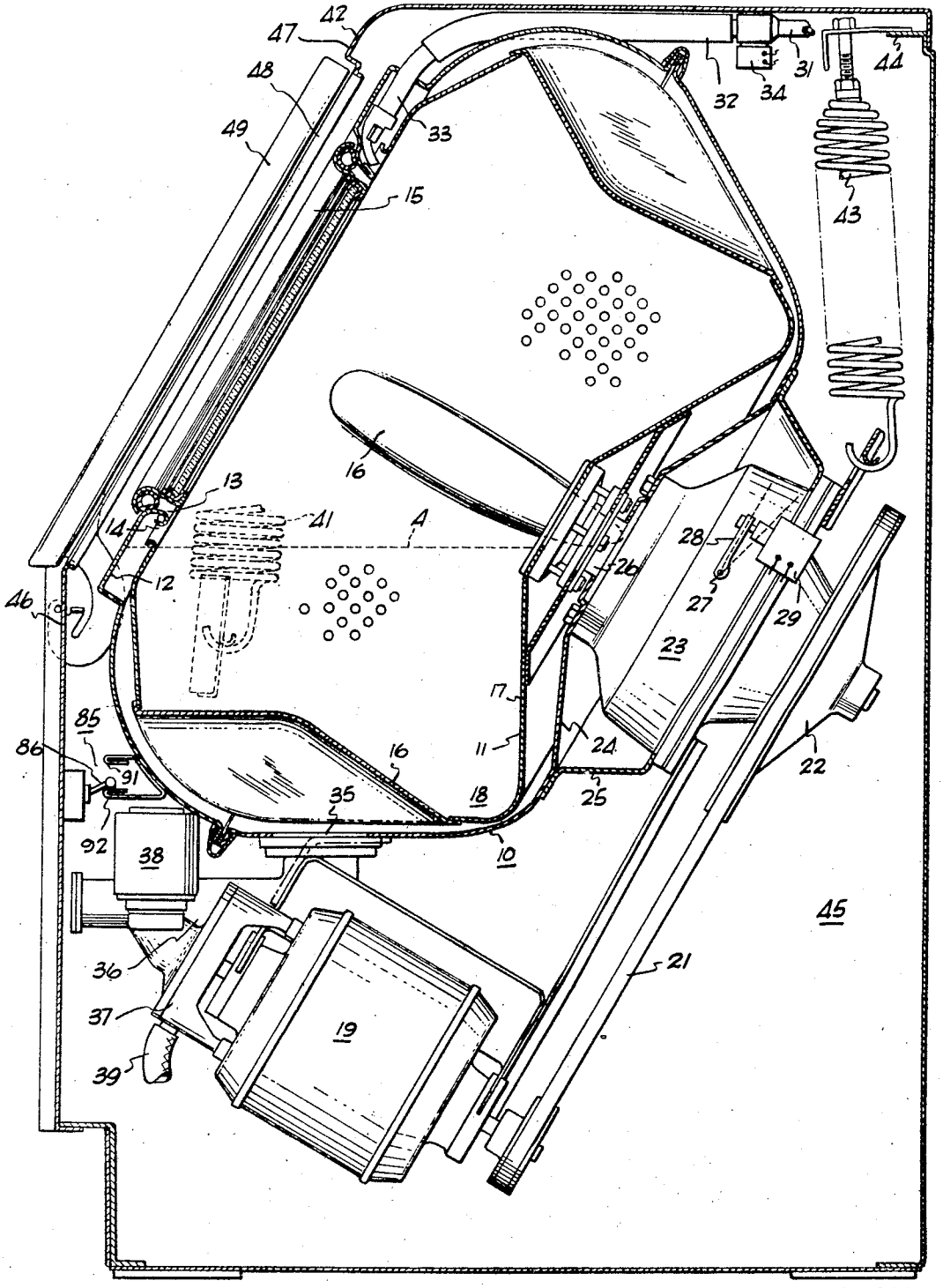
Nov. 24, 1942. F. BRECKENRIDGE ET AL 2,302,836

LAUNDRY APPARATUS

Filed March 5, 1940 3 Sheets-Sheet 1



WITNESSES

R. J. Ridge

E. H. Lutz

Fig. 1.

