may take the form of a double groove ring 40 carried by the shaft 23 in which a spring-pressed pin 41 rides, so that the ring 40 snaps from one position to the other.

Whenever the movable contact 8 engages contact 9, the solenoid 54 is energized, so that the tub 50 is centrifugally rotated. However, since the switch 57 is open whenever the door 56 is open, the solenoid 54 cannot be energized with the door open. Therefore, should the operator open the door while a centrifugal action is taking place, the solenoid 54 would be deenergized, and the centrifugal action would be changed to agitation. Also, if the door 56 should be left open during any previous operation, then, when the timer reaches a spin position, the solenoid 54 cannot be energized, and the agitator is reciprocated and the tub 50 is not rotated.

When 8 contacts 7 one of the water solenoids 62 or 63 is energized and water is introduced into the tub, depending on the position of contact 89. When 11 contacts 10, the mixed water solenoid 62 is energized and mixed (tepid) water is introduced into the tub regardless of the position of 89. When 11 contacts 12, the running winding of motor 53 is energized. When 3 contacts 4, the timer motor 20 is energized. When 5 contacts 6, the starting winding of motor 53 is energized. All of the above energizations are dependent on the knob 36 being manually pushed in to close contacts 1 and 2.

In the operation of the device, the door 56 is opened and clothes and detergent are placed in the tub 50. The door then should be closed and the knob 36 should be pushed away from the user to close contacts 1 and 2 and the knob 36 should be turned clockwise from the "off" position S (where the timer previously had stopped) to the start position at A. Just before reaching position A, the cams are actuated so that contacts 3 closes on 4 and contact 7 closes on 8 as indicated at A'. Current flows from L₁ through 1, 2, 42, 31, 8, 7, 43, 89, 15, 44, 63, 45 and L₂. This energizes the hot water solenoid and starts the flow of hot water into the tub 50. At the same time current flows from L₁ through 1, 2, 46, 3, 4, 29, 47, motor 20, 48 and L₂, thus actuating the timer motor 20. The shaft 23, and knob 36 are then intermittently progressed from position A to position B, where contact 8 is moved away from 7; 6 is moved to 5; and 11 is moved to 12. This energizes the starting coil of motor 53 from L₁, 1, 2, 46, 49, 5, 6, 28, 80, 53 and 81 to L₂. It also energizes the running coil from L₁, 1, 2, 82, 30, 11, 12, 83, 53, 81 and L₂. The motor 53 is therefore started and caused to run on the starting and running windings thereafter. Since the transmission solenoid 54 is deenergized, the agitator 51 is agitated. After a suitable interval of time, as at C, the starting winding of the motor 53 is deenergized by opening contacts 5 and 6. The washing operation continues, (agitator action) for the selected number of minutes, until the position D is reached. Should the user desire a shorter washing period than the 10 minutes indicated on the timer, he may advance the knob 36 manually to a shorter period, such as to an

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8, 6 or other minute period. When position D is reached, contacts 5 and 6 are closed, as are also 8 and 9. The closing of contacts 8 and 9 energizes solenoid 54, if the door 56 is closed, and starts the tub 50 to spin. The starting winding of the motor 53 is again energized by the closing of contacts 5 and 6 because acceleration is necessary, and the motor is slowed down to a speed requiring the starting winding to aid in getting the tub up to speed. The circuit to the solenoid 54 is from L₁ through 1, 2, 42, 31, 8, 9, 84, 18, 57, 17, 85, 54, 86 and L₂. However, should the door 56 be opened while the spinning operation progresses or if the door has been left open, then no spinning of the tub can take place, since the solenoid 54 cannot be energized because the switch 57 is open. The water in the tub is discharged over the rim of the tub into sump 100, and thence through pipe 101, pump 102 to the sewer drain connector 103.

