Aug. 19, 1947. H. E. EDWARDS 2,425,788

LAUNDRY APPARATUS

Filed Nov. 5, 1943

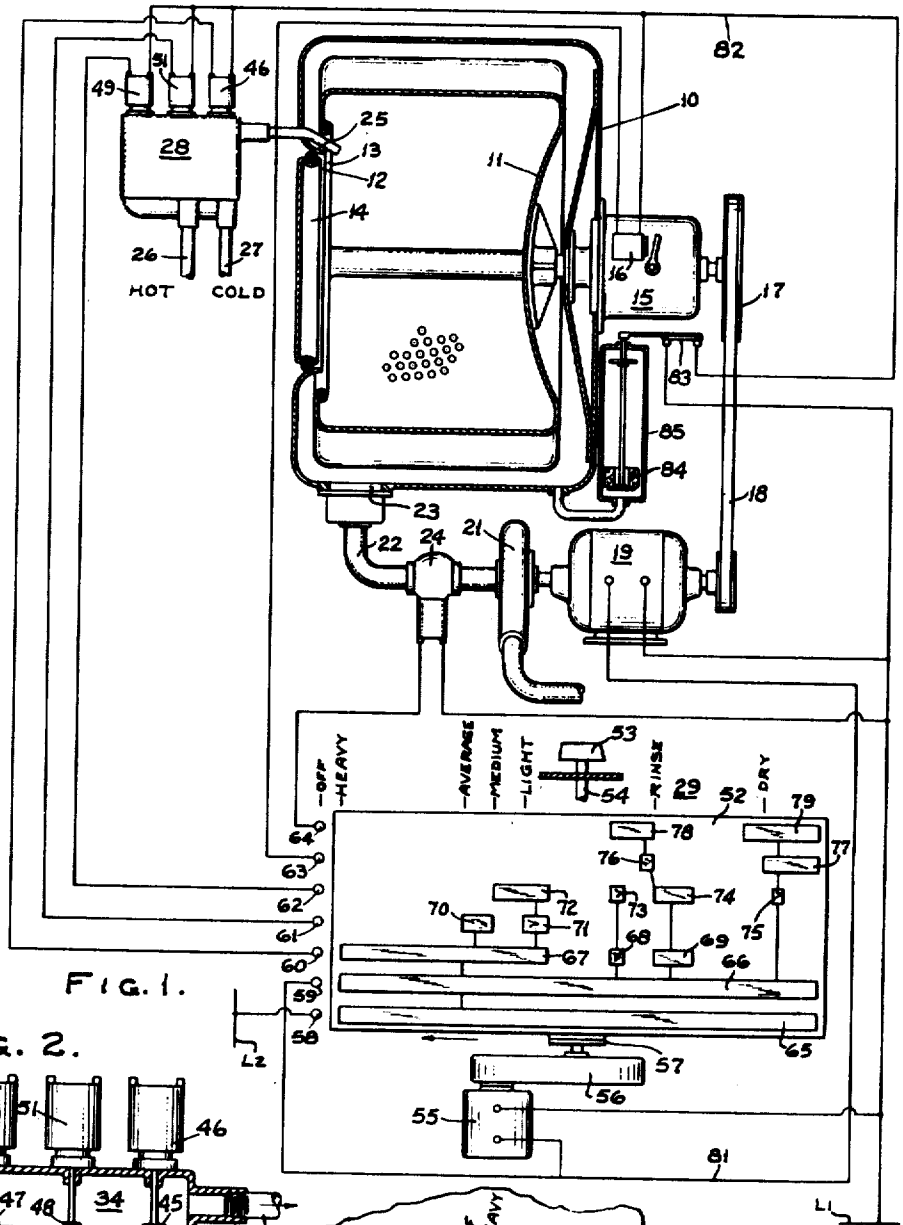
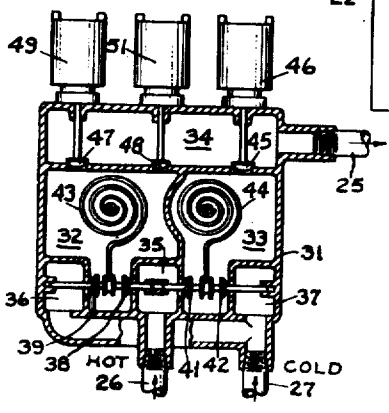


FIG. 1.