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LAUNDRY APPARATUS

Filed March 5, 1940 3 Sheets-Sheet 2

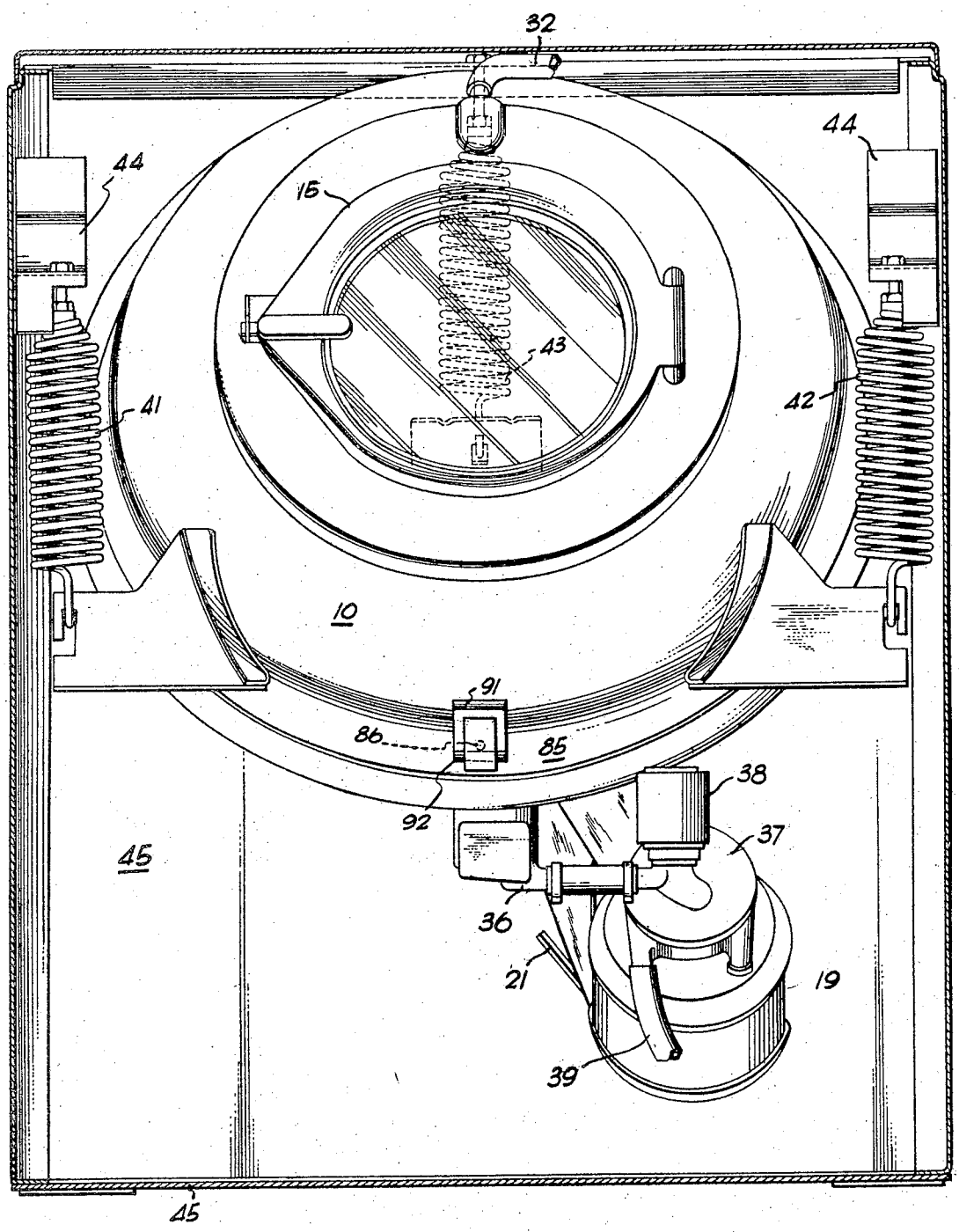


Fig. 2.

