Sept. 22, 1942. F. BRECKENRIDGE ET AL 2,296,262

WASHING APPARATUS

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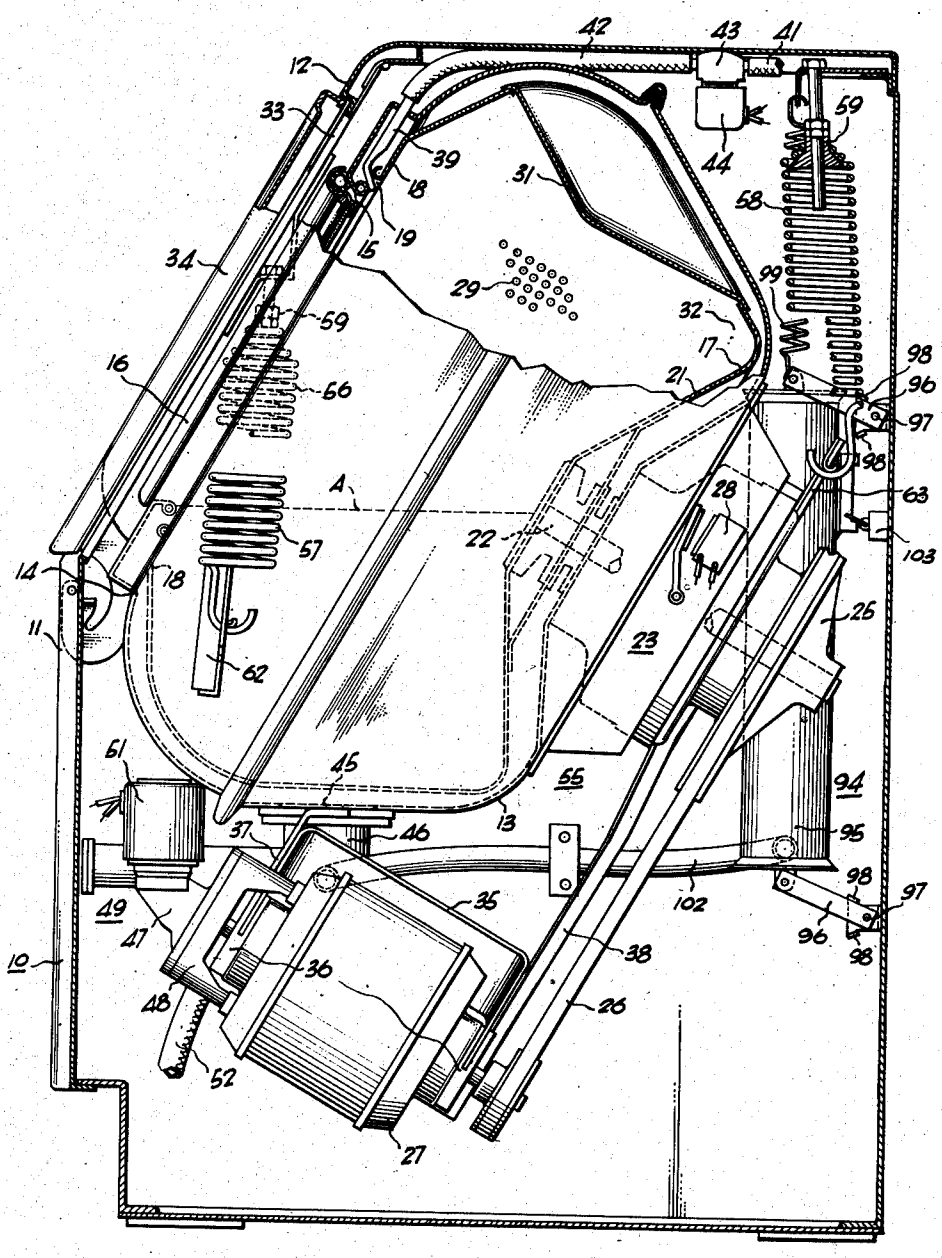


Fig. 1.

