May 5, 1953 T. R. SMITH 2,637,187

WASHING MACHINE WITH A ROTATABLE TUB AND A CONCENTRIC BASKET

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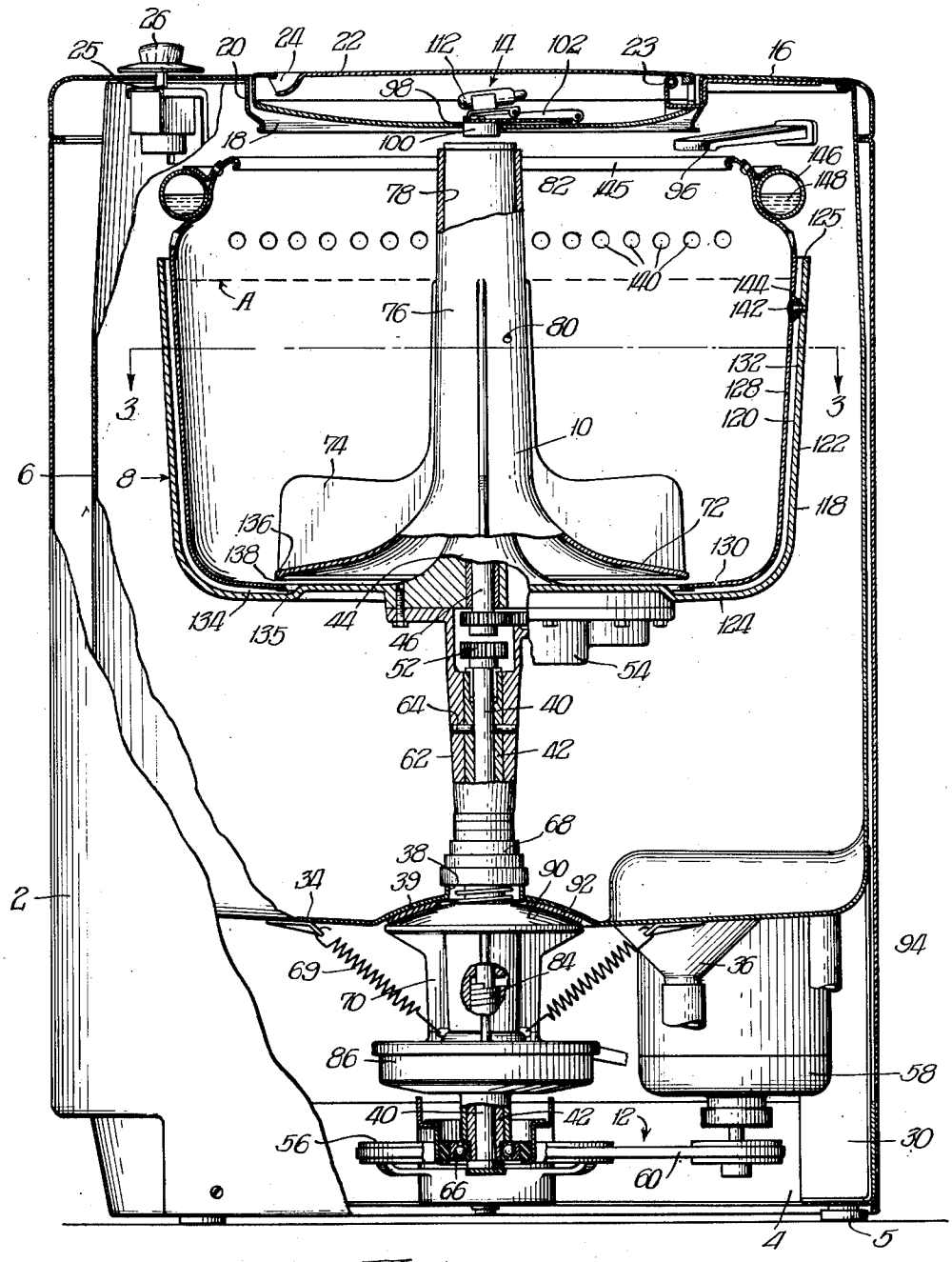


Fig. 1.

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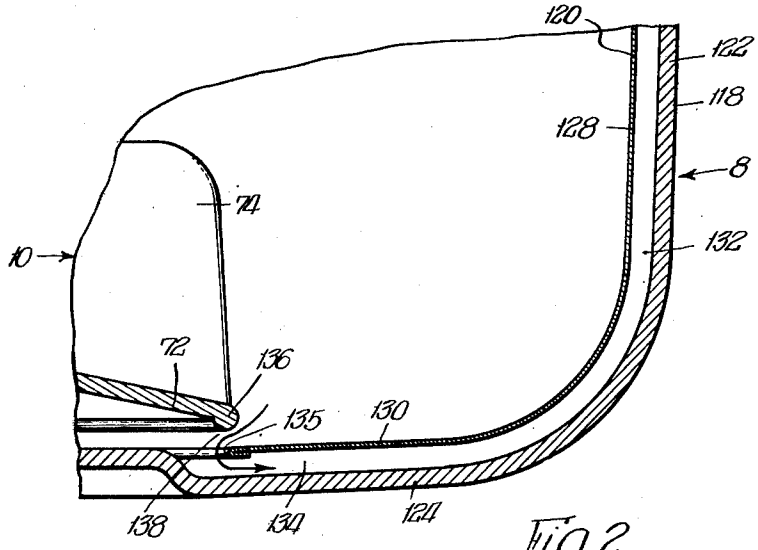


Fig. 2.

