Dec. 23, 1958 J. K. COWDERY 2,865,187

LAUNDRY APPARATUS

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FIG. 1.

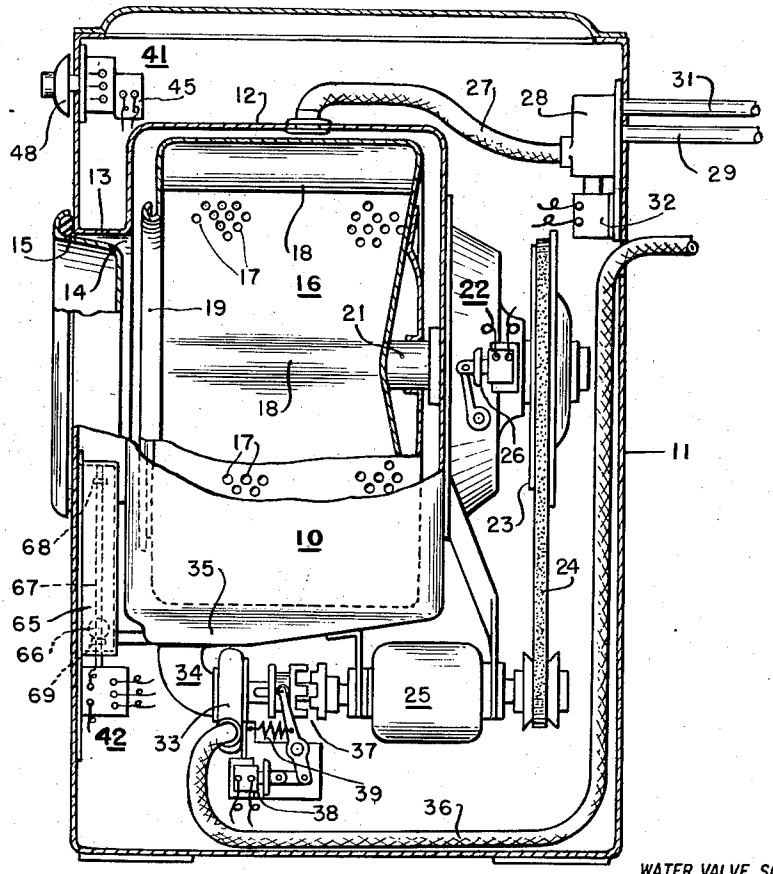
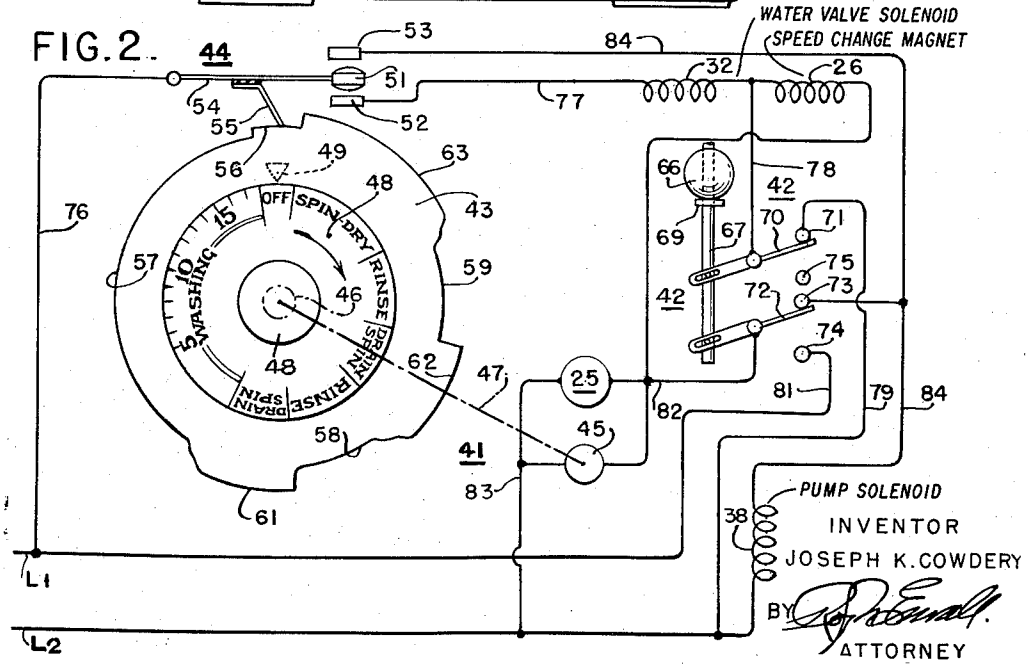



FIG. 2.