FIG. 2.



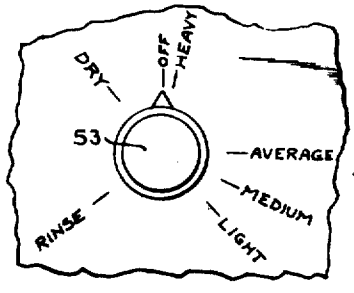


FIG. 3.

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BY

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UNITED STATES PATENT OFFICE

2,425,788

LAUNDRY APPARATUS

Hilbert E. Edwards, Mansfield, Ohio, assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application November 5, 1943, Serial No. 509,029

7 Claims. (Cl. 68—12)

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My invention relates to washing apparatus and has for an object to provide improved apparatus of this kind.

Another object of the invention is to simplify the adjustment of a washing machine having timing means for controlling the duration of the period of operation of the machine and means for varying the temperature of the water admitted to the machine.

A further object of the invention is to select by adjustment of a single control element of a washer both the duration of the period of operation of the washer and the temperature of the water admitted to the washer.

A still further object of the invention is to provide improved means for admitting water at selected temperatures to a washing machine.

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

Fig. 1 is a diagrammatic view of one form of washing machine constructed and arranged in accordance with the invention;

Fig. 2 is a section taken through a water-mixing mechanism shown in Fig. 1; and

Fig. 3 is a front view of the single control element shown in Fig. 1.

Reference will now be had to the drawing wherein I have elected to show my invention applied to a washer of the so-called horizontal cylinder type and which includes, generally, a container or tub 10 and a rotatable perforate basket 11 journaled therein. The tub 10 and basket 11 have respective registering access openings 12 and 13 at the front ends thereof for the ingress and egress of the fabrics to be treated, the opening 12 being closed by a suitable hinged gasketed door 14. Rotation of the basket at a low speed of, for example, 50 R. P. M. and at a high speed for centrifuging of, for example 450 R. P. M. is effected by a two-speed mechanism generally indicated at 15 and carried by the tub structure 10. The two-speed mechanism 15 is adjusted by an electromagnet 16 which, when deenergized, provides for low speed operation of the basket and, when energized, effects high speed rotation of the basket. As two-speed mechanisms of the type shown at 15 are well known in the art, no further description of the same is deemed necessary. A suitable mechanism of this kind is disclosed in my Patent No. 2,284,047, granted May 26, 1942, and assigned to the assignee of the present invention.

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The two-speed mechanism 15 is driven by a sheave 17, belted as shown at 18 to a constant-speed electric motor 19. The latter also drives a pump 21 for removing vitiated water from the tub 10, the inlet of the pump 21 being connected by means of a conduit 22 to a drain opening 23 formed in the bottom of the tub. The flow of water through the conduit 22 to the pump 21 is controlled by a suitable electrically-operated valve 24, which, when energized, provides communication between the pump 21 and the drain opening 23 and, when deenergized, the valve 24 is closed for terminating flow of water to the pump 21. Washing water and rinse water are admitted to the tub 10 through an inlet conduit or nozzle 25 connected to sources of hot and cold water defined by conduits 26 and 27.

In accordance with my invention, the temperature of the water delivered to the nozzle 25 is varied by means of a water-mixing device, generally indicated at 28 and described more in detail hereinafter. Furthermore, the temperature of the water delivered by the device 28 and the duration of the washing period are controlled by a single mechanism or timing device, generally indicated at 29. The latter is shown for the sake of clearness and brevity as a motor-driven drum switch which adjusts the water-mixing device 28 and which sequentially operates the magnet 16, the electrically-operated valve 24 and the motor 19 to provide a predetermined sequence of steps in a washing and centrifuging program.