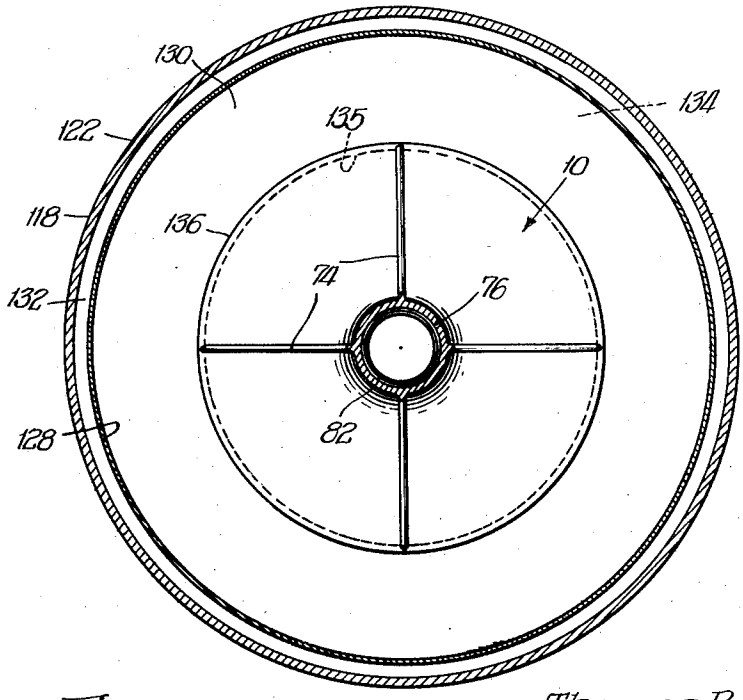


Fig. 3.

