

Oct. 7, 1952

T. R. SMITH ET AL
WASHING MACHINE PROVIDED WITH INTERLOCKING
LID MOUNTED VIBRATION CONTROL MEANS

2,612,766

Filed Dec. 11, 1948

4 Sheets-Sheet 1

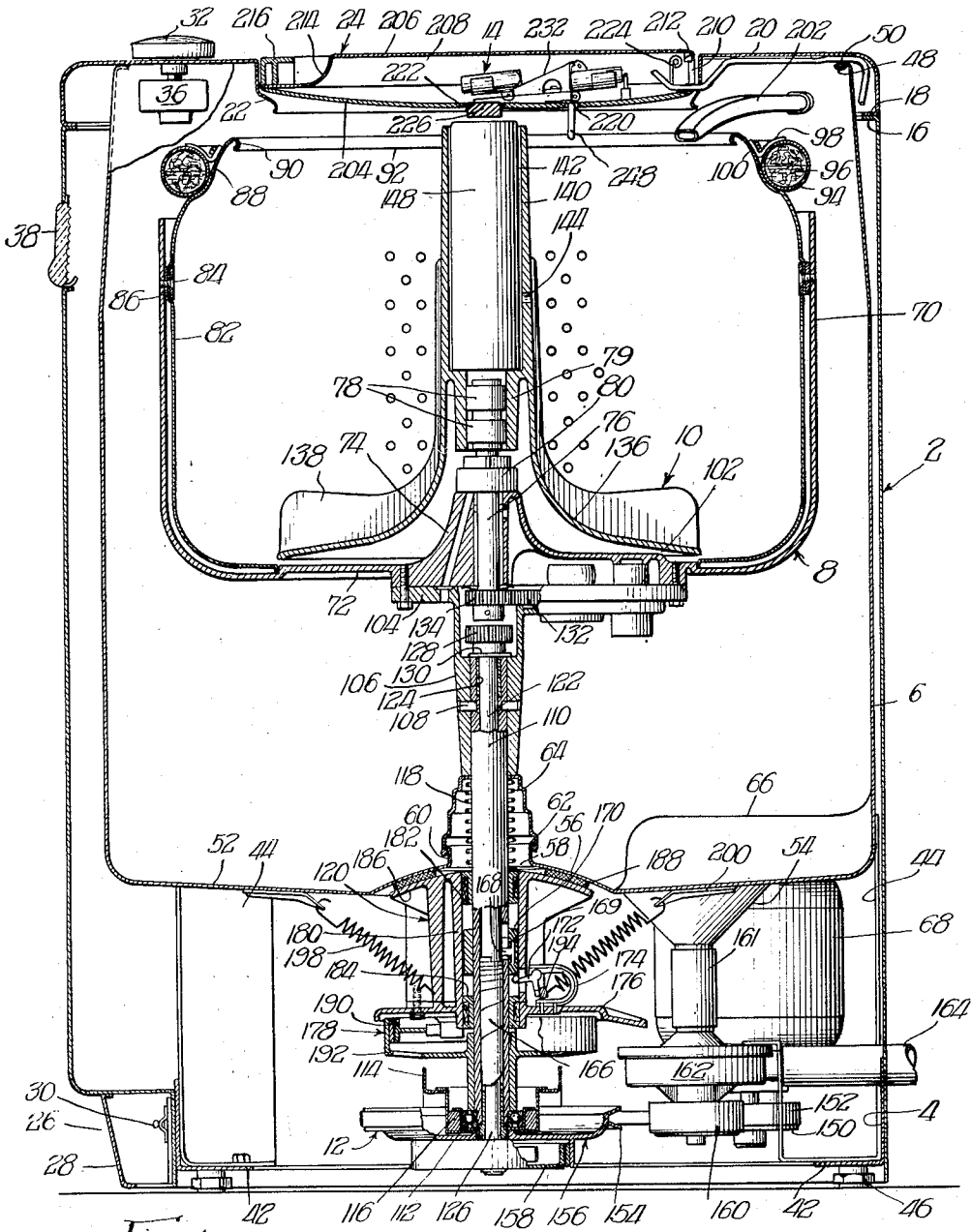


Fig. 1