The water-mixing device 28, shown enlarged in Fig. 2, includes a casing 31 having a water-mixing chambers 32 and 33 and a compartment 34 formed therein, the latter communicating with the tub 10 by means of a conduit or nozzle 25. The hot water conduit 26 communicates with a hot water space 35 and the cold water conduit communicates with cold water spaces 36 and 37, as clearly shown in Fig. 2. Flow of hot and cold water from the spaces 35 and 36 to the mixing chamber 32 is controlled, respectively, by valves 38 and 39, and the flow of hot and cold water to the mixing chamber 33 from the spaces 35 and 37 is controlled, respectively, by valves 41 and 42. The valves 38 and 39 are tied together so that they move in unison and are actuated by a suitable temperature-responsive device, such as the bimetallic spiral 43 arranged in the chamber 32. Similarly, the valves 41 and 42 are tied together and are moved in unison by a similar bimetallic spiral 44 arranged in the chamber 33

and responding to the temperature of the water therein.

The thermostatic elements 43 and 44 are adjusted to provide different temperatures of water in the chambers 32 and 33. For example, the element 43 may be adjusted to provide water at a temperature of 85° F. in the chamber 32 and the element 44 adjusted to provide water at a temperature of 145° F. in the chamber 33. Flow of water at 145° F. to the compartment 34 is under control of a valve 45 actuated, for example, by a solenoid 46 which, when energized, opens the valve 45 and, when deenergized, closes the valve 45. Flow of 85° F. water from the chamber 32 to the compartment 34 is controlled by valves 47 and 48 which are actuated by respective solenoids 49 and 51, the arrangement being such that the valves 47 and 48 are opened when their respective solenoids are energized and are closed when their respective solenoids are deenergized. The valve 47 has a flow area larger than the valve 48 so that different quantities of cold water are delivered to the compartment 34 at times when the hot water valve 45 is open for varying the temperature of the water delivered through the conduit 25 to the washer. As described hereinafter, hot water at 145° may be delivered to the washer when the valve 45 alone is opened, and water at approximately 130° F. is delivered to the washer when the valves 45 and 48 are open. With the valve 45 and 47 open, water at a still lower temperature of, for example, 115° F. is delivered to the washer, and with all valves 45, 47 and 48 open, water at a temperature of approximately 110° F. is delivered to the washer. Finally, when valve 47 alone is open, 85° water is delivered to the washer. This selective operation of the valves 45, 47 and 48 is under control of the timing mechanism 29 which selectively controls energization of the valve solenoids 46, 49 and 51.

Referring now to the diagrammatic showing of the timing mechanism 29 in Fig. 1, a drum type switch is shown having a rotatable drum 52 which may be manually rotated by a handle 53 connected to the shaft 54 of the drum 52 or may be rotated by a small synchronous motor of the type commonly employed for driving clocks and shown at 55. The motor 55 rotates the drum 52 at a relatively low speed of, for example, one revolution in approximately fifty minutes, by means of a reduction gear 56 connected to the shaft 54 through a clutch 57. The latter is employed to provide for manual adjustment of the drum 52 by the knob 53, the clutch at 57 at this time slipping. During periods when the motor 55 is energized to drive the drum, such operation is effected through the clutch 57. Movement of the drum 52, which is shown in development, is in the direction of the arrow at all times.

The timer 29 includes a plurality of stationary contact fingers 58 to 64, inclusive, which cooperate with movable contact segments 65 to 79, inclusive, the latter being electrically connected together. The source of power for the various electrical translating devices is represented by line conductors L_1 and L_2. The line conductor L_1 is directly connected to one terminal of each of the motors 19 and 55, the opposite terminals of which are tied together by a conductor 81, which extends to the finger 59. Accordingly, the motors 19 and 55 are in parallel and operate together at all times. One terminal of each of the solenoids 49, 51 and 46 are connected to their respective fingers 62, 61 and 60, the opposite terminals of the solenoids being tied together and connected by a conductor 82 to the line conductor L_1 through a float switch 83. In this connection the float switch is actuated by a float 84 arranged in a casing 85, which communicates with the tub 10. The construction and arrangement is such that the float switch 83 is open when a predetermined amount of water suitable for washing or rinsing is contained within the tub and is closed when the tub is devoid of water. One terminal of the electro-magnet 16 is connected to the finger 63, the opposite terminal of which is connected to the conductor 82 and, therefore, to the line conductor L_1 through the float switch 83. One terminal of the electrically-operated valve 24 is connected to the finger 64 and the opposite terminal is directly connected to the line conductor L_1. Line conductor L_2 connects with finger 58 so that, in any active position of the drum 52, all of the segments 65 to 79, inclusive, have the polarity of conductor L_2.