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3 Sheets-Sheet 3

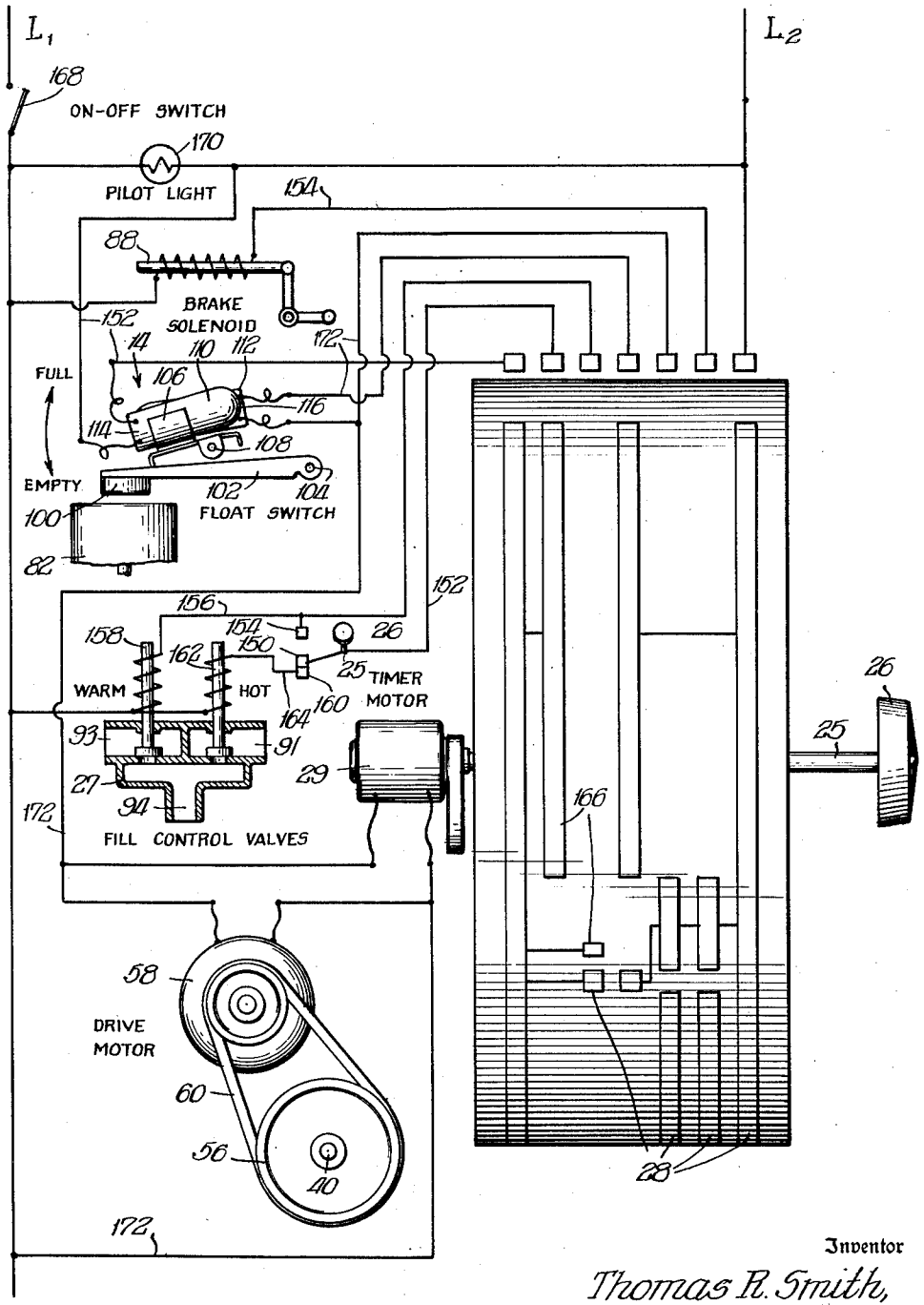


Fig. 4

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WASHING MACHINE WITH A ROTATABLE TUB AND A CONCENTRIC BASKET

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Application August 6, 1949, Serial No. 108,992

3 Claims. (Cl. 68—23)

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This invention relates to washing machines and more particularly to washing machines having rotatable tubs of improved construction for centrifugally removing liquid and solid particles therefrom.

Among the objects of the invention is to provide a washing machine with an improved rotatable tub of double wall construction which when rotated provides means for centrifugally removing heavy particles of dirt and foreign matter from the lower portion thereof.

In washing machines having rotatable tubs wherein a washing operation and a centrifugal drying operation takes place there are times, when washing some fabrics, that heavy particles of dirt, sand, etc. will settle out of the fabrics being washed. These particles tend to collect in the bottom of the tub during the washing operation and when the tub is rotated to extract the liquid a portion of the heavy dirt or foreign matter may be forced back into some of the fabrics which, of course, causes the same to be spotted or soiled. Even in installations wherein a space or sediment trap is provided for heavy dirt to settle out of contact with the fabrics being washed, the dirt is not always removed therefrom when the tub is rotated and it may accumulate therein until it eventually clogs the sediment trap. This is especially so in installations where the settling space is not readily accessible for manual cleaning.

Accordingly, it is another object of the invention to provide a washing machine having a rotatable tub of double wall construction which is provided with a settling space for heavy particles of dirt at the lower portion thereof communicating with an upwardly extending annular enclosed passage for the removal of such dirt from said space centrifugally out of contact with the fabrics when the tub is rotated.

It is still another object of the invention to provide a washing machine with a rotatable tub of double wall construction which is provided with a space at the lower portion thereof for the accumulation of heavy particles of dirt during the washing operation which are removed by causing the washing liquid and heavy dirt particles to flow upwardly between the walls of the tub by centrifugal action when the tub is accelerated.

It is yet another object of the invention to provide a sediment zone in a rotatable tub for a washing machine which is self-cleaning.

Other objects, features, capabilities, and advantages are comprehended by the invention as

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will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a partial vertical sectional view of a washing machine incorporating a rotatable tub of double wall construction made in accordance with the present invention;

Figure 2 is a partial enlarged vertical sectional view showing the tub of double wall construction more in detail;

Figure 3 is a horizontal cross-sectional view of the rotatable tub construction taken on the line 3—3 of Figure 1 of the drawings; and

Figure 4 is a diagrammatic wiring diagram of a control for a washing cycle for an automatic washing machine embodying a tub construction made in accordance with the present invention.

Referring now more in detail to the drawing for one form of a combined washing and drying machine, embodying a rotatable tub of double wall construction made in accordance with the present invention, there is shown an outer cabinet 2, secured to a base structure 4 having adjustable leg portions 5 for completely enclosing the operating parts of the machine. The base 4 provides a support for an outer stationary tub 6, a support for an inner rotatable tub 8, which is mounted for rotation about a vertical axis, having an agitator or washing device 10 disposed therein, as well as a support for mechanism, generally referred to as 12, for operating the agitator 10 and rotating the tub 8 in a washing cycle, as will be hereinafter more fully disclosed. The washing machine further includes a control mechanism generally referred to as 14 for automatically controlling certain operations in the washing cycle.