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LAUNDRY APPARATUS

Filed March 5, 1940 3 Sheets-Sheet 3

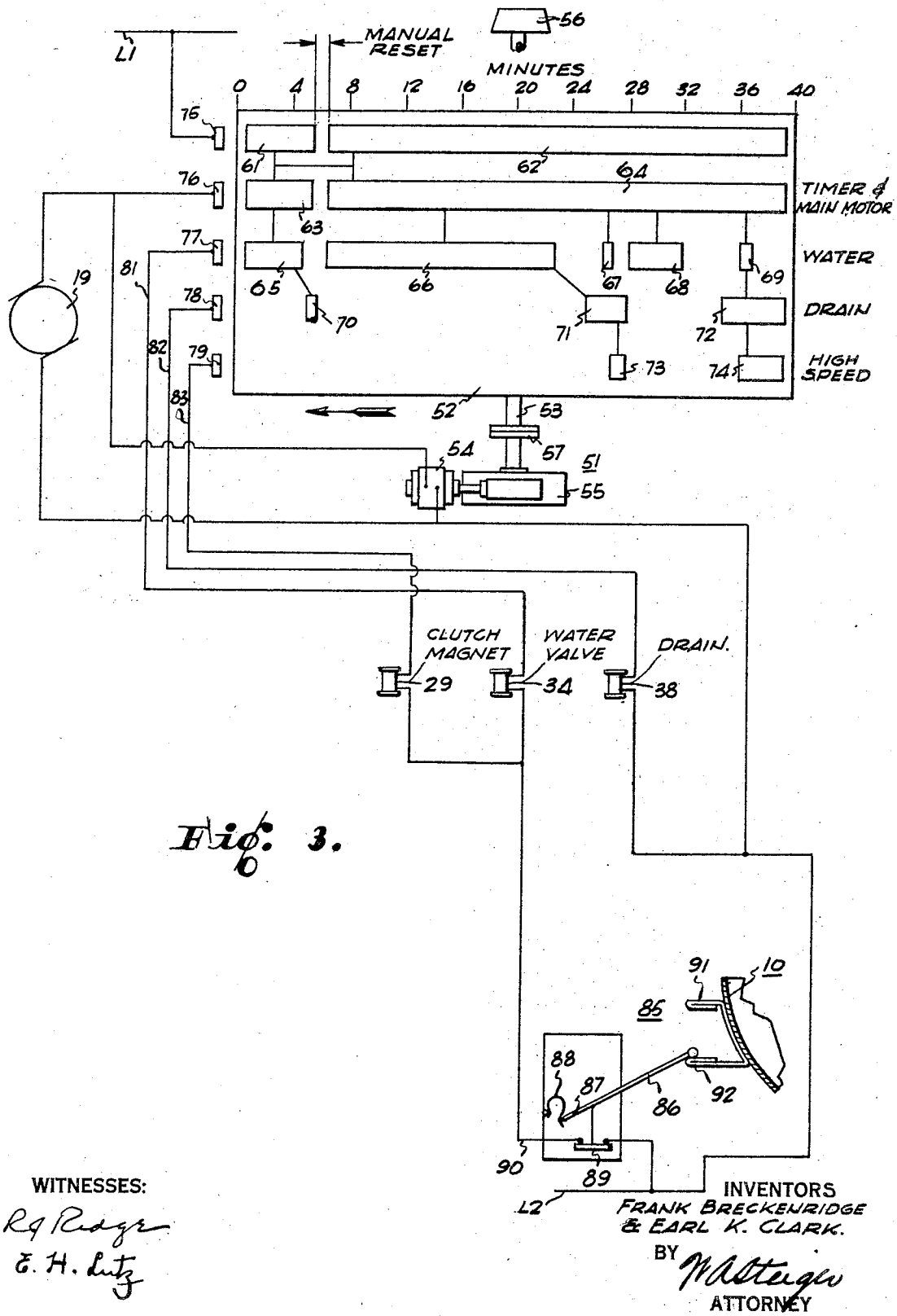


Fig. 3.

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Patented Nov. 24, 1942 2,302,836

UNITED STATES PATENT OFFICE

2,302,836

LAUNDRY APPARATUS

Frank Breckenridge and Earl K. Clark, Mansfield, Ohio, assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application March 5, 1940, Serial No. 322,320

6 Claims. (Cl. 68—24)

Our invention relates to laundry apparatus and has for an object to provide improved apparatus of this kind.

A further object of our invention is to provide an improved laundry machine wherein the amount of water admitted to the machine and/or the centrifuging of the fabrics are automatically and positively controlled.

A further object of our invention is to utilize, in a laundry machine in which the fabrics to be treated are washed and centrifuged in a single container structure that moves between an elevated and a lower position as water is admitted to and drained from the container, the movements of the container for controlling the admission of water to the container and the centrifuging of the fabrics therewithin.

A still further object of our invention is to provide a resiliently supported laundry tub that moves downwardly and upwardly as water is admitted to and discharged from the tub, wherein the movements of the tub are utilized to control the amount of water admitted to the tub and the period during which the fabrics being treated may be centrifuged.

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

Fig. 1 is a vertical sectional view taken longitudinally through a laundry machine constructed and arranged in accordance with our invention;

Fig. 2 is a front view of the machine shown in Fig. 1 with portions of the enclosing casing removed for the sake of clearness; and,

Fig. 3 is a diagram of the electrical elements employed in the laundry machine and the connections therebetween.