The timer 29 is adjustable manually to various positions to provide different periods of operation depending upon the condition of soil in the fabrics to be washed. I have indicated these conditions as "Heavy," "Average," "Medium" and "Light," which appear as indicia on the front of the timer 29, as shown in Fig. 3. When adjusted to the heavy soil position, a twenty-two and one-half minute washing period is provided. When adjusted to "Average," "Medium" and "Light," washing periods of, for example, eleven and one-half, nine and six and three-quarter minutes, respectively, are provided. It will be understood that these periods may be reduced by adjusting the knob 53 beyond the indicia various amounts. For example, if the knob is adjusted to a position intermediate "Heavy" and "Average," a washing period of approximately sixteen minutes is provided.

I have found from experience that the temperature of the water employed in a washing machine is related to the duration of the period of the washing operation or the condition of the soils in the fabrics. Where a heavy soil condition prevails, the duration of the washing period is relatively long and relatively high temperature water should be employed. Where the soil conditions are less severe, the duration of the washing period may be reduced and lower temperature water employed. This operation is obtained by the apparatus described up to now, it being noted that the timing mechanism adjusts both the duration of the washing period and the temperature of the water employed.

Operation

In operating the apparatus, the fabrics to be treated and a suitable detergent are deposited in the basket 11 through the openings 12 and 13 and the door 14 is closed. Assuming the condition of soil in the fabrics to be heavy, the timer 29 would be adjusted manually to the "Heavy" position for providing a maximum washing period of, for example, 22½ minutes. This adjustment effects engagement of the fingers 58, 59 and 60 with their respective segments 65, 66 and 67 so that both the motors 19 and 55 are energized as well as the solenoid valve 46. Accordingly, the motor 19 operates to rotate the basket at its low washing speed and the motor 55 operates to progressively advance the drum 52. Energization of the solenoid 46 opens the valve 45, and, therefore, delivers water at a temperature of 145° F. to

the tub 10. When a sufficient quantity of water is in the tub, the float switch 83 is opened for deenergizing the valve 46 and terminating the flow of washing water to the tub 10.

The motor 19 operates to rotate the basket at washing speed for approximately 22½ minutes, during which the fabrics are tumbled in the basket 11 and the soils removed therefrom. Toward the conclusion of the washing operation, the segment 78 and the finger 64 are engaged for opening the valve 24. The vitiated washing water is then discharged from the tub by the pump 21. Accordingly, the float 84 lowers and the switch 83 is closed when substantially all of the water has been discharged from the tub 10. A short flushing rinse may be effected at this time as the segments 68 and 73 engage the fingers 60 and 62, respectively. This latter operation energizes the solenoids 46 and 49 so that water at 145° F. from the chamber 33 and water at 85° F. from the chamber 32 are mixed to provide water of substantially 115° F. in the compartment 34. This lower temperature water is employed for flushing soap scum from the surface of the fabrics as they are tumbled in the basket and is effective for a period of approximately three-quarters of a minute.

A short period of centrifuging may be effected at the conclusion of the flush rinse by operating the basket at its high centrifuging speed for a period of approximately three-quarters of a minute. This centrifuging operation is initiated by the engagement of the segment 76 and the finger 63 and the consequent energization of the magnet 16. Disengagement of the segments 76 and 78 from the fingers 63 and 64 deenergizes the magnet 16 and the electrically-operated valve 24 so that the basket is again rotated at slow speed and the discharge valve 24 is closed. The segments 69 and 74 next engage the fingers 60 and 62 whereby water is admitted to the tub through the valves 45 and 47 which are now held open by their solenoids 46 and 49. Accordingly, rinse water at a temperature of approximately 115° F. is delivered to the tub for the rinsing operation which follows.