The cabinet 2 has its main body portion, formed with side, front and back panels with a top or cover panel 16 secured thereto to provide a substantially rectangular unitary structure. The top panel 16 is preferably formed with an opening 18 defined by a downwardly and inwardly extending flange 20 to permit access to the inner rotatable tub 8 and is normally closed by a lid 22, preferably formed hollow to enclose the control mechanism 14 and hinged at 23 to the top panel to pivot about a horizontal axis. In addition, the lid is recessed remote from the hinge 23 to provide a handle or grip 24 which can be readily grasped by the operator to swing the lid into and out of its closed position. In this instance, the top panel is further formed with two openings adjacent the front corners thereof, each of which has a control

shaft 25 extending upwardly therethrough with a control knob 26 mounted thereon adapted to be grasped by the operator for manipulation. One of the control shafts is adapted to be adjusted for controlling a thermostatically operated mixing valve 27, and the other is adapted to be manipulated by the operator for manually positioning a plurality of cams 28 normally driven by a timer motor 29 through any suitable speed reduction mechanism for automatically controlling the washing cycle, as diagrammatically shown in Figure 4 of the drawings.

The outer stationary tub 6 may be supported, in any suitable manner, by a plurality of corner posts 30 and is preferably formed circular in horizontal cross section, with an upper open end disposed adjacent the lower portion of the top panel 16 and a lower bottom wall 34 having a drain opening 36 and a centrally disposed enlarged opening 38 in a centrally located crowned portion 39 through which vertical coaxial shaft means extend. The shaft means is in the form of an inner rotatable shaft 40 and an outer rotatable shaft 42, for supporting and rotating the inner tub 8 and for actuating the agitator 10.

Disposed within and at the upper portion of the stationary tub 6 and secured to the upper end of the tubular shaft 42 is the rotatable tub 8. This tub is preferably circular in horizontal cross section and adapted to receive and hold the washing liquid and the fabrics to be washed. During the washing operation the tub is held stationary and it is rotated about its vertical axis to remove the liquid therefrom during the drying operation, as will be hereinafter more fully described.

The lower portion of the rotatable tub 8 is provided with a centrally located conically shaped hub portion 44 through which a vertically disposed oscillatable shaft 46 extends which is splined or connected in any suitable manner to a hub on the underneath side of the agitator 10. In this manner the shaft 46 and agitator may be oscillated about the vertical axis of the tub to agitate the water and fabrics to be washed. Any suitable sealing means may be utilized between the hub 44 and the shaft 46 to provide a fluid-tight joint.

Means for oscillating the agitator 10 are provided by suitable oscillating mechanism generally indicated at 52 which, in this construction, is carried in a gear housing 54 disposed at the bottom of and bolted to the rotatable tub 8 to increase the mass thereof. This oscillating mechanism is preferably directly operated by the inner vertical rotatable shaft 40 which has a driven pulley 56 secured thereto at its lower end, the same being continuously rotated in one direction by a motor 58 when energized, by means of a belt 60. The gear housing 54 is further provided with a downwardly projecting hub portion 62 concentric with the shaft means and rigidly secured to the upper end of the tubular shaft 42 by means of pins 64, while the lower end of the shaft means 40 and 42 are mounted in a combined radial and thrust bearing 66 adjacent the lower portion of the base 4. Leakage between the hollow shaft 42 and the stationary tub 6 is prevented, where the shaft means traverses the tub at the crowned opening 38, by means of a resilient spring biased seal or boot 68 having upper and lower sealing surfaces adapted to engage the lower portion of the hub 62 and an upstanding portion on the stationary tub about the opening 38, respectively.

The combined radial and thrust bearing 66 provides the sole support for the rotatable tub 8 which is free to tilt thereabout at which time the upper portion of the tub will move laterally with respect to the opening 18 in the top panel 16. Accordingly, means are provided to maintain the tub in a substantially vertical position during the washing operation and, although it is not absolutely necessary, it is desirable to have the means act to aid in centering the same when the tub is rotated. In this instance, a plurality of oppositely disposed, preferably four, centering springs 69 disposed at an angle to provide a component of force axially of the shaft means, in addition to the centering action, are connected at one of their ends to the bottom 34 of the stationary tub 6 and the opposite ends are connected to a damper housing 70 disposed adjacent to and beneath the bottom 34 of the stationary tub 6. This damper housing is also disposed concentric with and journalled on the tubular shaft 42 and moves laterally therewith.

The agitator 10, disposed within the rotatable tub 8, is formed with a flaring base or body portion 72 extending downwardly and outwardly about the hub 44 to underlie the clothes, and has one or more blades 74 extending radially upwardly and outwardly from the lower portion of the base 72 adapted to agitate the liquid within the tub upon oscillation of the agitator for effecting the washing operation. The agitator is further provided with a hollow center-post or pedestal 76 disposed on the vertical axis of the tub which extends upwardly from the hub above the normal liquid level within the tub. This center post is formed with an inner compartment or float chamber 78 having an upper open end facing in the direction of the lid 22 and communicating with the interior of the tub through one or more openings 80 extending radially through the wall of the center post adjacent the bottom of the chamber. A float 82 is loosely carried in this float chamber to permit longitudinal sliding movement therein in accordance with the liquid level within the tub and chamber 78 for operating the control mechanism 14 with a minimum of friction.