As the timer continues to rotate, the position E is reached where the starting winding is deenergized by the opening of contacts 5 and 6. When the position F is reached contact 8 is moved from 9 and 11 from 12. This deenergizes the solenoid 54 and the motor 53 and stops the spinning operation. At position G 10 is closed on 11. Current flows from L₁ through 1, 2, 82, 30, 11, 10, 90, 62 and 91 to L₂. This energizes the mixed water solenoid 62 and starts flow of mixed water through the nozzle 67. The flow of water continues until position H is reached by the timer, which is the correct length of time to fill the tub. At H contact 11 is moved from 10 while the contacts 5 and 6 are closed together with contacts 11 and 12. This stops the flow of water and energizes the starting and running windings of the motor 53 and agitates the clothes in a tepid rinsing water. At I contact 6 is moved from 5, thus deenergizing the starting winding of motor 53, the motor 53 continuing to run on the running winding. From H to J, the agitator 51 is reciprocated. At J contact 6 closes on 5 while contact 8 closes on 9. If the door 56 is closed, the tub 50 starts to spin; but if the door is already open, then the tub does not spin but the agitator reciprocates. At K the starting winding is deenergized by the opening of contacts 5 and 6. At L the spinning operation is terminated by the opening of contacts 8 and 9 and 11 and 12. The water in the tub is discharged by the spinning operation as before described. At M the mixed water solenoid 62 is opened by the closing of contacts 10 and 11. The filling operation continues until N is reached, when contacts 10 and 11 are opened while 5 and 6, and 11 and 12 are closed. This stops the filling operation and starts the reciprocation of the agitator, the motor 53 running on both its starting and running windings. At O the starting winding is deenergized by the opening of contacts 5 and 6. At P the contacts 5 and 6 are closed as are also contacts 8 and 9. This starts a spinning operation, the motor 53 running on both windings until position Q, when the starting winding is deenergized by the opening of contacts 5 and 6. At R the spinning operation is terminated by the opening of contacts 8 and 9 and 11 and 12. It should be noted that, if the door 56 should be opened at any time during the interval between P and R the spinning operation will be stopped and changed to agitation by the deenergization of spin solenoid 54. If the door had been left open before the reaching of this spinning operation, the basket will not spin but will be agitated.

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Thereafter the timer continues to run until position S is reached when the contacts 3 and 4 are opened, thus deenergizing the timer motor 20. At this time the entire washing operation is terminated.

The opening of the door 56 does not interfere with any filling or agitation operations, such as occur between the intervals A to D, F to J, and L to P. The opening of door 56 also does not interfere with the operation of timer motor 20 at any time. However, should the door 56 be opened during the normally spin periods D to F, J to L, P to R, the spinning action is stopped and changed to agitation. Likewise, should the door 56 be left open, and one of the said normally spin periods be reached, the agitator 51 is reciprocated, and no spinning action is produced. Danger of injury to the user is thus avoided.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A control switch means for washing machines including: a power motor; a power motor switch; a spin switch; an agitation switch; an axially movable and rotatable timer shaft actuating said switches by rotation of said shaft; a door switch; said door switch enabling said power motor switch, said spin switch and said agitation switch when the door of the door switch is closed, and enabling said power motor switch, and agitation switch but disabling said spin switch when the door of said door switch is open; and a master

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switch in series with said switches and opened and closed by axial movement of said timer shaft.

2. A control switch means for washing machines including: a power motor; a power motor switch; a spin switch; an agitation switch, a filling switch; a timer motor, and an axially movable and rotatable timer shaft having cams and rotatably driven by said timer motor for operating said switches; a door switch; said door switch, when its door is closed, enabling said power motor, spin, agitation, and filling switches; said door switch, when its door is open, enabling said power motor, agitation and filling switches, but disabling said spin switch; and a master switch in series with said switches and opened and closed by axial movement of said timer shaft.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,582,268	Husted	Apr. 27, 1926
2,161,604	Watts	June 6, 1939
2,176,954	Clark	Oct. 24, 1939
2,233,362	Beeman	Feb. 25, 1941
2,302,012	Dyer	Nov. 17, 1942
2,302,836	Breckenridge	Nov. 24, 1942
2,321,641	Anderson	June 15, 1943
2,325,663	Claybourn	Aug. 3, 1943
2,355,162	Hovey	Aug. 8, 1944