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4 Sheets-Sheet 2

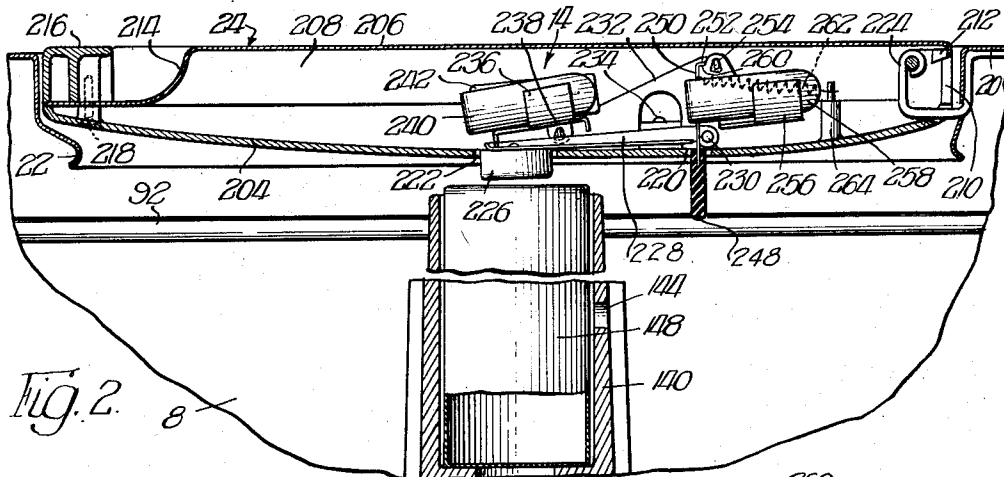


Fig. 2

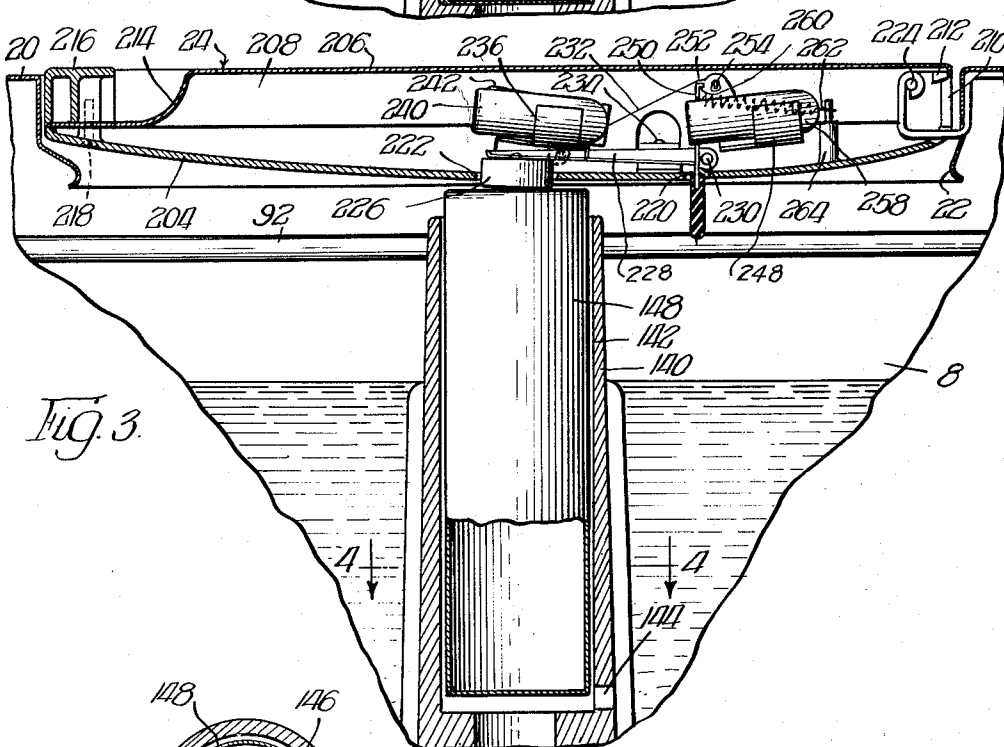


Fig. 3

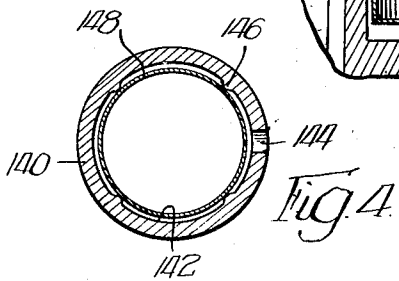