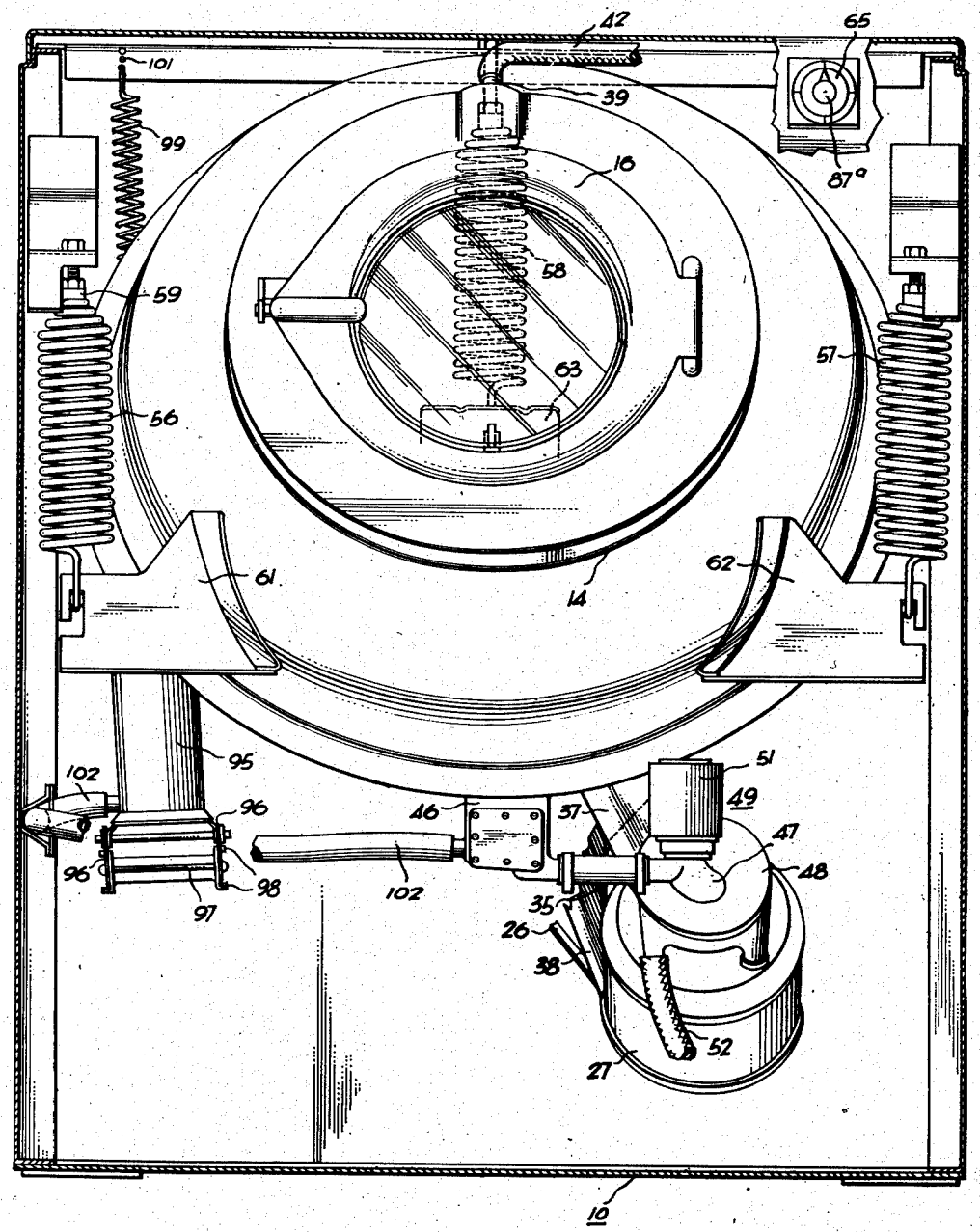
WITNESSES:
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E. H. Lutz

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Sept. 22, 1942. F. BRECKENRIDGE ET AL 2,296,262

WASHING APPARATUS

Filed Dec. 2, 1939 3 Sheets-Sheet 2



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Fig. 2.

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Fig. 3.