As previously mentioned, the material introduced into the rotatable tub is subjected to a washing action through the oscillating action of the agitator and is also subjected to a centrifuging action whereby the same is spin-dried upon the rotation of the tub. In order to rapidly rotate the tub 8, suitable clutch mechanism 84 may be provided for effecting a driving relation between the inner shaft 40 and the outer shaft 42.

Means are provided in the form of a brake mechanism 86 secured in part to the stationary tub 6 and to the outer shaft 42 for holding the tub 8 stationary during the washing operation and for permitting the rotation of the tub during the spinning operation. The operation of both the brake and clutch is under control of a solenoid 88 (Figure 4) which when deenergized applies the brake 86 and renders the clutch 84 inactive and when energized releases the brake and engages the clutch to connect the inner and outer shafts together to drive the same in unison.

The damper housing 70 which provides a support at least in part for the clutch and brake mechanisms and has the centering springs connected thereto, is also provided at its lowermost end with a spherical surface 90 having dampening material 92 attached thereto which is posi-

tioned to engage the crowned portion 39 of the stationary tub 6. This damper is provided to reduce the amplitude of lateral movement of the agitator 8 during the spinning operation.

A clutch, centering means, brake and damper mechanism suitable for effecting the above operation are described and claimed in my co-pending application Serial No. 66,230, filed December 20, 1948, and assigned to the assignee of the present invention. It is to be understood, however, that said application discloses but one form of such mechanisms suitable for operating the washing machine as herein disclosed and that other suitable types may be utilized.

Hot and cold washing liquid or water are supplied from conduits 91 and 93 (Figure 4) to the thermostatically controlled mixing valve 27 which discharges the liquid at the proper temperature into a conduit 94 extending upwardly between the cabinet and the stationary tub, the same being connected at its upper end (not shown) to an inlet spout or nozzle 96 extending laterally through an opening in the upper part of the tub 6 to discharge the washing water into the rotatable tub 8.

The hollow lid 22 housing the control mechanism 14 has its lower wall section formed with an aperture or opening 98 disposed directly above the upper open end in the center post 76 and through which a control button 100 on the control mechanism 14 loosely projects.

This control button 100 is preferably secured adjacent one end of a lever 102 which is pivoted at its opposite end to a pin 104 carried by the lower wall section. A bracket 106 is pivotally mounted above the lever on a pivot 108 and provides a support for a pair of mercury control switches 110 and 112 of the mercury type whose longitudinal axes are displaced with respect to each other and whose contacts 114 and 116 are oppositely disposed. This bracket is movable about its pivot 108 by the lever 102 when the same is moved by the float.

The details of construction of the entire switch assembly 14, including an unbalanced safety switch and the operation therefor in an apparatus herein disclosed, is more fully described in the co-pending application of Thomas R. Smith and Dudley P. Combs, Serial No. 64,792, filed December 11, 1948, now Patent No. 2,612,766, issued October 7, 1952, and assigned to the assignee of the present invention.

In order to provide a rotatable tub which is capable of expelling a large portion of the water quickly and at the same time prevent the fabrics from interfering with the centrifuging action the tub 8 is formed or fabricated in two sections to provide an outer tub or receptacle 118 and an inner tub or container 120. The outer tub or receptacle 118 is imperforate and substantially cup-shaped in vertical cross-section with its open end facing in the direction opposite of the cover 16 and whose frusto-conical side wall 122 tapers upwardly and outwardly from the imperforate bottom wall 124. This side wall terminates in a top edge 125 above the normal desired liquid level and over which liquid is discharged when the tub is rotated. The lower portion of the side wall 122 is curved inwardly and merges with the generally horizontal bottom wall 124 which in turn forms the central hub portion 44 of the receptacle wherein the oscillatable shaft 46 is journalled.

The inner tub 120 is smaller in diameter than the outer tub and is in the form of an open ended basket or container having the portion of its side wall 128 adjacent the side wall 122 of the outer tub and the bottom 130 imperforate and disposed in substantially parallel spaced relation with respect to the side wall 122 and the bottom 124 of the receptacle 118 to provide an annular space 132 therebetween along the side walls and a space 134 between the bottom walls 124 and 130 to define a sediment space or zone. The bottom wall 130 of the inner tub is curved to merge with the side wall 128 and is preferably tapered downwardly toward the center of the tub and its inner edge 135 is preferably disposed adjacent to or slightly inward from the outer periphery 136 of the agitator base 72. It is to be noted that a liquid conducting passage 138 is provided between the bottom of the basket and base of the agitator and that the agitator is also spaced from the bottom 124 of the receptacle 118. In view of the fact that the inner tub is imperforate below the normal liquid level the liquid in the sediment zone 134 and annular space 132 is relatively quiet and when heavy particles of dirt pass or gravitate through the passage 138 into the sediment zone 134 during the washing operation there is little or no tendency for the dirt to flow or work back into the interior of the basket. Also, it is through this passage that a relatively large portion of the liquid is conducted during the acceleration of the tub.