Fig. 4

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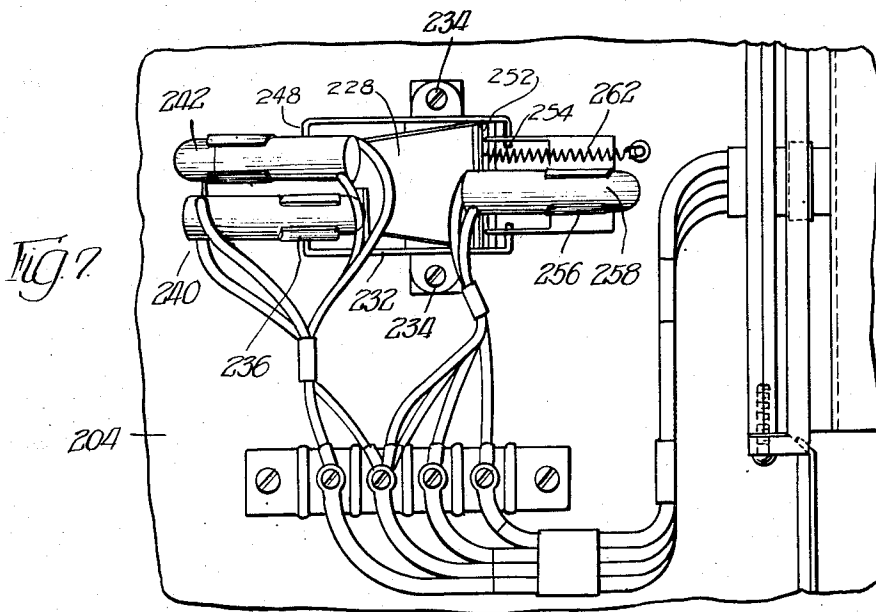
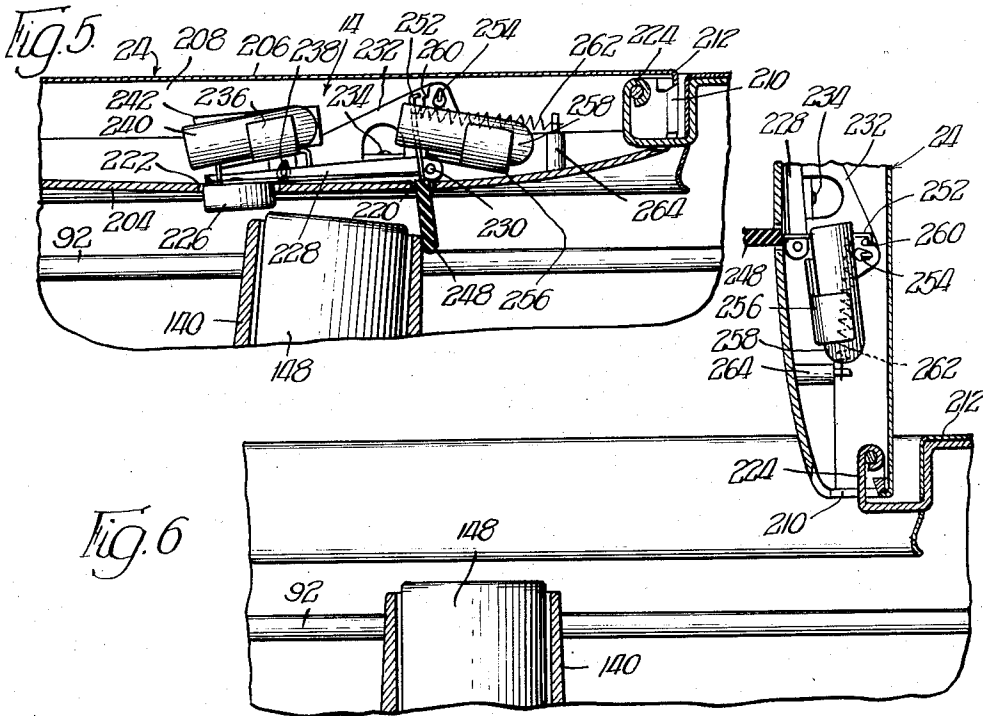
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4 Sheets-Sheet 3