Reference will now be had to Figs. 1 and 2 of the drawings wherein we have shown our invention applied to a washing and spinning machine of the type disclosed and claimed in the copending application of Frank Breckenridge, Serial No. 203,804, filed April 23, 1938, and assigned to the assignee of the present application. It will be understood that the specific form of laundry machine which we have disclosed is shown by way of example and that our invention may be applied equally well to other forms of machines and irrespective of the position of the axis of rotation. This type of washer includes a tub structure 10, generally of frusto-conical configuration, and a perforate basket 11 of similar formation rotatably disposed therein.

The axis of the tub and perforate basket is arranged at an acute angle from the vertical so that the end wall 12 of the tub of major diameter faces upwardly and forwardly. Registering access openings 13 and 14 are formed in the tub and basket, respectively, for the ingress and egress of clothes to be washed. The access opening 13 of the tub is closed by a door 15 which is hinged to the tub structure and gasketed, as shown, to provide a water-tight seal for the opening 13.

The basket structure 11 includes a plurality of inwardly-extending, circumferentially-spaced vanes 16 for agitating the fabrics during the washing period, as described hereinafter. The end wall of the basket 11 of minor diameter is dished inwardly to define a dome 17 which cooperates with the vanes 16 to effect a predetermined circulation of the fabrics within the basket during the washing period. The vanes 16 are spaced from the dome 17 to provide an annular space or zone 18 within the basket which is substantially uninterrupted. The basket and vane structure shown herein is disclosed and claimed in the copending application of Stuart R. Baird, Serial No. 268,103, filed April 15, 1939, and assigned to the Westinghouse Electric & Manufacturing Company.

Rotation of the basket 16 about its axis is effected by a motor 19, carried in any suitable manner to the underside of the tub structure 10 and belted, as shown at 21, to a pulley 22 that defines the driving element for a two-speed mechanism generally indicated at 23. Support for the two-speed mechanism 23 is provided by an end wall 24 of the tub 10 and suitable bracing means 25 secured to the end wall 24. The two-speed mechanism includes a driven shaft 26 which carries the basket 11 and is secured thereto centrally of the dome 17.

The two-speed mechanism 23 is driven by the motor 19 at constant speed and is adjustable so that the driven shaft 26 thereof may be rotated at relatively low speed of, for example, 52 R. P. M. during washing periods and at relatively high speed of, for example, 480 R. P. M. during fluid extracting periods. As the specific mechanism for effecting the two basket speeds forms no part of the present invention, it has not been shown in detail for the sake of brevity, it being understood that any suitable two-speed mechanism may be employed for driving the basket. A two-speed mechanism combined with a washer element of the type disclosed in the present application is disclosed and claimed in the copending application of Frank Breckenridge, Serial No.

...31, filed November 21, 1938, and assigned to the assignee of the present application.

The two-speed mechanism 23 is adjusted to its high and low speeds by means of an electro-magnet device including a stub shaft 27 which extends within the mechanism for adjusting the same. The shaft 27 is provided with a movable arm 28 that is moved between two positions, indicated by broken lines, by an electro-magnet of suitable construction as shown at 29. It will be understood that during deenergized periods of the electro-magnet 29, the arm 28 is biased to the position shown in Fig. 1 wherein slow speed rotation of the basket is effected and, during energizing periods of the electro-magnet 29, the arm 28 is moved to its other position in which high speed operation of the basket is effected.

Water at the desired temperature is admitted to the tub structure 10 from a conduit 31 which connects with a suitable source of water and which includes a flexible portion 32 such as, for example, a length of rubber tubing. The discharge end of the flexible conduit 32 connects with a water projecting device 33 disposed within the tub and adjacent the access opening 13 of the basket. A water projecting device of the type shown at 33 is disclosed and claimed in the copending application of Stuart R. Baird, Serial No. 315,371, filed January 24, 1940, and assigned to the assignee of the present application. Flow of water through the conduits 31 and 32 to the tub is controlled by an electrically-operated valve 34 of any well understood construction. No description of the valve 34 is deemed necessary other than to say that when energized, it is opened and, conversely, when deenergized, it is closed. Vitiated water is discharged from the tub through a drain opening 35 formed in the bottom thereof and communicating by means of a conduit 36 with the inlet of the pump 37, the latter being driven by the motor 10. Flow of water through the conduit 36 is controlled by an electrically-operated valve 38 which, when energized, is opened and, when deenergized, is closed. Water discharged by the pump 37 is conveyed through a flexible conduit 39 to a point of discharge.