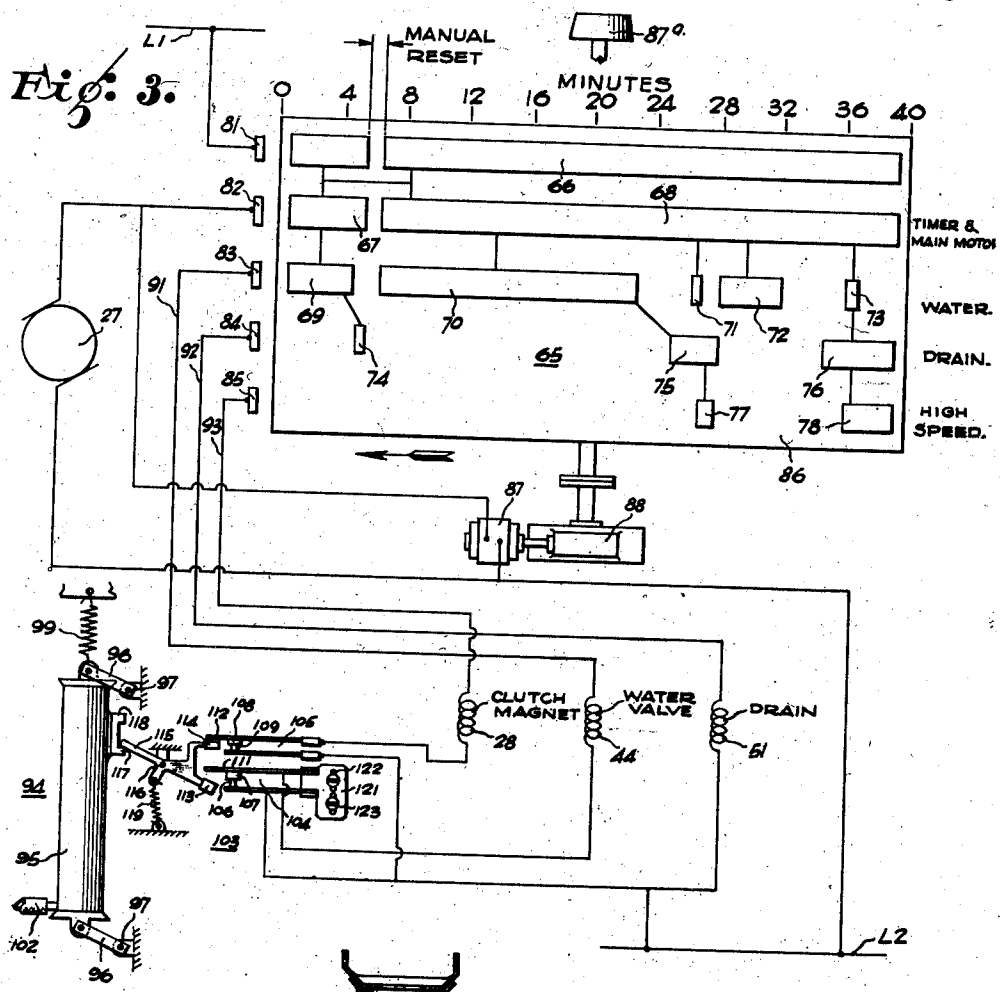




Fig. 4.

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2,296,262

WASHING APPARATUS

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Application December 2, 1939, Serial No. 307,202

4 Claims. (Cl. 68—12)

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

A further object of the invention is to provide apparatus for washing fabrics and spinning fluid therefrom, wherein improved means is provided for controlling the amount of water delivered to the apparatus and for preventing spinning of the fabrics when the amount of water in the apparatus is above a predetermined value.

It is a still further object of the invention to provide improved control means for washing apparatus that will operate reliably over long periods of time while subjected to alkaline washing solutions.

A still further object of our invention is to provide improved means for controlling the amount of water admitted to a washer and spinner and for positively preventing spinning of the fabrics until sufficient water is drained from the washer to safely permit the spinning operation, which control means may be subjected to the alkaline washing solutions without affecting its operation.

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 of a washing and spinning machine controlled in accordance with our invention;

Fig. 2 is a front view of the apparatus shown in Fig. 1 with portions of the front of the casing broken away;

Fig. 3 is a diagrammatic view of the electrical circuits for the driving motor and control devices employed in the apparatus; and,

Fig. 4 is a sectional view taken through the vessel of the gravity-operated switching mechanism.

Reference will now be had to Figs. 1 and 2 of the drawings wherein we have shown a laundry 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. The laundry machine includes a casing structure generally indicated at 10 and having a front wall 11, a portion of which is inclined as shown at 12. A water-containing structure or a tub 13 of frusto-conical configuration is disposed within the casing structure 10 so that its axis is inclined, said tub being provided with an end wall 14 at the large end thereof. The end wall 14 is provided with an opening 15 that is closed by a suitable gasketed and hinged door 16.