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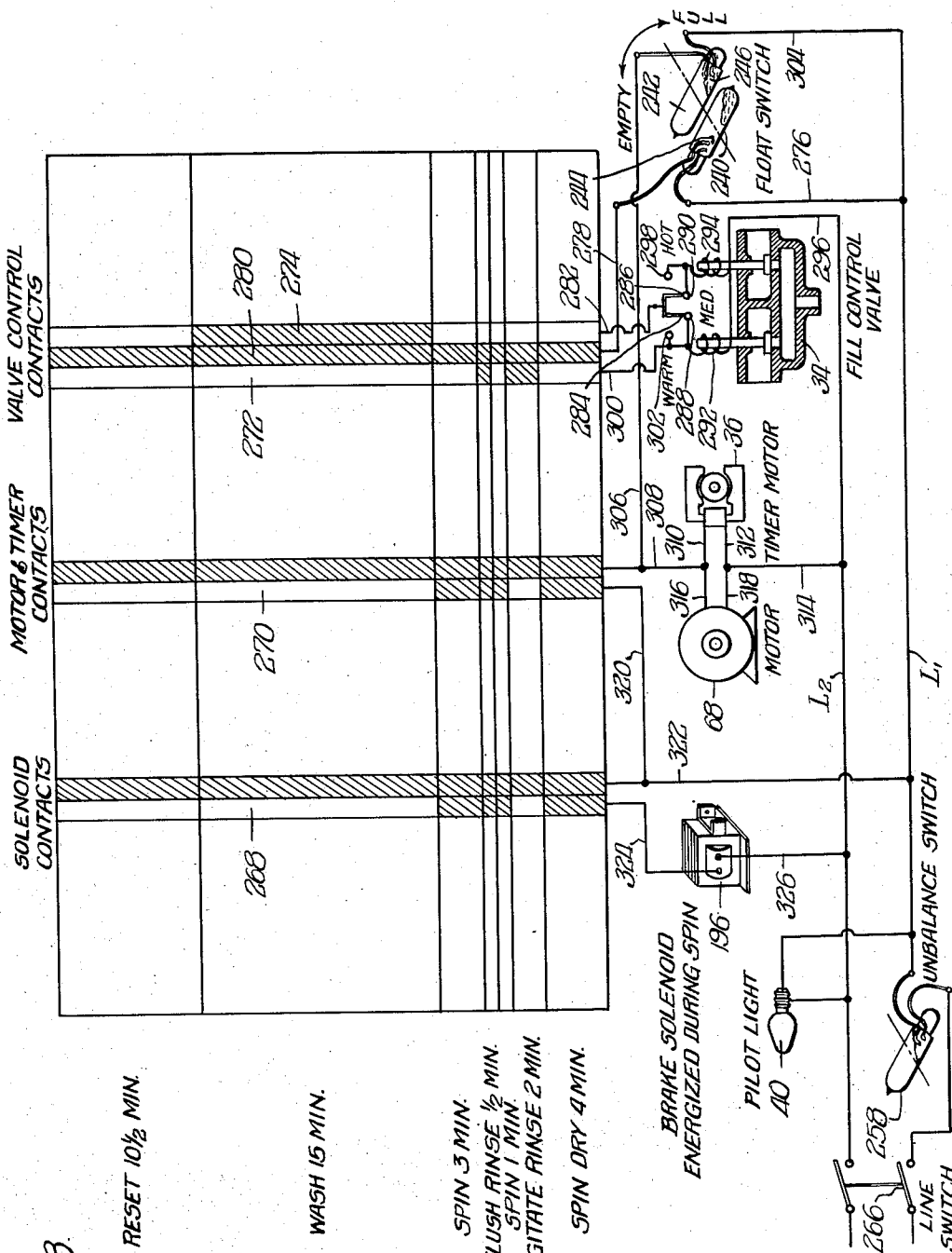
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RESET 10 1/2 MIN.