Above the top of the edge 125 of the outer tub 118 the inner tub 120 is provided with a plurality of horizontally arranged openings or perforations 140 which are above the desired liquid level in the receptacle during the washing operation, but through which a portion of the liquid is centrifugally discharged when the tub is rotated. These perforations are preferably positioned at the point of the largest diameter of the inner tub 120 and above the top edge 125 of the outer tub 118 so that water being discharged therethrough will not interfere with the water being discharged from the annular space 132 between the inner and outer tubs. In order that the inner and outer tubs may form a unitary structure and rotate in unison they may be secured together in any suitable manner, such as, for example, by screws 142 fitting into recesses 144 in the inner tub and extending into the outer tub. These screws act to hold the inner tub rigid and at the same time maintain the same in spaced relation with respect to the side and bottom walls 122 and 124 of the outer tub. The upper portion of the inner tub above the discharge openings 140 is imperforate and extends upwardly and inwardly and terminates to define an opening 145 disposed in alignment with the opening 18 in the cover, whereby the operator may have access to the interior of the inner tub when the lid is opened.

In this particular construction the upper portion of the inner tub has mounted thereon a hollow toroidal balancing member or ring 146, preferably containing a mobile material 148, of any suitable type, having a relatively high specific gravity, which serves as a balancing means for tending to maintain the rotatable tub in its vertical position when it is rotated at relatively high speed, above its critical speed, under unbalanced load conditions.

From the foregoing it can be seen that when the tub 8 is stationary during the washing operation, the liquid A within the inner tub or

basket 120 is agitated rather violently by the agitator 10 to wash or cleanse the fabrics therein. Due to this action heavy particles of dirt and other heavy matter will be loosened therefrom and gravitate toward the bottom of the basket. In view of the contour of the bottom wall 130 it will have a tendency to flow toward the center of the tub and in so doing pass through the passage 138 between the bottom of the agitator and basket and enter and settle on the bottom 124 of the outer tub in the sediment zone 134, wherein the liquid is relatively quiet. Since the passage 138 is the only connection with this space and no recirculation is provided for, the foreign particles are restricted or retarded in their flow back toward the interior of the inner tub and for the most part will remain therein.

After the washing operation the tub 8 is rotated about its vertical axis to extract the liquid therefrom. As the tub is accelerated centrifugal force moves water up the imperforate side wall 128 of the inner tub 120 and a portion is discharged through the horizontal openings 140 therein disposed at its largest diameter, while the fabrics move outwardly against the interior side wall of the inner tub. Simultaneously with this action centrifugal force causes a portion of the water to flow upwardly through the annular space 132 and it is discharged over the top edge 125 of the outer tub 118. Since the lower portion of the side wall and bottom of the inner tub are imperforate it is obvious that the liquid being discharged over the top edge 125 must initially enter the sediment zone 134 through the passage 138 between the outer periphery 136 of the agitator and the innermost edge 135 on the bottom wall of the inner tub. In so doing the rotation of the tub produces in effect a centrifugal pumping action through this space and increases the velocity of the liquid entering the sediment zone 134 as it flows outwardly, picks up the foreign particles therein, carries the same upwardly along the annular space 132 provided between the inner and outer tub and discharges the same over the top edge 125 into the stationary tub 6 wherein it is directed to the drain opening 36. During this cleaning of the sediment zone liquid is being discharged through the openings 140, however, in view of the fact they are above the top edge of the outer tub the liquid does not interfere with the flow in the annular passage 132. The speed of rotation of the tub determines the velocity of the liquid flowing through the sediment zone, while the inner edge 135 on the inner tub determines the quantity of liquid discharged therethrough. After this quantity of liquid has been removed from the tub the removal of liquid through the annular space 132 is terminated and all of the remaining liquid still in the tub must flow upwardly along the imperforate side wall of the inner tub and out of the discharge openings 140 provided therein.

By providing an inner tub as shown should any of the heavy particles or dirt remain in the sediment zone after the spinning operation, the tendency for it to be washed back into the interior of the inner tub to thereby soil the next group of fabrics being washed is minimized, because recirculation of liquid through this space is reduced to a minimum.