Flow of rinse water to the tub is, of course, terminated by the opening of the float switch 83 when the proper amount of rinse water has been admitted to the tub. The rinse period continues for approximately six minutes or until the segment 79 engages the contact finger 64. This operation opens the drain valve 24 for the discharge of rinsing water from the tub. Accordingly, the float 84 moves downwardly and again closes the float switch 83 when substantially all of the water has been discharged from the tub. The final drying of the fabrics at high speed is initiated upon engagement of the segment 77 and contact finger 63 and the consequent energization of the high speed magnet 16. During this centrifuging operation, a short spray rinse may be employed for flushing lint from the fabrics and for scouring the inner surface of the tub 10, which operation is initiated by the engagement of the segment 75 and finger 62. This rinse is usually of short duration, for example, three-quarters of a minute. Engagement of these members 75 and 62 energizes the solenoid 49 which admits water at 85° F. from the chamber 32 to the compartment 34 and thence to the tub. Operation of the apparatus is terminated by the disengagement of the segments 65, 66, 77 and 79 from their respective fingers. At this time, all of the electrical translating devices associated with the washer are de-

energized and the timer is in its "off" position as shown in the drawing.

Assuming the soil conditions in the fabrics to be treated to be average or somewhat less than heavy, the operator, in initiating the cycle, will move the drum 52 manually to the position marked "Average." It will be noted in this position that both the segments 67 and 70 engage their respective fingers 60 and 61, so that the solenoids 46 and 51 are energized. Accordingly, the valves 45 and 48 are opened and a relatively large quantity of water at 145° F. is discharged to the compartment 34 of the valve 45 and a relatively small quantity of water at 85° F. is discharged to the compartment 34 by the valve 48. Mixture of the water at these temperatures provides water at a temperature of approximately 130° F. for this washing operation. It will be apparent that both the period of washing and the temperature of the water employed for the washing are less than in the example cited, wherein the timer was adjusted for heavy soil conditions.

For medium soil conditions, the operator adjusts the drum 52 to the "Medium" position for engagement of the segments 67 and 72 with their respective fingers 60 and 62. Accordingly, the valves 45 and 47 are opened by their solenoids 46 and 49 so that a larger quantity of 85° water is mixed with the 145° water than in the operation just recited, where the drum 52 was advanced to the "Average" position. Accordingly, the temperature of the water now delivered to the tub is approximately 115° F. and the washing period is reduced to approximately nine minutes. Adjustment of the drum 52 to its light soil position reduces the period of the washing operation to approximately 6¾ minutes and further reduces the temperature of the water employed, inasmuch as all valves 45, 47 and 48 are opened by their respective solenoids 46, 49 and 51, it being noted at this time that segments 67, 71 and 72 are in contact with their fingers 60, 61 and 62. Accordingly, a larger quantity of water at 85° is admitted to the chamber 34 for mixture with the 145° water and the final washing water temperature under these conditions is approximately 110° F.

Other relations between the temperature of the water and the duration of the washing period may be obtained. For example, if the operator wishes to wash some fabrics for a short period of time but using high temperature water, she would adjust the drum 52 to the heavy soil position whereupon the tub would fill up with 145° water, as described heretofore. The drum 52 could then be advanced to its "Average," "Medium" or "Light" position to provide for the shorter washing period. The drum could also be advanced to the "Average" position, whereupon the tub would fill with 130° F. water, as described, and if a shorter period of washing is desired, the drum could then be advanced to the "Medium" or "Light" position.