WASH 15 MIN.

SPIN 3 MIN.
FLUSH RINSE 1/2 MIN.
SPIN 1 MIN.
AGITATE RINSE 2 MIN.
SPIN DRY 4 MIN.

BRAKE SOLENOID
ENERGIZED DURING SPIN

PILOT LIGHT
40

UNBALANCE SWITCH
L1

Fig. 8

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UNITED STATES PATENT OFFICE

2,612,766

WASHING MACHINE PROVIDED WITH INTERLOCKING LID MOUNTED VIBRATION CONTROL MEANS

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Application December 11, 1948, Serial No. 64,792

22 Claims. (Cl. 68—12)

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The present invention relates to control mechanisms, and more particularly to such mechanisms adapted for use in machines in which a centrifuging operation is performed.

Among the objects of the present invention is to provide novel control mechanism for limiting lateral movement of a device which is supported for tilting movement during its rotation, whereby the device is rendered inoperative by said control mechanism when the same is tilted beyond a predetermined amount.

Another object of the invention is to provide a control mechanism of the type immediately hereinabove described which is associated with a protective lid or cover for the rotatable device adapted to be reset from an inoperative condition upon movement of the lid or cover into its open position, whereby the control mechanism is rendered effective to control said device when the lid is again moved into its closed position.

Still another object of the invention is to provide a control mechanism which has the further characteristic of preventing operation of said device when the protective lid therefor is in its open position.

More particularly, the invention has the further object of providing a control mechanism of the type described which is particularly adapted for use in machines in which a centrifuging operation is performed such, for example, in washing machines in which a washing operation is accomplished by agitating the liquid and material contained therein and in which the tub is thereafter rotated to extract the liquid from the material to effect a partial drying thereof.

The present invention comprehends the provision of control mechanism of the type specified to prevent excessive lateral movement of the tub of a washing machine in which the washing cycle, including the washing of the material, the rinsing thereof, and the extracting of liquid therefrom is automatically controlled.

A still further object of the invention is to provide a novel control mechanism for such an automatically operated device which renders the means for controlling its operating cycle inoperative upon tilting of the tub or container beyond a predetermined limit but which is adapted to be reset when the lid or cover for said device is moved into its open position to render such control means operative to continue said operating cycle when the lid or cover is again moved into its closed position.

The present invention further contemplates a control mechanism adapted for use with control

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means of an automatically operated device of the type hereinabove set forth which brings all operating parts thereof to rest and/or renders the same inoperative when the lid or cover is opened, or the control means and operating mechanisms for the device are brought to rest and/or rendered inoperative by excessive tilting of the tub or container while the lid or cover is in a closed position, thus preventing injury to the operator or damage to the device at all times during the operating cycle thereof.