It will be apparent from the foregoing description that the tub 10, the two-speed mechanism 23 and the motor 19 define major elements of a unitary washing and spinning structure which, in accordance with this invention, moves downwardly and upwardly as water is respectively admitted to and discharged from the tub structure. In the present embodiment, the unitary structure is flexibly supported by means of a plurality of helical tension springs 41, 42 and 43. The springs 41 and 42 are disposed on opposite sides of the tub structure adjacent the front end thereof and the spring 43 is centrally disposed with respect to the tub structure at the rear end thereof.

The springs are carried at their upper ends by brackets 44 which form elements of an enclosing casing generally indicated at 45. The springs 41 to 43, inclusive, resiliently support the unitary structure and permit vibration thereof relative the casing 45 in all modes. The scale of the springs 41 to 43, inclusive, is such that the unitary structure, when substantially devoid of water, is disposed in the elevated position shown, and, when the tub 10 contains a full charge of water, the spring structure permits downward movement of the tub to a lower position. In other words, during washing periods, the tub 10 is supported in a relatively low position and, during centrifuging periods, the tub is supported in the elevated position shown on the drawings. A simplified form of flexible support is shown in the present application for the sake of brevity and clearness. Other suitable flexible supporting arrangements for a unitary structure of the type disclosed in the present application are disclosed and claimed in the copending applications of Frank Breckenridge, Serial No. 226,868, filed August 26, 1938, and Frank Breckenridge et al., Serial No. 303,202, filed November 7, 1939, both of which applications are assigned to the assignee of the present application.

The enclosing casing 45 includes a front wall, the upper portion of which is inclined, as shown at 47, and provided with an access opening 48 aligned substantially with the access opening 13 of the tub structure. A suitable cover 49 is provided for the opening 48 which may be closed during inactive periods of the apparatus and which is removed or actuated to an open position during operating periods.

Control of the energization of the various electrical elements including the motor 19, the speed change electro-magnet 29 and the electrically operated valves 34 and 38 may be manual or automatic. We have disclosed an automatically-operated system which includes a timer for energizing the aforesaid electrical elements in a predetermined sequence so that the various steps in the washing program are carried out automatically. These steps include the admission and discharge of water to and from the tub, the washing, rinsing and centrifuging of the fabrics to be treated and terminating operation of the apparatus after the washing and spinning operations are completed.

Any suitable form of timer may be employed for effecting the energization and deenergization of the various electrical elements but, as shown, a motor driven drum switch, generally indicated at 51, and diagrammatically shown in Fig. 3 is employed. As drum switches of this type are well understood in the art, it is our belief that no detail description of the mechanical structure is necessary and that the developed diagrammatic showing in Fig. 3 is sufficient. The motor driven drum switch 51 includes a rotatable drum 52 having a shaft 53 which is rotated by a motor 54 of the type commonly employed for driving clocks. A reduction gear 55 is interposed between the motor 54 and the shaft 53 so that the drum 52 is rotated at a relatively low speed. As shown, the drum 52 rotates at the rate of approximately 1 revolution in 40 minutes. In the developed showing the movement of the drum 52 is always in the direction of the arrow. The motor driven drum switch or timer 51 is constructed as a unit as is well understood and may be carried by the casing 45 in any convenient location, not shown.

The rotatable drum 52 is provided with an operating knob or handle 56 so that the drum 52 may be rotated through a slight arc during starting periods independently of the motor 54 and, in this connection, an overrunning or slip clutch 57 is connected in the shaft 53 so that the drum 52 may be rotated slightly relative the reduction gear 55. The clutch 57 operates to drive the drum 52 when the motor 54 is rotated. The clutch 57 is shown diagrammatically as any suitable form of overrunning clutch may be employed for this application.

The drum 52 carries a plurality of electrically-connected movable contact segments 61 to 74, in-

clusive, which cooperate with a plurality of stationary contact fingers 75 to 79, inclusive. The source of power for the electrical elements is defined by the line conductors L_1 and L_2, the former of which is connected to the contact finger 75 as shown. The contact finger 76 is electrically-connected to one terminal of each of the motors 19 and 54, the opposite terminals of which are connected to the line conductor L_2. The contact fingers 77 to 79, inclusive, are respectively connected by means of conductors 81, 82 and 83 to terminals of the electrically-operated water valve 34, the drain valve 38 and the speed change electro-magnet 29. The opposite terminal of the electrically-operated drain valve 38 is connected to the line conductor L_2 and the opposite terminals of the speed change electro-magnet 29 and the electrically-operated water valve 34 are connected to the opposite line conductor L_2 through a switch structure, generally indicated at 85 and constructed and arranged in accordance with our invention.