Rotatably disposed within the tub 13 is a perforate basket 17 of frusto-conical configuration and having an end wall 18 at the large end thereof within which an opening 19 is formed. The basket 17 includes an end wall 21 at the small end thereof which is curved inwardly of the basket and defines a dome within the basket. The basket 17 is coaxially arranged within the tube and rotatably carried by a shaft 22 that is driven by a two-speed mechanism, generally shown at 23 and secured to the end of the tub 13 of minor diameter. The two-speed mechanism 23 is driven at substantially constant speed by a shaft 24 carrying a pulley 25, the latter being driven by means of a belt 26 by a motor 27. As the specific construction of the two-speed mechanism 23 forms no part of the present invention, it has not been shown in detail for the sake of clearness and brevity. It will suffice to say that the two-speed mechanism 23 is adjustable so that the shaft 22 and the basket 17 are rotated at relatively low speed of the order of 52 R. P. M. during the washing periods and at relatively high speed of the order of 460 R. P. M. during spinning operations. Adjustment of the two-speed mechanism 23 is effected by a magnet 28 which, when deenergized, provides for low speed operation of the basket and when energized effects high speed operation of the basket. An adjustable two-speed mechanism of the type shown herein is described in detail in the copending application of Frank Breckenridge, Serial No. 305,512, filed November 21, 1939, and assigned to the Westinghouse Electric & Manufacturing Company.

The basket 17 is perforate, a number of perforations being shown at 29, and is provided with a plurality of inwardly-extending and circumferentially-spaced vanes, one of which is shown at 31, which vanes extend from adjacent the end wall 18 towards the dome and terminate in spaced relation with the latter so that a substantially uninterrupted annular space 32 is defined adjacent the dome 21. The specific form of basket and vane structure which we have shown in more fully disclosed and claimed in the copending application of Stuart R. Baird, Serial No. 268,103, filed April 15, 1939, and assigned to the assignee of the present application. The respective access openings 15 and 19 of the tub 13 and basket 17 are aligned substantially with an access opening 33 formed in the inclined portion 12 of the casing front wall 11. The opening 33 is closed by a

suitable cover 34 during inactive periods of the laundry machine, which cover is removed when the machine is to be operated. When the cover 34 is removed the door 16 may be swung to its open position through the opening 33 in the casing. The admission of fabrics to be washed to the basket 17 is effected through the openings 15 and 19.

The motor 27 which we have shown is of the conventional type used for driving domestic washing apparatus and is supported by a cradle 35, the opposite ends of which support rings 36 of resilient material such as, for example, rubber, which rings encompass and support hub portions of the motor frame. The cradle 35 is carried by brackets 37 and 38 which are suitably secured to the tub structure.

Admission of washing water to the tub 13 is through a nozzle 39 which is secured in the end wall 14 of the tub and which functions to direct the water inwardly of the basket in a fanned-out sheet. The nozzle 39 is connected to a suitable source of water shown as a conduit 41 by means of a flexible conduit 42 such as, for example, a length of rubber hose. An electrically-operated valve 43 controls the passage of water to the nozzle and, as shown, includes an operating solenoid 44. It will be understood that, when the solenoid 44 is energized, the valve 43 is opened so that water is admitted to the tub and, conversely, when the solenoid 44 is deenergized, the flow of water to the tub is terminated.

The discharge of water from the tub 13 is effected through an opening at 45 formed in the bottom of the tub, which opening 45 communicates with a sump 46 which may contain a removable filter, not shown. The sump 46 communicates with the inlet 47 of a pump 48, the latter being driven by the motor 27. Control of the passage of water from the sump 46 to the inlet 47 of the pump 48 is effected by an electrically-operated valve 49 which, as shown, is opened and closed by a solenoid 51. When energized, the solenoid 51 effects opening of the valve 49 and, conversely, when deenergized, effects the closing of the valve 49. The water discharged by the pump 48 passes through a suitable flexible conduit 52 to a point of discharge.

From the foregoing it will be apparent that the tub 13, the two-speed mechanism 23, and the motor 27 define major elements of a unitary structure, generally shown at 55, which may be supported within the casing 10 in any well understood manner. Preferably, the unitary structure 55 is flexibly supported within the casing 10 so that it is free to vibrate in all modes. The flexible support may include a plurality of springs 56, 57, and 58, the springs 56 and 57 being disposed on opposite sides of the tub adjacent the front end thereof, and the spring 58 being centrally disposed at the rear end of the tub. The springs 56, 57, and 58 are suspended from spring nuts 59 which are suitably secured to the casing structure 10. The springs 56 and 57 support brackets 61 and 62 which are suitably secured such as, for example, by welding to opposite sides of the front of the tub. The spring 58 supports a bracket 63 secured to the rear end of the tub and which may define an extension of the bracket 38. Flexible supporting structures of the type generally shown herein are disclosed and claimed in the copending application of Frank Breckenridge, Serial No. 226,853, filed August 26, 1938, and in the copending application of Frank Breckenridge et al., Serial No. 303,202 filed November 7, 1939, both of which are assigned to the assignee of the present application.