The present invention also comprehends a novel control mechanism adapted for use in connection with control means which includes timer means for automatically controlling the cyclic operation of a washing machine or the like, such timer means being operatively associated with the control mechanism whereby the timer means is rendered inoperative when the tub or container is tilted beyond a predetermined amount, but which is rendered operative to continue said cyclic operation upon movement of the lid or cover into its open position to reset said control mechanism and the lid or cover is again moved into its closed position.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a vertical cross-sectional view of a washing machine embodying control mechanism made in accordance with the present invention;

Figure 2 is an enlarged fragmentary view in vertical cross-section of the cover assembly for the washing machine disclosed in Figure 1 of the drawings, disclosing more in detail the control mechanism incorporated therein;

Figure 3 is a view similar to Figure 2 of the drawings, disclosing the control mechanism in another of its operative positions;

Figure 4 is a horizontal cross-sectional view taken in the plane represented by line C—C of Figure 3 of the drawings;

Figure 5 is a view similar to Figures 2 and 3 of the drawings showing the unbalance switch in its tripped position;

Figure 6 is an enlarged fragmentary view in vertical cross-section of the cover assembly showing the position of the unbalance switch when the cover is in an open position;

Figure 7 is an enlarged top plan view of the control mechanism; and

Figure 8 is a diagrammatic disclosure of control means for the washing machine which em-

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bodies the control mechanism more particularly shown in Figures 2 and 3 of the drawings.

Referring now more in detail to the drawings, a combined washing and drying machine embodying a control mechanism made in accordance with the present invention is shown as comprising an outer cabinet 2, mounted upon a base structure 4 for completely enclosing the operating parts of the machine. The base 4 provides a support for an outer tub 6, a support for an inner rotatable tub 8 having an agitator or washing device 10 mounted therein, as well as a support for mechanism, generally referred to as 12, for operating the said agitator or washing device 10 and for rotating the tub 8 in a washing cycle, as will be hereinafter more fully disclosed. The washing machine is further characterized as including 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 to provide a substantially rectangular unitary structure, although any desired shape may be used for enclosing the various parts of the washing machine. The said panels are formed with inturned flanges 16 at the upper edges thereof adapted to mate with and be secured to similar flanges 18 of the cover or top panel 20 which is formed with an opening, defined by the downwardly and inwardly extending flange 22, normally closed by the lid 24. The front panel of the cabinet is cut out to form the toe space 26 defined by the finishing strip 28 having a contour conforming substantially to that of the front panel and being secured to the base structure 4 as by means of the ball studs 30, or the like.

The top cover or panel 20 is formed with two openings adjacent the front corners thereof, each of which is adapted to receive a control shaft extending upwardly therethrough which has a control knob, such as 32, mounted thereon adapted to be grasped by the operator for rotating the control shaft. One of the control shafts is adapted to be adjusted for controlling a thermostatically operated mixing valve 34 and the other of the control shafts is adapted to be manipulated by the operator for positioning a plurality of cams driven by a timer motor 36 for automatically controlling the washing cycle, as shown diagrammatically in Figure 8 of the drawings.

The front panel of the cabinet 2 is formed with an opening in which is mounted a panel 38 of translucent material such as "Lucite," in or on which a trade-name or the like may be impressed or otherwise embodied therein. The trade-name or the like is made more readily readable by means of a pilot light 40 mounted in the cabinet to the rear of the front panel and incorporated in the control circuit, as shown in Figure 5 of the drawings.

The base structure 4 is of rectangular formation and comprises horizontally disposed angle irons 42 having their ends secured together in any desired manner, the said base structure having corner posts or pedestals, such as 44, adapted to provide a support for the outer stationary tub 6 which is secured thereto. Adjacent each corner of the base structure there is provided an adjustable leg 46 adapted to maintain all four supporting points of the machine in contact with the floor and at the same time to maintain the machine level. If desired, the said adjustable legs may be provided with a projecting point

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adapted to penetrate the floor or foundation to prevent the machine from moving or creeping from its operative position.