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# LAUNDRY APPARATUS

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This invention relates to automatic cycle clothes washing and centrifuging machines and has for an object to provide an improved machine of this kind.

A further object of the invention is to provide a low cost simplified control mechanism for a machine of the class set forth.

The improved control mechanism is particularly adaptable to a domestic washing and spinning machine having the usual driving motor and speed change mechanism, the latter including a magnet which, when energized and deenergized, respectively operates the machine at spinning and washing speeds. These machines also include a conventional solenoid valve controlling admission of water to the machine and an electrically operated drain mechanism for discharging vitiated water from the machine.

In accordance with this invention a timing mechanism of simple low cost construction is employed in conjunction with a switching mechanism actuated by the water level within the tub. The timing mechanism includes a single cam for operating a switch, preferably of double throw type, to first and second active positions for energizing the valve solenoid and the drain mechanism respectively. The switching mechanism of the water level control moves from one position when the tub is devoid of water to a second position when the proper amount of water is admitted to the tub. The circuitry connecting the various electrically translating devices of the machine and the control elements set forth is such that the following steps are carried out.

When the timing mechanism is adjusted from an inactive or off position to its first active or washing position, the fill valve solenoid is energized and water is admitted to the tub until a predetermined amount is obtained therein. In response to this, the water level control mechanism moves to its second position deenergizing the valve solenoid and also establishing a circuit for the energization of the main motor of the machine and the timer-motor. A washing operation of selected duration is now carried out, at the conclusion of which, the timing mechanism moves its switch to the second active position thereof and energizes the draining means. Vitiated washing fluid is discharged from the machine and the water level control mechanism is actuated to said one position. During transition to this position, the water level control switching mechanism maintains energization of the driving motor and timer motor and also energizes the speed change magnet. Accordingly, high speed operation of the machine is initiated and continues for a predetermined period of time for the extraction of water from the fabrics. This operation is concluded by the timing mechanism which actuates its double throw switch to an inactive position for stopping operation of the apparatus or, the timing mechanism may actuate this switch to its first active position to carry out another series of steps, as described, during which rinsing and spinning of the fabrics is effected.



The foregoing and other objects are effected by my invention as will be apparent from the following description taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical longitudinal section taken through one form of washing and centrifuging machine controlled in accordance with this invention; and

Fig. 2 is a diagram of the electrical connections employed in the washer shown in Fig. 1.

Reference will now be had to the drawing wherein the invention is shown applied to a domestic clothes washing and centrifuging machine of the type having a washing and spinning unit 10 arranged within a housing 11. The washing and spinning unit 10 includes a tub 12, the front wall of which is connected by a sleeve 13 to the housing 11 and forms an access passage or opening 14. The latter is closed by a conventional gasketed door 15 hinged in any suitable manner (not shown) to the front of the housing 11.

Arranged within the tub 12 is a generally cylindrical basket 16, the side wall of which is perforate, a number of the perforations being indicated at 17. The basket 16 is rotatable about a generally horizontal axis at low and high speeds for respectively washing the fabrics and centrifuging washing fluid therefrom. A plurality of conventional vanes 18 are disposed within the basket 16 and extend radially inwardly from the side wall thereof. The vanes 18 are effective to tumble the fabrics within the basket 16 during the slow speed rotation thereof and assist in the washing of the fabrics. The front end of the basket 16 is provided with an access opening 19 which registers, substantially, with the access opening 14 in the tub.