The operation of an automatic washing machine of the type hereinabove described and incorporating a rotatable tub of double wall construction for removing heavy particles of dirt therefrom made in accordance with the invention is as follows:

The operator opens the lid 22 and then places the clothes or fabrics to be washed through the opening 18 into the interior of the basket 120 including with it the proper quantity of detergent, and the lid is closed. Thereupon the operator decides whether to use hot or warm water for the washing operation and adjusts the temperature control knob 26 to position a movable contact 150 in an electrical circuit 152 to either engage the warm water contact 154 in a circuit 156 to energize the warm water valve 158, or to engage a hot water contact 160 to energize the hot water valve 162 through a parallel circuit 164, when the appropriate cam 166 on the timer is advanced to complete the circuit 152 from L_1 to L_2. For example, if the operator desires hot water, the contact 150 is placed in engagement with the hot water contact 160 and the circuit 152 is conditioned for operation.

Next the operator grasps the timer control knob 26 and turns the same to the desired washing period and closes the main line switch 168 which conditions the timer motor 29 for operation and lights the pilot light 170 to indicate that the washing circuit is energized. Upon turning of the timer control knob, the hot water side of the thermostatically controlled valve 27 is actuated and conducts water at the proper temperature to the rotatable tub through the inlet nozzle 96. As the water level in the tub rises above the opening 80 in the centerpost the water flows therethrough into the float chamber 78 to raise the float 82 from its inactive position. After the float is moved vertically a sufficient distance the top of the float contacts the button 100 on the lever 102 and raises the same about its pivot 104 which in turn tilts the bracket 106 about its pivot 108 to tilt the pair of mercury switches. When the liquid in the tub reaches a predetermined level the mercury switch 112 is actuated so that the mercury bridges the contacts 116 therein to energize the timer motor 29 and main drive motor 58 through circuit 172 and the appropriate cams to start the washing action by oscillating the agitator 10 through the oscillating mechanism 52 and to advance the cams 28 intermittently on the timer. Shortly thereafter the switches 110 and 112 are tilted still further by an increase in the water level and the mercury in the switch 110 moves away from the contacts 114 to deenergize the water supply circuit 152 and the flow of water to the receptacle through the valve 27 is interrupted, at which time the proper quantity of water for the washing operation has been introduced into the tub 8.

During the washing operation heavy particles of foreign matter and dirt will pass into the sediment zone 134 through the passage 138 between the outer edge of the agitator 10 and the bottom of the inner tub wherein a relatively large portion tends to settle due to the less violent action of the liquid. After a predetermined period of agitation, the timer, advancing the cams 28 completes a circuit 154 which energizes the brake solenoid 88 to release the brake 86 holding the tub from rotary movement and at the same time causes the clutch 84 to directly connect the continuously rotated drive shaft 40 to the hollow rotatable shaft 42 carrying the receptacle to rotate the same, at which time no relative movement takes place between the agitator and tub. Also, the two mercury switches 110 and 112 are cut out

of the control circuits by means of the cams on the timer which control the same.

As the tub is accelerated by the motor **58** a portion of the liquid in the annular space **132** is centrifugally discharged from the same by moving up the imperforate side wall of the outer tub and the liquid in the inner tub is moved upwardly by centrifugal force and is discharged through the openings **140**. At this time a large portion of the liquid flows downwardly about the outer edge **136** of the agitator through the space **138** around the edge **135** of the inner tub and into the sediment zone **134**. Due to the rotation of the tub, a centrifugal pumping action of the washing liquid is effected in the spaces **132** and **134** and the velocity thereof is increased as the same enters and flows outwardly through the sediment zone **134** whereby the heavy foreign particles are picked up and carried up the annular space **132** along the side wall of the outer tub and discharged over the top edge **125** into the stationary tub **6**, wherein the water and the dirt is directed to the drain opening **36**.

After a certain amount of liquid is discharged under the agitator as determined by the inner edge **135** on the inner tub the remaining liquid therein is discharged through the openings **140** in the upper portion of the inner tub because the basket is imperforate elsewhere.

At full speed of rotation the major portion of the washing liquid is removed from the fabrics in the tub. During this time a flush rinse of clear, warm water is admitted to the tub through the inlet nozzle **96** through the actuation of the cam controlling the warm water to complete the circuit **156** through the warm water control valve to remove a portion of the remaining soapy washing liquid in the fabrics.

As the timer motor **29** reaches the end of the spin period, the cam for energizing the same is moved to deenergize the timer motor **29** and the drive motor **58** and deenergize the brake solenoid **88** so that it is actuated to apply the brake **86** and release the clutch **84** to stop and hold the tub **8** stationary. Simultaneously with this action the warm water valve is energized again by its cam through its circuit **156** and warm water is admitted to the tub through the nozzle and upon attaining the proper level therein the switches **110** and **112** are tilted in a manner identical to that previously described to again actuate the timer and drive motors and to interrupt the supply of liquid to the tub and to initiate the agitate rinse.