I have described my invention applied to a washer having provisions for centrifuging fluid from the fabrics, but it will be apparent that it may be employed with other forms of washers, whether or not centrifuging is effected. Furthermore, the invention, while particularly adaptable for washing apparatus in which fabrics are treated, may be applied to other forms of washing apparatus in which other material is cleansed. It will be apparent that I have provided an improved, automatically-operated washing machine wherein a single adjustment determines the

period of operation and the temperature of the water admitted to the washer. The water-mixing device which I employ controls accurately the temperatures of the hot and cold bodies of water which are mixed to provide the proper temperature of the washing water and, therefore, more uniform operation is obtained than in apparatus utilizing hot and cold water from sources whose temperatures may vary considerably because of weather and other conditions.

While I have shown my invention 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, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In washing apparatus, the combination of a container for material to be washed, means for washing the material within the container, timing means for controlling the duration of the period of operation of the washing means, said timing means being manually adjustable for varying the duration of said washing period, sources of hot and cold water, first and second water-mixing devices connected to said water sources and each device including a chamber for the mixed water, first and second means responsive respectively to the temperatures of the water in said chambers for controlling the flow of water from said hot and cold sources to the chambers, said first and second temperature-responsive means being adjusted to provide relatively hot and cool water in their respective chambers, first and second valves for controlling the flow of water from the respective first and second chambers to said container, and means associated with the timing means for controlling the operation of said valves so that said first valve is opened when the timing means is manually adjusted to provide a relatively long period of operation of the washing means and said second valve is opened when the timer is adjusted to provide a relatively short period of operation of the washing means.

2. In washing apparatus, the combination of a container for material to be washed, means for washing the material within the container, timing means for controlling the duration of the period of operation of the washing means, said timing means being manually adjustable for varying the duration of said washing period, sources of hot and cold water, first and second water-mixing devices connected to said water sources and each device including a chamber for the mixed water, first and second means responsive respectively to the temperatures of the water in said chambers for controlling the flow of water from said hot and cold sources to the chambers, said first and second temperature-responsive means being adjusted to provide relatively hot and cool water in their respestive chambers, a first valve for controlling the flow of relatively hot water from said first water-mixing device to said container, second and third valves for controlling the flow of relatively cool water from said second water-mixing device to said container, said second valve being smaller in flow area than said third valve, and means associated with said timing means for controlling the operation of the first, second and third valves so that the first valve is opened by the timing means when the latter is adjusted for a relatively long

period of operation of the washing means, the first and second valves are opened by the timing means when the latter is adjusted for a short period of operation of the washing means and the first, second and third valves are opened by the timing means when the latter is adjusted for a still shorter period of operation of the washing means.

3. In washing apparatus, the combination of a container for water and the material to be washed, motor-driven means for washing said material, timing means for controlling energization of the motor-driven means and manually adjustable to a retarded position, wherein the motor-driven means is energized for a relatively long period of time, through a plurality of intermediate positions, wherein the period of energization of the motor-driven means is progressively reduced, to an advanced position wherein the period of operation of the motor-driven means is minimum, sources of hot and cool water, an electrically-operated valve for controlling the delivery of hot water from its source to the container, second and third electrically-operated valves for controlling the delivery of cool water from its source to the container, said second valve having a delivery rate smaller than said third valve, first, second and third switches actuated by the timing means for controlling energization of the respective first, second and third valves, said first switch being closed when the timing means is manually adjusted to its various positions, said second switch being closed when the timing means is manually adjusted to an intermediate position thereof, said third switch being closed when the timing means is manually adjusted to its advanced position, and means responsive to a predetermined amount of water in said container for deenergizing the first, second and third valves independently of their respective first, second and third switches.

4. In apparatus for washing fabrics, the combination of a container for water and the fabrics to be treated, means for washing the fabrics within the container, and means for admitting water at different temperatures to the container, said last-mentioned means including sources of cold and hot water, first and second water mixing devices connected to said sources and having respective chambers in which the hot and cold water are mixed, means responsive, respectively, to the temperatures of the mixed water in said chambers for controlling the flow of hot and cold water thereto, first and second valves for controlling the discharge of water from the respective chambers, means defining a compartment for receiving the water discharged by the valves, means for conveying the water from the compartment to said container and means for operating said valves.