The outer tub 6 is formed with a side wall having its lower portion cylindrical in horizontal cross-section and its upper portion frusto-conical shaped. The upper portion terminates in an inwardly extending flange 48 provided with an annular curved recess or groove adapted to receive a toroidal shaped sealing element 50 of resilient and compressible material, such as rubber or the like, which fits in the groove or recess and is compressed against the inner surface of the top or cover 20 to provide a fluid-tight joint therebetween to prevent water in the tub 6 from leaking into the chamber or compartment formed between the outer tub 6 and the cabinet 2 and into the lower part of the cabinet disposed below the outer tub 6. The outer tub is further formed with a bottom wall 52 sloping inwardly and downwardly from the side wall of the tub for the purpose of draining liquid falling to the bottom thereof into the conical shaped drain 54 depending from the bottom wall. This bottom wall is further formed with a centrally disposed crowned portion 56 having an opening 58 therein defined by an annular upstanding flange 60 which terminates in an outwardly extending peripheral portion 62 providing a shoulder for the sealing element 64. The tub 6 is further formed with an offset portion 66 which extends upwardly into the tub to provide clearance for a motor 68 which operates the washing machine.

The inner tub 8 is formed in two sections or parts, the outer part having an imperforate side wall 70 and an imperforate bottom wall 72 formed with a central hub 74 in which a vertically disposed shaft 76 is journaled. This shaft extends above the hub portion 74 and is splined, as at 78, to the hub 79 of the agitator 10 which is mounted thereon. A sealing device, generally referred to as 80, embraces the upper end of the shaft 76 and the hub 74 and provides a fluid-tight joint between the shaft and the interior of the tub 8.

The inner part or section of the tub 8 is in the form of a basket 82 which has its lower portion perforated and disposed in substantially parallel relation to the side and bottom walls 70 and 72 of the outer imperforate part of the tub 8. The inner basket is rigidly secured to the side wall 70 by means of a plurality of screws 84 and is held in spaced relation to the outer imperforate wall 70 of the tub 8 by means of the spacing washers 86, or the like, to provide a channel which allows heavy dirt or the like to settle out below the basket so that when the tub 8 is rotated such heavy dirt will be carried between the basket and the outer imperforate wall 70 of the tub over the top of the wall 70 without passing through the clothes contained within the basket 80. The upper portion 88 of the basket 82 is imperforate and extends upwardly and inwardly and terminates in the rolled edge 90 defining an opening 92 disposed in association with the opening in the cover or top panel 20 of the cabinet, whereby the operator is able to gain access to the interior of the rotatable tub 8 when the lid 24 is lifted. The upper portion 88 of the tub 8, by virtue of its inward inclination, serves to restrict the upward movement of clothes or other material contained within the tub 8 when the same is rotated during a drying operation. As will be more clearly apparent as the description proceeds, the upper edge of the outer im-

perforate part of the tub 8 does not define the liquid level in the tub, but, on the other hand, such level is controlled by control mechanism 14, as will be hereinafter more fully described.

The upper imperforate portion 88 of the basket has mounted thereon a hollow toroidal shaped tubular member 94 containing a body of fluid 96 or other mobile material having a relatively high specific gravity, which assembly serves as a balancing ring for a purpose to be hereinafter more fully described. This balancing ring 94 is secured to the upper wall portion 88 by means of a plurality of clips or brackets 98 connected to the wall portion 88 by means of screws, bolts or the like 100. As will be clearly apparent from the drawings, the outside diameter of the balancing ring 94 is less than the diameter of the inner tub 8 in order to position the balancing ring so as not to be engaged by the tub 6 in the event of excessive wobbling or gyratory movement of the inner tub which might otherwise cause damage thereto.

Formed as a part of the bottom wall 72 of the inner receptacle 8 is a gear housing 102 having a cover or closure 104 provided with a downwardly extending hub or hollow supporting member 106 which embraces and is rigidly secured, as by means of pins 108 or the like, to the upper end of a hollow shaft 110 which extends downwardly through the opening 58 of the outer tub 6. The hollow shaft 110 is mounted in a radial and thrust roller bearing 112, which in turn is mounted upon an arched supporting member 114 through suitable supporting means, including the annular resilient bushing 116, whereby a flexible support is provided for the outer shaft 110 and permits tilting of the inner rotatable basket 8 in a manner to be more fully disclosed hereinafter. The channel member 114 has its ends fixed to oppositely disposed angle members 42 of the base structure 4.