Energization of the motor 27, the clutch magnet 28, the water valve and drain valve solenoids 44 and 51, respectively, is controlled by a motor-driven timing device generally indicated at 65 and carried by the casing front wall 12. The timer 65 which we have shown is of the motor-driven drum switch type and includes a plurality of movable contact segments 66 to 78, inclusive, which cooperate with stationary contact fingers 81 to 85, inclusive. The movable contact segments 66 to 78, inclusive, are electrically connected and are carried by an insulating drum 86, the latter being rotated by a motor 87 through a speed reducing mechanism indicated at 88. The drum 86 is shown in development in Fig. 3 and it will be understood that, as it rotates, it moves in the direction of the arrow. The motor 87 is of the synchronous type usually employed for operating clocks. The drum 86 may be manually rotated by a knob 87a independently of the motor 87 in any well understood manner, which knob 87a is accessible to the operator.

The finger 81 is connected to a line conductor L_1 and the finger 82 is connected to one side of each of the main motor 27 and the timer motor 87, the opposite terminals of the motors 27 and 87 being directly connected to the opposite line conductor L_2. The segments 83, 84 and 85 are respectively connected by means of conductors 91, 92 and 93 to one terminal of each of the clutch magnets 28, the water valve solenoid 44 and the drain valve solenoid 51. The opposite terminal of the drain valve solenoid 51 is directly connected to the line conductor L_2.

The opposite terminals of the clutch magnet 28 and the water valve solenoid 44 are connected in accordance with our invention, with the opposite line conductor L_2 through a gravity-operated switching mechanism, generally indicated at 94, the arrangement being such that the water valve solenoid 44 is open-circuited when a full charge of water has been admitted to the tub and the clutch magnet 28 is open-circuited at all times except when the tub is substantially devoid of water. In other words, the valve solenoid 44 may be energized to admit water to the tub at all times except when a full charge of water is contained within the tub, at which time the water attains the level indicated by the broken line A in Fig. 1. The operation of the gravity-operated switch 94 is such that at no time can the clutch magnet 28 be energized for effecting high speed operation unless the tub is substantially devoid of water.

The gravity-operated switch 94 includes an open top tubular vessel 95 that is pivotally supported by a plurality of arms 96 which are pivotally carried by the casing 10 as shown at 97. The arms 96 permit upward and downward movement of the vessel 95 between limits defined by stops 98 which are disposed on opposite sides of the arms 96 and limit the angular movement thereof about the pivots 97. The vessel 95 is maintained in its elevated position by a tension spring 99 that is suspended from the upper portion of the casing 10. Preferably, the bias of the spring 99 is adjustable and to this end a plurality of holes 101 of different elevations may be provided in a portion of the casing 10 for receiving the upper end of the spring 99.

Communication between the tub 13 and the vessel 95 is provided by a flexible conduit such as, for example, a length of rubber hose 102. The

hose communicates at one end with the bottom of the vessel **95** and at the other end with the sump **46** which is, of course, at all times in communication with the interior of the tub **13**. As water is admitted to the tub through the admission nozzle **39**, the level of the water rises in the vessel **95** and, due to the weight of the water, the vessel **95** moves downwardly in opposition to the bias of the spring **99**. The vessel **95** attains its lowermost position when a predetermined amount of water is contained therein at which time the level of the water in the tub has risen to the level indicated at A.

Upward and downward movement of the vessel **95** operates a switching mechanism, generally indicated at **103**, which controls the circuits of the clutch magnet **28** and the water valve solenoid **44**. The switching mechanism **103** includes first and second switches **104** and **105** connected respectively in the circuits of the water valve solenoid **44** and the clutch magnet **28**. The switch **104** includes spring-mounted contacts **106** and **107** which are biased in switch-closing direction at all times. The switch **105** includes spring-mounted contacts **108** and **109** which are also biased in switch-closing direction at all times. The contacts **107** and **108** are carried by conducting springs **111** and **112**, respectively, which springs are engageable with spaced insulating fingers **113** and **114** that are carried by a lever **115** having a pivot **116**. The lever **115** is moved to its extreme or terminal positions by spaced projections **117** and **118** movable with the vessel **95** and the lever **115** is biased at all times towards an intermediate position by a tension spring **119**.