The operation of the washing machine during the agitating rinse period is identical to the operation thereof during the washing period, except it is of shorter duration, after which the cams **28** are advanced to interrupt the agitating rinse period and the tub is again rotated as above described to remove the rinse water from the fabrics being washed and to discharge the same through the drain opening **36**. Also, at the same time a portion of the rinse water is forced about the outer periphery of the agitator into the sediment zone and up the annular space to clean or remove any remaining foreign particles in the zone in an identical manner as previously described.

At the end of the final spin period, as determined by the location of the cams of the timer, the timer motor **29** is deenergized simultaneously with the drive motor **58**, the brake solenoid **88** is deenergized to re-apply the brake **86** to the tub **8** to stop the same. During this washing cycle the fabrics have been washed with detergent, rinsed with clear water and have had a large portion of the water removed thereform. The washing operation is now complete, and the operator need only raise the lid and remove the fabrics from the tub.

From the foregoing, it can be seen that a rotatable tub of double wall construction has been provided having imperforate side and bottom walls forming a sediment trap or zone adjacent the lower portion thereof which is utilized to collect particles of heavy foreign matter during the washing operation and an annular space between the wall communicating therewith and through which water is centrifugally discharged to remove the particles of foreign matter from the sediment trap or zone and that this operation provides in effect a self-cleaning sediment zone.

Also, there has been provided a tub construction which minimizes the recirculation of particles of heavy dirt and other foreign matter back into the interior of the inner tub **120** after it enters the sediment zone.

While I have herein described and upon the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit thereof.

It is claimed:

1. In a washing machine having a rotatable tub for receiving washing liquid and fabrics to be washed and being provided with an oscillatable agitator disposed in said tub having a part underlying the fabrics to be washed, said tub comprising an imperforate receptacle having an upwardly and outwardly flaring side wall with an upper open end and an open-ended basket having a side wall and a bottom wall, means for securing said receptacle in parallel spaced relation thereto to provide an annular space between said side wall and a sediment zone at the bottom of said receptacle, said basket having its lower inner open end terminating inwardly in spaced relation to the sidewall and above the bottom wall of said receptacle to provide a continuous peripheral opening adjacent the outer periphery of said agitator providing communication between the interior of said basket and said annular liquid conducting space, said basket being further provided with liquid discharge openings above the upper end of said receptacle and being imperforate elsewhere along its side wall and bottom, whereby when said tub is rotated a portion of the liquid flows around said agitator through the inner peripheral open end of said basket into the sediment zone and up the annular discharge space out of contact with the fabrics, and the remainder is discharged from said basket through said openings in the upper portion of its side wall.

2. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, said tub comprising an imperforate receptacle having a bottom and an upwardly and outwardly flaring side wall terminating in an upper edge above the normal liquid level desired in said tub, and a container having a side wall and a bottom wall disposed in parallel spaced relation to the side and bottom wall of said receptacle to provide an annular liquid conducting space therebetween and from the

bottom of said receptacle to define a sediment zone, said container having an upper and lower open end with discharge openings in its side wall disposed above the upper edge of said receptacle and being imperforate elsewhere, the inner open end of said bottom wall terminating inwardly in spaced relation to the sidewall and bottom wall of said receptacle to provide a continuous peripheral opening providing direct communication between the interior of said container and said annular liquid conducting space so that when said tub is rotated a portion of the liquid is centrifugally conducted through the sediment zone to entrain foreign matter therein and to conduct the same upwardly through the annular space to discharge the same over the top edge of said receptacle out of contact with the fabrics in said container, and means adjacent the upper end of said receptacle for holding the side and bottom walls of said receptacle and container in parallel spaced relation.

3. In a washing machine having a rotatable tub assembly mounted for rotation about a vertical axis and adapted to receive liquid and fabrics to be washed and being provided with a washing device having a base portion underlying the fabrics to be washed, said tub assembly comprising an open-ended inner tub having a side wall provided with discharge openings in the upper portion thereof and a bottom wall having a continuous peripheral opening extending inwardly therefrom and being imperforate elsewhere, an imperforate outer tub having an upwardly flaring frusto-conical side wall the upper end of which terminates below said discharge openings and a substantially horizontal bottom wall disposed in parallel spaced relation to the side and bottom walls of said inner tub to define an annular liquid conducting space between said side walls and a sediment zone between said bottom walls, means for securing said inner and outer tubs together in parallel spaced relation to provide a unitary structure, the open end of said bottom wall being disposed in spaced relation to and extending inwardly of the base portion of said washing device to provide a liquid conducting passage between the interior of said inner tub and said sediment zone, whereby liquid in said tub flows through said passage into said sediment zone and up the annular space out of contact with the fabrics in said inner tub when said tub assembly is rotated, and drive means for selectively operating said washing device and for rotating said tub assembly.

THOMAS R. SMITH.

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