The switch structure 85 functions to control the proper amount of water admitted to the tub structure 10 and to prevent high speed operation of the basket structure 11 until substantially all of the water has been drained from the tub. As described hereinafter, the switch structure 85 is mechanically actuated by upward and downward movements of the unitary structure, including the tub 10, which movements are concomitants of the discharge of water from the tub and the admission of water thereto, respectively.

The switch structure 85 is diagrammatically shown in Fig. 3 and includes an operating arm 86 pivoted at 87 and actuated to its open and closed positions in a snap-acting manner by a U-shaped compression spring 88 which is interposed between supporting knife edges carried by the arm 86 and by a stationary portion of the switch structure, respectively. The switch structure 85 includes an electric switch 89, connected in a conductor 90 which extends from terminals of the speed change magnet 29 and the electrically-operated water valve 34 to the line conductor L_2.

The outer end of the movable arm 86 is interposed between spaced fingers 91 and 92 which are carried by the tub 10. As the tub moves downwardly when water is admitted thereto, the space between the finger 91 and the switch actuating arm 86 is first closed and when a predetermined weight of water is admitted to the tub 10 the finger moves the switch arm 86 to its switch open position. Conversely, as water is discharged from the tub 10, the springs 41 to 43, inclusive, elevate the tub and after the space between the finger 92 and the switch arm 86 is closed, the latter actuates the switch 89 to its closed position. At the time of closing of the switch 89, substantially all water is removed from the tub 10 or, at least, the amount remaining therein will not be detrimental to high speed spinning operation. The fingers 91 and 92 are preferably resilient to permit some limited vibratory movement of the tub 10 relative the switch arm 86 when the latter is moved to either of its extreme positions. As shown, the fingers 91 and 92 may be formed from a spring strip which is suitably secured to the tub 10 in any well understood manner.

Operation

The operation of the automatically-operated mechanism will now be described. As shown in the drawings, the apparatus is inactive. In order to charge the tub, the cover 48 is removed or opened and the door 15 swung to its open position. The fabrics to be treated are deposited in the basket 11 and the door 15 is closed. The operator then advances the drum 52, if a soaking or prewashing period is desired, until the contacts 61, 63 and 65 engage their respective fingers 75, 76 and 77. In this connection, if it is not desired to soak or prewash the fabrics, the drum 52 may be advanced to approximately the seven-minute position on the diagram, which initiates the automatic washing period. However, if it is desired to soak or prewash the clothes, the drum 52 is advanced as described. Accordingly, the main motor 19 and the timer motor 54 are energized, the former operating the basket at relatively low speed, it being understood that the speed-control magnet 29 at this time is deenergized, and the motor 54 operating to slowly advance the drum 52.

Engagement of the finger 77 by the contact 65 energizes the water valve 34, the circuit of which includes the switch 89 which, at this time, is closed because the tub is devoid of water and is in its elevated position. The admission of water to the tub continues until the switch 89 is opened by engagement of the finger 91 with the switch arm 86. Opening of the switch 89 is effected when the proper amount or weight of water has been admitted to the tub for the washing operation. The level of the water at the time of opening of the switch 89 is indicated by the broken line A in Fig. 1.

During this soaking or prewashing period, the fabrics are agitated in the clear water by the vanes 16. At this time the fabrics are engaged by the rotating vanes 16 and are elevated to an upper region of the basket. The vanes become more and more inclined as they move upwardly because of the inclined axis of the frusto-conical basket, so that the fabrics slide along the inclined vanes toward the dome and are dropped thereon from the upper region of the basket. The fabrics then glide downwardly over the dome and launch in the body of water and move forwardly therein due to the forward motion imparted to the fabrics by the inclined dome. The fabrics are again elevated by the vanes 16 and deposited on the dome. This operation continues during the washing cycle.

Toward the conclusion of the prewash period, the segment 65 is disengaged from the finger 77 so that the water valve circuit is opened. The segment 70 engages the finger 78 for energizing the electrically-operated drain valve 38, so that the discharge of water from the tub is initiated. Removal of water from the tub reduces the weight thereof, so that the tension springs 41, 42, and 43 move the tub towards its elevated position, at the conclusion of which the finger 92 engages the switch arm 86 and closes the switch 89. This is of no consequence for the moment as the water valve circuit is open, the segment 65 being disengaged from the finger 77. The segments 61 and 63 are then disengaged from their respective fingers 75 and 76 for deenergizing the motors 19 and 54, so that the apparatus is rendered inactive.

The operator then returns to the machine and deposits a detergent in the basket and advances the drum 52 until the segments 62, 64 and 66 engage the fingers 75, 76 and 77, respectively. The motors 19 and 54 are again started and water is admitted to the tub, as described heretofore,

When a sufficient quantity of washing water is admitted to the tub, the downward movement thereof opens the switch 89, as described, for terminating the flow of water. The duration of the washing period may be shortened, as will be apparent, by further advancing the drum 52 after the engagement of the contacts 62, 64 and 66 with their segments.