As shown in the drawing (Fig. 3) the tub **13** and the vessel **95** are substantially devoid of water so that the vessel **95** is held in its elevated position by the tension spring **99**, the projection **117** at this time positioning the lever **115** so that the fingers **113** and **114** are out of engagement with the springs **111** and **112**. Accordingly, the switches **104** and **105** are closed and the circuits of the clutch magnet **28** and water valve solenoid **44** are conditioned for energization.

As water is admitted to the tub **13** and vessel **95**, the latter progressively moves downwardly so that the pivoted lever **115** is moved by the tension spring **119** to an intermediate position as the projection **117** is moved downwardly. In the intermediate position of the lever **115** the finger **114** is in engagement with the spring **112** so that the switch **105** is open. At this time, however, the finger **113** is still spaced from the spring **111** so that the switch **104** remains closed. Opening of the switch **104** is effected only when the projection **118** engages the lever **115** and depresses it to its lower extreme position at which time the finger **113** moves the spring **111** and contact **107** upwardly. The latter operation occurs only when the tub and vessel contain their full charge of water.

It will be apparent from the foregoing description, that the switch **105** is opened as soon as the vessel **95** begins its downward movement or when a relatively small amount of water is present in the vessel **95**. Accordingly, the clutch magnet solenoid cannot be energized at any time when an appreciable amount of water is in the tub and vessel **95**, which amount would interfere with high speed operation of the basket. It will be apparent also that the water valve solenoid **44** may be energized through the switch **104** at any and all times except when a full charge of water is contained within the vessel **95**.

The switching arrangement including the switches **104** and **105** defines an improvement over prior switching arrangements wherein a single switch responsive to the amount of water in the tub is employed for controlling admission of water to the tub and high speed operation of the basket. Where a single switch is used it is possible to inadvertently actuate the timer or master controller for high speed operation of the basket at times when the tub has a substantial quantity of water contained therein less than the full charge of water. This operation is possible because the switch which is responsive to the amount of water in the tub cannot be opened until the full charge of water is contained in the tub; otherwise, it would be impossible to completely fill the tub with water.

We prefer to employ an actuating mechanism of the gravity type, as disclosed, for actuating the switching mechanism but it is to be understood that our invention is not to be limited to an actuating mechanism of this type, as a conventional float may be employed for operating the same. The gravity type mechanism defines an improvement over a float, however, as the accumulation of soap or other solids in the vessel **95** will not affect its operation. In the case of a float, solids, formed on the float chamber walls, frequently cause the float to stick with obvious undesirable results.

The respective switches **104** and **105** may be relatively adjusted to operate in the proper sequence. The switch **105** in its entirety may be rigid with respect to its support and the bias of the spring **99** adjusted to effect opening of the switch **105** when the proper amount of water is contained within the vessel **95**. It is desirable that the switch **104** in its entirety be adjusted with respect to the contact finger **113** so that it is opened when some predetermined amount of water is contained within the vessel **95**. The switch **104** in its entirety is, therefore, carried by a plate **121** which is adjustable relative the lever **115** and finger **113**. The plate **121** may be provided with elongated slots **122** which receive binding screws **123** threaded in some stationary portion of the switch structure **94** and the proper elevation of the switch **104** is attained by experiment, after which the binding screws **123** are tightened.

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 **34** is removed and the door **16** swung to its open position so that the fabrics to be washed may be deposited in the basket **31**. The door **16** is then closed and the operator turns the timer knob **87***a* sufficiently to effect engagement of the contact segments **66**, **67** and **69** with their respective fingers **81**, **82** and **83**. The main motor **27** and the timer motor **87** are energized, the former operating the machine at low speed as the clutch magnet **28** is deenergized at this time. The timer motor **87** operates to slowly advance the drum in the direction of the arrow. Engagement of the segment **69** and the finger **83** energizes the water valve, it being understood that the switch **104** at this time is closed. As the tub fills with water, the vessel **95** moves downwardly and when a relatively small quantity of water is present in the tub the switch

105 is opened. As far as filling with water is concerned, this is of no consequence, but opening of the switch 105 prevents high speed operation, should the timer 65 be advanced inadvertently at this time to a high speed position. When the tub is completely filled with water to the level indicated by the broken line "A," the finger 113 engages the spring 111 and opens switch 104 so that the flow of water to the tub is terminated.