Rotation of the basket is effected by a shaft 21 defining the sole support for the basket and driven by a two speed mechanism, generally indicated at 22 and carried by the rear wall of the tub 12. The two speed mechanism 22 is driven by a sheave 23, belted as shown at 24 to an electric motor 25 suitably carried by the tub structure. A magnet 26 adjusts the speed of the shaft 21 of the two speed mechanism 22. Since two speed mechanisms of the type shown at 22 are so well understood in the art, further description of the construction and operation thereof is deemed unnecessary, other than to state that, when the magnet 26 is energized, high speed operation of the basket 16 is carried out and, conversely, when the magnet 26 is deenergized the basket 16 is rotated at low washing speed. A suitable two speed mechanism of the type shown at 22 is disclosed in the patent of H. E. Edwards No. 2,284,047 granted May 26, 1942.

Washing water is admitted to the tub 12 through a conduit 27 the inlet end of which is connected to a water mixing device 28 receiving hot and cold water through conduits 29 and 31. The discharge of water from the mixing device 28 to the conduit 27 is under control of a valve (not shown) but which is actuated by a solenoid 32. When energized, the solenoid 32 opens the valve for delivery of water to the tub and, conversely, when deenergized the valve is closed for terminating flow of water to the tub. Further description of the water mixing device 28 is deemed unnecessary since apparatus of this kind is well understood in the art. A suitable water mixing device as shown at 28 is disclosed in the patent of Frank Breckenridge No. 2,296,266, granted September 22, 1942.

Vitiated water is discharged fom the tub 12 by means of a pump 33, the inlet conduit of which is indicated at 34 and connected to a sump 35 formed in the bottom of the tub 12. The discharge conduit from the pump 33 is indicated at 36 and extends upwardly and out of the casing 11 at a point elevated with respect to the level of

water in the tub 12. It will be noted that no drain valve is employed and that the pump 33 and the portion of the conduit 36 below the water level in the tub 12 are flooded at any and all times that the tub contains water. Of course, at this time the pump 33 is inactive. The discharge of water from the tub 12 is carried out by starting operation of the pump 33. Preferably the pump 33 is driven by the motor 25 through a suitable clutch, shown by way of example as a jaw clutch 37. The latter is engaged by a magnet 38 when energized. A spring 39 biases the clutch to its disengaged position at all times so that, when the magnet 38 is deenergized, the clutch 37 is actuated to its disengaged position and operation of the pump 33 is terminated.

In accordance with this invention, the various electrical translating devices set forth heretofore are controlled conjointly by a timing mechanism, indicated at 41, and a switching mechanism, generally indicated at 42 and operated in accordance with the level of the water within the tub 12. The timer 41 is located on the front of the housing 11 and may be of conventional construction except that it includes but a single cam which is shown at 42 in Fig. 2 and operating a double throw switch structure 44. The timing mechanism 41 includes a timing motor 45 which drives a cam shaft, indicated at 46 in Fig. 2, through a suitable speed reducing transmission diagrammatically indicated at 47 in Fig. 2. The arrangement is such that the shaft 46 and cam 43 are rotated at a speed of approximately one revolution in forty-five (45) minutes. The cam 43 is driven at all times in the direction of the arrow in Fig. 2 and may be turned manually in this same direction by a knob or a handle 48 for starting operation of the timer or for reducing the duration of any of the steps in the washing program. Usually, a slip or one way clutch, not shown, is interposed between the cam shaft 46 and the timer motor in order to permit this manual advancing of the cam shaft 46. The knob 48 may be provided with indicia, as indicated, which shows the operation being carried out and which may also carry numerals representing duration of the washing period in minutes. A fixed pointer 49 on the front of the housing cooperates with the indicia shown on the knob 48.

The double throw switch structure 44 includes a movable contact 51 engageable with fixed contacts 52 and 53. The contact 51 is carried by a spring arm 54 having a cam follower 55 biased at all times into engagement with the cam 43. In the "off" position of the cam, as shown in Fig. 2, the follower 55 engages a cam surface 56 of intermediate height and the contact 51 is maintained out of engagement with both contacts 52 and 53. When the cam follower 55 engages either of the lower surfaces 57, 58 or 59, the contacts 51 and 52 are engaged. Also, when the follower 55 rides upon the surfaces of the cam lobes 61, 62 and 63, the contact 51 engages the fixed contact 53.