Washing of the fabrics is effected in the soapy water, the operation being similar to that described in the prewash or soaking period. At the conclusion of the wash period, the segment 71 engages the finger 78 so that the electrically-operated drain valve is opened and the wash water is discharged from the tub. A spray rinse may be imparted to the fabrics at this time for washing away soap scum and lint while the clothes are being tumbled at slow speed in the basket. This operation is effected by the engagement of the segment 67 with the finger 77. Water admitted to the tub at this time is drained away as fast as it is admitted, as it will be understood that at this time the drain valve is open. Toward the conclusion of the spray rinse period, the segment 73 engages the finger 79 and the speed-change magnet 29 is energized for adjusting the two-speed mechanism 23 for high-speed operation. Acceleration of the basket is now effected to its high spinning speed.

Prior to the energization of the speed-change magnet 29, the clothes are tumbled in the absence of water within the basket during the period when they are sprayed. In the absence of a body of wash water in the tub, the fabrics which are deposited on the dome tend to cling thereto and gather as an annulus in the region 19 adjacent the dome. As this is the region of the basket of minimum diameter, the moment of inertia of the load is relatively small so that acceleration of the basket and its load is readily effected. During accceleration, the fabrics move forwardly in the basket toward the region thereof of maximum diameter, wherein they may be more effectively centrifuged.

The spray rinse referred to heretofore may be continued for a relatively short period of time after high-speed operation of the fabrics is initiated for facilitating the removal of soap. The spray rinse is discontinued by the disengagement of the segment 67 from the finger 77. Spinning of the fabrics is terminated by the disengagement of the segment 73 from the finger 79. It will be noted from the foregoing description that the speed-change magnet 29 is also controlled by the switch 89 and that, if for any reason sufficient water remains in the tub to maintain the switch 89 open, high-speed operation cannot be effected. Accordingly, damage to the mechanism because of the presence of a body of wash water in the tub and particularly to the driving motor is prevented.

This cycle of operation also provides for an agitating rinse which is initiated by the engagement of the segment 66 with the finger 77, which operation admits water to the tub, it being understood that at this time the tub is in its elevated position and that the switch 89 is closed. Flow of rinse water to the tub is terminated by the opening of the switch 89. The fabrics are agitated in the clear rinse water, the movement of the fabrics in the basket being the same as described in connection with the prewash and the wash periods. At the conclusion of the agitating rinsing period, the contact segment 72 engages the finger 78 so that the drain valve is opened. As the water drains from the tub, the latter gradually moves to its elevated position for closing the switch 89. A second spray rinse may be imparted to the clothes by opening the water valve 34, which operation is effected by the engagement of the contact 69 with the finger 77. Preferably, the latter spray rinse is effected during high-speed operation of the basket. Accordingly, the contact segment 74 is arranged to engage the finger 79 at about the same time that the contact 69 engages its finger 77. As the tub is in its elevated position and the switch 89 is closed, high-speed operation of the basket is effected. The spray rinse at this time is effected for a relatively short period of time, for example, one minute, and is terminated by the disengagement of the segment 69 from the finger 77.

At the conclusion of the centrifuging operation, which is continued for about four minutes, all of the movable segments carried by the drum 52 are disengaged from their respective contacts, so that the apparatus is rendered inactive. The fabrics which are now damp-dried may be removed from the basket for further drying through the access opening 13.

The washing program which we have described is disclosed by way of example and it will be understood that it may include other steps, such as additional spray rinses or agitating rinses. Regardless of the program employed, the operation of the switch mechanism 85 controlling the admission of water or the high-speed operation of the basket is the same. The use of a switch of the type shown at 85 is not necessarily limited to a washer which is automatically cycled, as described heretofore, as it will be apparent that it may be employed in a washer wherein the various steps in the washing program are manually controlled.

In our copending application, Serial No. 307,202, filed December 2, 1939, and assigned to the assignee of the present application, there is disclosed and claimed an automatic laundry machine having switching means controlling the admission of water and the speed-change magnet, which means is actuated by a movable vessel that fills and empties with the tub. The movable vessel moves upwardly and downwardly in response to the amount of water in the tub for operating the switching means. The present invention provides for the functioning of the switching means without providing a separate movable vessel. The present invention defines an improvement over float switches employed heretofore, as the float member of such switches is subject to deposits or corrosion because of the alkaline solution to which it is subjected, so that sticking of the float may prevail with obvious bad results.