The fabrics are at this time agitated in the clear wash water for thoroughly soaking the same. During this operation, the fabrics contained in the body of wash water are lifted by the baffles or vanes 31 to an elevated region in the basket. The vanes 31 become more and more inclined as they move upwardly because of the inclined axis so that the fabrics slide from the vanes in an elevated region of the tub and are deposited on the dome 21 over which they slide and launch in the body of washing water. Movement of the fabrics from the dome into the water causes a forward movement of the fabrics towards a region of the basket of maximum diameter. The fabrics are again elevated by the baffles 31 and deposited on the dome. Cleansing of the fabrics during the washing period is effected by agitation in the water and the scrubbing action effected by their passage over the dome and the vanes. This cycle of operation continues during the washing period.

After a relatively short period of time such as, for example, five minutes, the segment 74 engages the contact finger 84 so that the drain valve is opened and the soaking water is discharged from the tube. Subsequent to the discharge of water, the contact finger 67 is disengaged from the finger 82 so that both the main motor and the timer motor are stopped.

The operator then returns to the machine and deposits a suitable quantity of detergent in the basket and manually adjusts the knob to advance the drum to effect engagement of the segment 68 and finger 82, at which time slow speed operation of the basket is again initiated. Engagement of the contact segment 70 with the finger 83 energizes the water valve solenoid 44 so that washing water is admitted to the tub until terminated by switch 104, as described heretofore. The duration of the washing period may be shortened if desired by moving the drum 86 to a more advanced position, as is well understood. Agitation of the fabrics in the soapy water as described heretofore is now effected for the removal of soils therefrom.

Toward the conclusion of the washing period, the segment 75 engages the finger 84 so that the drain valve solenoid 51 is energized and water removed from the tub. During removal of water the vessel 95 moves upwardly, the switch 104 is first closed and the switch 105 is maintained open until the vessel 95 is substantially empty. It will be apparent that during the discharge of water or during a period when the tub might be full of water, high speed operation of the basket cannot be effected by inadvertently turning the drum 86 to a high speed position as the switch 105 is maintained open until the tub is substantially devoid of water. Shortly after the drain valve is opened the contact segment 77 engages the finger 85 and conditions the clutch magnet for energization which is effected when substantially all the water is drained from the tub and the switch 105 is closed. At this time wash water is spun from the fabrics and carried away by the pump 48.

Prior to the spinning of the fabrics, a flushing rinse may be provided. This operation is effected by engagement of the contact segment 71 with the finger 83, whereby the water valve is opened to spray water upon the tumbling fabrics. Accordingly, sediment and lint which may gather on the clothes during the discharge of water are flushed away. This spray rinse continues for a relatively short period of time. Spinning of the fabrics is terminated by disengagement of the segment 75 and finger 84 which effects deenergization of the clutch magnet 28. The drain valve solenoid 51 is also deenergized as slow speed operation of the basket is again effected.

Rinse water is then admitted to the tub for an agitating rinse by the engagement of the contact segment 72 and the finger 83. When a sufficient quantity of rinse water is admitted to the tub the water valve solenoid 44 is deenergized by the gravity-operated switch-operating mechanism 84, as described heretofore.

When the rinsing operation is completed, the drain valve is again opened by the engagement of the segment 76 and finger 84. During the draining of the water, the segment 73 engages the finger 83 so that the water valve is opened for spray rinsing the clothes, it being understood that water is discharged from the tub faster than it is admitted. During the relatively short agitating spray rinse or flushing operation, at which time lint and sediment are carried away by water discharged by the pump, the contact segment 78 engages the finger 85 for effecting high speed operation of the basket. The flushing operation may accompany high speed operation for a relatively short period of, for example, one minute, after which the segment 73 disengages finger 83 and the supply of flushing water is terminated. High speed operation continues for a period of about three or four minutes during which a substantial quantity of the water contained in the fabrics is centrifuged therefrom. At the termination of the spinning period the segments 66, 68, 76 and 78 are disengaged from their respective fingers 81, 82, 84 and 85 so that all electric circuits are deenergized and the apparatus is rendered inactive. The fabrics may then be removed.