The switching mechanism 42 may be actuated in any suitable manner responsive to water level in the tub but, as shown, it is operated by a float. As shown, a water chamber 65 is provided which is in communication at all times with the interior of the tub 12 so that the chamber 65 fills and empties with the tub 12. A float 66 rides upwardly and downwardly on a stem 67 between upper and lower shoulders 68 and 69 and operates the switching mechanism 42 in a well understood manner. The float operated switching mechanism 42 includes a first movable contact 70 which engages a fixed contact 71 in a first position of the float operated switching mechanism 42 or the position attained when the tub is devoid of water. In this same position, a second movable switch arm 72 engages a fixed contact 73. In a second position of the float operated switching mechanism 42, or when the tub 12 continues its proper charge of water, the switch contact 72 engages a fixed contact 74 while the upper movable contact 70 engages a stop member 75.

The source of power for the apparatus usually a 115 volt house circuit is represented by the line conductors $L_1$ and $L_2$. It will be assumed that the conduits 29 and 31 are connected to suitable sources of hot and cold water and that the conduit 36 extends to a suitable drain. Under these conditions a description of the operation of the apparatus will be given.

The fabrics to be treated and a suitable detergent are placed in the basket 16 and the door 14 is closed. The timer knob 48 is advanced to a washing position, for example, the ten-minute position if the soils in the fabric are not too severe. During this movement the cam follower 55 rides down onto the surface 57 and the switch contacts 51 and 52 are engaged. Accordingly, a circuit is established from the line conductor $L_1$ through a conductor 76 to the contact support 54 and thence through the closed contacts 51 and 52, a conductor 77, valve solenoid 32, a conductor 78, the closed contacts 70 and 71 and a conductor 79 to the line conductor $L_2$. Energization of the solenoid 32 opens the valve (not shown) and water is admitted to the tub until a complete charge is present therein, at which time the float 66 moves the stem 67 upwardly, disengaging the contacts 70 and 71 and, therefore, deenergizing the valve solenoid 32. Accordingly, the flow of water to the tub is now terminated. The movement of the switching mechanism 42 by the float 66 just described also moves the contact 72 out of engagement with the fixed contact 73 and into engagement with the fixed contact 74. The latter operation establishes a circuit from the line conductor $L_1$ through a conductor 81, closed contacts 72 and 74 and conductor 82, the motors 25 and 45, and a conductor 83 to the line conductor $L_2$. Accordingly, the main motor 25 now operates to rotate the basket at its slow washing speed and the timer motor 45 drives the cam 43 slowly in the direction of the arrow during the washing period, which is now carried out.

At the conclusion of the washing period, cam follower 55 rides up onto the cam lobe 61, disengaging contacts 51 and 52 and engaging contacts 51 and 53. The former operation is of no moment as the valve solenoid 32 is already deenergized but the latter operation establishes a circuit, including line conductor $L_1$, conductor 76, spring 54, closed contacts 51 and 53, a conductor 84, drain magnet 38 and line conductor $L_2$. Energization of the magnet 38 engages the clutch 37 so that operation of the pump 33 is initiated. At this time, the vitiated washing water is discharged through the conduit 36 to drain. When substantially all of the water has been removed from the tub, float 66 will have moved downwardly depressing the stem 67 and returning the switching mechanism 42 from said second position to its first position, as illustrated. During this transition, it will be noted that operation of the driving motor 25 and timer motor 45 is continued even though the circuit appears to be broken at the contact 74, since the engagement of contacts 72 and 73 maintains a connection of the motors 25 and 45 and the line conductor $L_1$ by a circuit including the conductor 82, closed contacts 72 and 73, conductor 84, contacts 51 and 53, spring 54 and conductor 76 to the line conductor $L_1$. Engagement of the contacts 72 and 73 at this time also energizes the speed control magnet 26 by means of a circuit extending from the conductor 82, which at this time is at the potential of the line conductor $L_1$, the speed control magnet 26, conductor 78, closed contacts 70 and 71, and the conductor 79 to the line conductor $L_2$. Accordingly, the basket is now rotated at its high spin speed and the extraction of a substantial portion of the water from the fabrics is effected. The spinning operation is terminated as well as operation of both motors 25 and 45 when the follower 55 rides off lobe 61 and disengages contacts 51 and 53.