From the foregoing description it will be apparent that we have provided improved control means for a laundry machine which effectively controls the admission of the proper amount of water to a washer and which prevents centrifuging of the fabrics until the conditions within the tub are such that high-speed operation may be safely effected. The specific form and disposition of the switch 85 are disclosed by way of example and it will be understood that other types of switches per se and their connection to the movable tub structure may be employed without departing from the spirit of our invention.

While we have shown our 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 we claim is:

1. In laundry apparatus, the combination of a container for containing washing water and the fabrics to be treated, means for admitting water to the container, means for discharging water from the container, means for resiliently supporting the container in an elevated position when substantially devoid of water and for permitting movement of the container to a lower position as water is admitted thereto, a switch actuated in response to movements of the container for controlling the operation of the water-admitting means, and means interposed between the container and said switch for actuating the switch when the container is moved to its extreme positions and for permitting vibratory movement of the container relative the switch when the container is intermediate its extreme position.

2. In apparatus for washing fabrics and for centrifuging water therefrom, the combination of a basket structure for enclosing washing water and the fabrics to be treated, means for admitting water to the basket structure and for discharging water therefrom, driving means for actuating the basket structure at relatively low speed for washing the fabrics and for rotating the same at relatively high speed for extracting water therefrom, means for supporting the basket structure in an elevated position when substantially devoid of water, said supporting means permitting progressive downward movement of the basket structure to a lower position as water is admitted thereto and means responsive to upward and downward movements of the basket structure for controlling the operation of said driving means, said controlling means being effective when the basket structure is adjacent its elevated position to condition the driving means for high speed operation and, when the basket structure is in its lower position, to prevent high speed operation of the driving means.

3. In laundry apparatus, the combination of a tub structure for containing washing water, means for admitting water to the tub and for discharging water therefrom, a basket rotatably disposed within the tub for containing the fabrics to be washed, driving means for actuating the basket at relatively low speed for washing the fabrics and for rotating the basket at relatively high speed for extracting water from the fabrics, means for supporting the tub in an elevated position when substantially devoid of water and for permitting movement of the tub to a lower position as water is admitted to the tub, and switching means actuated by movements of the tub for controlling the operation of said driving means, said switching means being effective to condition the driving means for high speed operation when the tub is adjacent its elevated position and to prevent high speed operation of the driving means at other times.

4. In apparatus for washing fabrics and for extracting water therefrom, the combination of a tub structure for containing washing water, a basket rotatably disposed therein for containing the fabrics to be treated, means for admitting water to the tub, means for discharging water from the tub, driving means for actuating the basket at relatively low frequency during washing periods and for rotating the basket at relatively high speed during fluid-extracting periods, means for supporting the tub structure in an elevated position when substantially devoid of water and for permitting downward movement of the tub to a lower position as water is admitted thereto, switching means actuated by movements of the tub for controlling the operation of the water-admitting means and said driving means, said switching means being effective to permit admission of water to the tub or high speed operation of the basket when the tub is in its elevated position and to terminate flow of water to the tub and prevent high speed operation of the basket when the tub is in its lower position.

5. In laundry apparatus, the combination of a tub for containing washing water, a basket rotatably disposed therein for containing the fabrics to be treated, means for admitting water to the tub, means for discharging water from the tub, driving means for operating the basket at relatively low speed for washing the fabrics and for operating the basket at relatively high speed for extracting water from the fabrics, means for resiliently supporting the tub in an elevated position when substantially devoid of water and for permitting movement of the tub to a lower position as water is admitted to the tub, a switch actuated in response to movements of the tub for controlling the operation of the water-admitting means and said driving means, and means interposed between the movable tub and said switch for actuating the switch when the tub is moved to its extreme positions and for permitting vibratory movement of the tub relative the switch when the tub is intermediate its extreme positions.

6. In laundry apparatus, the combination of a tub structure for containing washing water, means for admitting water to the tub and for discharging water therefrom, a basket rotatably disposed within the tub for containing the fabrics to be washed, driving means for actuating the basket at relatively low speed for washing the fabrics and for rotating the basket at relatively high speed for extracting water from the fabrics, electrically-operated means for adjusting the driving means for high speed operation, a master switch for controlling energization of the electrically-operated means, means for supporting the tub in an elevated position when substantially devoid of water and for permitting downward movement of the tub to a lower position as water is admitted to the tub, and a second switch connected in series with said master switch and actuated in response to movements of the tub for controlling energization of the electrically-operated means, said second switch being closed when the tub is adjacent its elevated position and open when the tub is in its lower position.

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