As described in the said copending application of Stuart R. Baird, when the clothes are tumbled in the basket in the absence of water, they gather in an uninterrupted annular space 32 adjacent the dome. In the absence of water, the clothes as they descend from the dome do not move forwardly of the basket, as described in connection with the washing operation, but tend to cling to the dome so that they are gathered in the portion of the basket indicated at 32, which portion is of relatively small diameter. In this position the fabrics offer less resistance to acceleration of the basket, which is readily effected. As the basket accelerates, the fabrics are moved forwardly or toward the region of the basket of maximum diameter, in which region centrifuging may be more effectively carried out. Furthermore, in this region they are adjacent the access opening and may be more readily removed by the operator.

From the foregoing description, it will be apparent that we have provided improved means for controlling the admission of water to the tub of a washing and spinning machine and for

preventing high speed operation of the basket thereof during periods when water is contained within the tub. In accordance with our improved control mechanism, high speed operation of the basket can be effected only when the tub is substantially devoid of water. We consider this an important feature of our invention.

We have, furthermore, provided improved means for actuating the water-admitting and speed-controlling devices which defines a distinct improvement over apparatus employed heretofore, in that our improved apparatus may be operated over relatively long periods of time without attention while subjected to alkaline or scale-forming solutions and without affecting its operation.

While we have disclosed our invention applied to a laundry machine, it will be understood that it may readily be applied to other forms of washing apparatus. Controlling the admission of water by means of a gravity-operated control device to various forms of washing apparatus may be readily effected as will be apparent.

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 we 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 apparatus for washing fabrics and for centrifuging water therefrom, the combination of a tub for containing washing water, a basket rotatably disposed within said tub, driving means for actuating the basket at relatively low frequency for washing the fabrics and for rotating the basket at relatively high speed for centrifuging fluid therefrom, means for admitting water to the tub, means for discharging water from the tub, first and second control devices for respectively controlling the operation of the water-admitting means and said driving means, and means responsive to the amount of water in said tub for so actuating the first and second control devices that the first controlling device renders the water-admitting means inactive when a predetermined amount of water is contained in the tub and active to admit water to the tub at any and all times that the amount of water in the tub is less than said predetermined amount, and that the second control device conditions the driving means for high-speed operation only when the tub is substantially devoid of water and for low-speed operation at any and all other times.

2. In apparatus for washing fabrics and for extracting fluid therefrom, the combination of a tub, a basket rotatably disposed within the tub for containing the fabrics to be washed, adjustable 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 fluid therefrom, said adjustable driving means including a solenoid which, when energized, effects high speed operation of the basket, an electrically-operated valve controlling admission of water to the tub, said valve when energized admitting water to the tub and when deenergized terminating the flow of water to the tub, a switch for controlling the energization of said solenoid and normally closed when the tub is substantially devoid of water, said switch being open at any and all other times, a second switch for controlling said electrically-operated valve, said second switch being open when the tub contains a predetermined weight of water and closed at any and all other times, and means responsive to the amount of water in said tub for actuating said first and second switches.

3. In apparatus for washing fabrics and for extracting fluid therefrom, the combination of a tub, a basket rotatably disposed within the tub for containing the fabrics to be washed, adjustable driving means for rotating the basket at relatively low speed for washing the fabrics and at relatively high speed for extracting fluid therefrom, said adjusting means including a magnet which, when energized, effects high speed operation of the basket and, when deenergized, effects low speed operation of the basket, an electrically operated valve controlling admission of water to the tub, said valve when energized admitting water to the tub and when deenergized terminating the flow of water to the tub, a member movable in response to the amount of water in said tub, a switch for controlling the energization of said magnet and actuated by said movable member, said switch being closed when the movable member is in a first position in which the tub is substantially devoid of water and open at any and all other times, a second switch for controlling said electrically-operated valve and actuated by said movable member, said second switch being open when the movable member is in a second position in which the tub contains a predetermined weight of water and closed any and all other times, first and second master switches for controlling the energization of the magnet and the electrically-operated valve, respectively, and a timing mechanism for opening and closing said master switches in a predetermined sequence.

4. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid and the fabrics to be treated, means for admitting fluid to the container, means for draining the fluid from the container, adjustable driving means for actuating the container at relatively low and high speeds for respectively cleaning the fabrics and for extracting cleaning fluid therefrom, and means responsive to the amount of fluid in the container for controlling the operation of the fluid admitting means and the driving means so that the former is rendered inactive to admit fluid to the container only when the container is substantially filled with fluid and is rendered active to admit fluid to the container at all other times and so that the driving means is conditioned for high speed operation only when the container is substantially devoid of fluid and is conditioned for low speed operation at all other times.

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