Two rinsing operations, each followed by a spinning step are next carried out in exactly the same manner as described in connection with the washing and spinning operation. These steps are effected as the cam follower

55 is engaged with the cam surfaces 58, 62, 59 and 63 in the order named. The complete cycle of operation is terminated when the cam 43 and knob 48 are returned by the timer motor to the position shown in the drawing wherein the cam follower 55 engages the intermediate cam 56 and the contact 51 is disengaged from both fixed contacts 52 and 53. Preferably, the final spinning is carried out for a longer period of time than the previous spins in order to remove as much water as possible from the fabrics before they are removed from the basket and, accordingly, the length of the cam lobe 63 is relatively long.

From the foregoing description, it will be apparent that an improved, simplified control means is provided for an automatically cycled washing and centrifuging machine wherein a single cam timer and a novel form of water level responsive switching mechanism conjointly control the machine to provide the various washing, rinsing and centrifuging steps usually carried out in such machines. The timer having but a single cam, may be economically constructed, one reason being that high precision, a requisite in the manufacture of multiple cam timers is not necessary where only a single cam is involved. While a float switch is disclosed for operation with the timer it will be understood that other forms of switching mechanism responsive to the amount of water in the tub may be employed.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. In apparatus for washing fabrics and centrifuging washing fluid therefrom, the combination of a tub for containing washing water, a perforate basket rotatably disposed within the tub for containing the fabrics to be treated, means for rotating the basket at relatively low and high speeds for respectively washing the fabrics and centrifuging washing fluid therefrom, said rotating means including a main motor and a magnet energizable and deenergizable for effecting high and low speed rotation of the basket respectively, electrical valve means energizable for admitting water to the tub and terminating admission of water when deenergized, electrically actuated means for draining vitiated water from the tub, said draining means being rendered effective and inactive when energized and deenergized respectively, a switching mechanism responsive to the amount of water in the tub and movable to one controlling position when the tub is devoid of water and to a second controlling position when a predetermined quantity of water is present in the tub, a timing mechanism including a single cam, first and second switches selectively opened and closed thereby and a timing motor for actuating the cam, a power source, means connecting the valve means across the power source in series with the switching mechanism and the first cam operated switch, means connecting the water draining means across the power source in series with the second cam operated switch, means connecting the timer motor across the power source through said switching mechanism when the latter is disposed in its second controlling position, means connecting said timer motor and magnet in a parallel circuit in series with the second cam operated switch when said switching mechanism is disposed in its first controlling position, and means controlling operation of the main motor.



2. In apparatus for washing fabrics and centrifuging fluid therefrom, the combination of a tub for containing washing water and the fabrics to be treated, means for washing the fabrics, means for spinning fluid from the fabrics, a motor for driving the washing means and the spinning means, means including a magnet for selectively operating the washing means and spinning means, said magnet when energized and deenergized effecting operation of the spinning means and washing means, respectively, an electrically operated valve for admitting water to the tube when energized and terminating admission of water to the tube when deenergized, electrically actuated means for draining vitiated water from the tub when energized, a switching mechanism responsive to the amount of water in the tub and movable to one controlling position when the tub is devoid of water and to a second controlling position when a predetermined quantity of water is present in the tub, a timing mechanism including a single cam, first and second switches selectively opened and closed thereby and a timing motor for actuating the cam, manually operated means for rotating the cam from an inactive position to an active starting position wherein said first switch is closed, means effective in the closed position of said first switch for energizing said valve in series with the switching mechanism, said valve being deenergized in response to movement of the switching mechanism to its second controlling position, means responsive to movement of the switching mechanism to its second controlling position for energizing said timing motor, means responsive to closing of the second cam operated switch for energizing the electrically actuated draining means, said switching mechanism returning to said one position thereof toward conclusion of said draining operation and means responsive to the closing of said second cam operated switch and actuation of said switching mechanism to said one controlling position thereof for energizing the timing motor and said magnet in parallel with the electrically actuated draining means.

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