5. In apparatus for washing fabrics, the combination of a container for water and the fabrics to be treated, means for washing the fabrics within the container and means for admitting water at selected temperatures to the container; said last-mentioned means including sources of cold and hot water, first and second water mixing devices having respective first and second chambers in which the hot and cold water are mixed, means responsive, respectively, to the temperatures of the mixed water in said chambers for controlling the flow of hot and cold water thereto, a first valve for controlling the discharge of water from the first chamber, means defining a compartment for receiving the water discharged by the said first valve, second and third valves for controlling the

passage of water from the second chamber to said compartment, said second valve having a rate of discharge different from the third valve, and means for opening and closing said valves.

6. In washing apparatus, the combination of a tub for containing material to be washed, means including first and second valves respectively controlling the flow of high and lower temperature water to the tub, means for washing the material within the tub, a timer for controlling operation of the washing means and manually adjustable to one position wherein operation of the washing means is effected for a relatively long period of time, said timer being manually adjustable to a second position wherein operation of the washing means is effected for a relatively short period of time, means actuated by the timer and responsive to manual adjustment thereof to said one position for opening said first valve and means actuated by the timer and responsive to manual adjustment thereof to said second position for opening both of said valves.

7. In washing apparatus, the combination of a tub for containing material to be washed, means for conveying relatively high and low temperature water to the tub, first and second electrically-operated valves respectively controlling the flow of said high and lower temperature water to the tub, said valves being opened and closed when energized and deenergized, respectively, motor driven

means for washing said material within the tub, a timer mechanism manually adjustable to one position for energizing said motor driven means for a predetermined relatively long period of operation, said timer mechanism being manually adjustable to an advanced position for energizing the motor driven means for a predetermined relatively short period of operation, and switching means controlled by the timer mechanism and effective to energize said first valve when the timer mechanism is manually adjusted to said one position, said switching means being effective in response to manual movement of the timer to said advanced position for energizing both of said electrically-operated valves.

HILBERT E. EDWARDS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,346,259	Hutchings	Apr. 11, 1944
2,288,141	Oliver	June 30, 1942
2,309,940	Douglas	Feb. 2, 1943
2,139,919	Watkins	Dec. 13, 1938
2,296,266	Breckenridge	Sept. 22, 1942

Disclaimer

2,425,788.—*Hilbert E. Edwards*, Mansfield, Ohio. LAUNDRY APPARATUS. Patent dated Aug. 19, 1947. Disclaimer filed Aug. 31, 1949, by the assignee, *Westinghouse Electric Corporation*.

Hereby enters this disclaimer to claim 4 of said patent.

[*Official Gazette October 25, 1949.*]

passage of water from the second chamber to said compartment, said second valve having a rate of discharge different from the third valve, and means for opening and closing said valves.

6. In washing apparatus, the combination of a tub for containing material to be washed, means including first and second valves respectively controlling the flow of high and lower temperature water to the tub, means for washing the material within the tub, a timer for controlling operation of the washing means and manually adjustable to one position wherein operation of the washing means is effected for a relatively long period of time, said timer being manually adjustable to a second position wherein operation of the washing means is effected for a relatively short period of time, means actuated by the timer and responsive to manual adjustment thereof to said one position for opening said first valve and means actuated by the timer and responsive to manual adjustment thereof to said second position for opening both of said valves.

7. In washing apparatus, the combination of a tub for containing material to be washed, means for conveying relatively high and low temperature water to the tub, first and second electrically-operated valves respectively controlling the flow of said high and lower temperature water to the tub, said valves being opened and closed when energized and deenergized, respectively, motor driven

means for washing said material within the tub, a timer mechanism manually adjustable to one position for energizing said motor driven means for a predetermined relatively long period of operation, said timer mechanism being manually adjustable to an advanced position for energizing the motor driven means for a predetermined relatively short period of operation, and switching means controlled by the timer mechanism and effective to energize said first valve when the timer mechanism is manually adjusted to said one position, said switching means being effective in response to manual movement of the timer to said advanced position for energizing both of said electrically-operated valves.

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