Leakage between the outer hollow shaft 110 and the outer tub 6 is prevented by means of the seal or boot 64 formed of resilient and flexible material, such as rubber or the like, which has its lower marginal edge engaged by the shoulder 62 and its upper edge in frictional engagement with the lower end of the supporting hub 106. Adequate pressure is applied to maintain this sealing relation between the seal 64 and the supporting hub 106, which rotates with the tub 8 during a spinning operation, by means of a coil spring 118 having its upper end in engagement with the seal 64 and its lower end in abutting relation with a damper assembly 120.

Disposed within the hollow shaft 110 is an inner drive shaft 122 journaled in the outer shaft by the upper and lower bearings 124 and 126, respectively, which align the inner shaft with respect to the hollow shaft and permit the inner shaft to rotate relative thereto. Splined to the upper end of the inner shaft 122 is a drive pinion 128 which is fixed thereon and is supported upon the outer shaft 110 and the hub 106 by means of the washer 130, whereby the drive shaft 122 is mounted in operative association with, and is supported by, the outer shaft 110. Upon rotation of the shaft 122, the pinion 128 is adapted to oscillate the shaft 76 and the agitator 10 for effecting a washing operation within the tub 8 through oscillating mechanism, generally referred to as 132, disposed within the gear housing 102 and which has a terminal element in the form of a segmental gear meshing with a pinion 134 mounted on the lower end of the shaft 76.

The agitator 10, disposed within the tub 8, is formed with a base or body portion 136 extending downwardly and outwardly from the hub 79 and has one or more blades 138 which extend upwardly and outwardly from the base portion 136 adapted to agitate the liquid within the tub 8 upon oscillation of the agitator for effecting the washing operation. The agitator 10 is further provided with a central post or pedestal 140 extending upwardly from the hub 79 which is formed with an inner chamber or compartment 142 which communicates with the interior of the tub 8 through one or more openings 144. Extending inwardly from the central post or pedestal 140 and into the chamber or compartment 142 there are a plurality of vertically disposed ribs 146 adapted to position a float 148 disposed within said chamber 142 to permit sliding movement thereof axially of the chamber in accordance with the liquid level within the inner tub 8 for operating the control mechanism 14, as will be hereinafter more fully described.

The drive shaft 122 is rotated for oscillating the agitator 10 and for rotating the inner tub 8 by means of the motor 68 mounted in any suitable manner upon the base structure 4. This motor is provided with a drive pulley 150 having a V-shaped peripheral groove for driving a belt 152 which passes around and is received within the V-shaped peripheral groove of a driven pulley 154 of a constant torque friction clutch, generally referred to as 156, which also has a drum member 158 secured to the lower end of the inner shaft 122 whereby the shaft is driven by the pulley 154. The back side of the belt 152 engages and drives a pulley 160 of a centrifugal pump 162 suitably mounted on the base structure 4 which has its intake connected to the drain 54 through the conduit 161 and which is adapted to discharge liquid from the outer tub 6 to drain through the conduit 164.

As previously described in a general way, the material which is introduced into the receptacle 8 is subjected to a washing action through the action of the agitator 10 and is also subjected to a centrifuging action whereby the same is spin dried upon rotation of the tub 8. In order to rapidly rotate the inner tub 8, suitable clutch mechanism is provided for effecting a driving relation between the inner shaft 122 and the outer shaft 110. Such clutch mechanism as herein disclosed comprises an expanding type tapered spring clutch element 166 embracing the shaft 122 and being disposed within the outer hollow shaft 110 adjacent its lower end. The lower end of the spring clutch element is connected to the inner shaft 122 whereby a driving connection is effected therebetween. The upper actuating end of the spring clutch element 166 is arranged to be engaged by a key or projection 168 mounted for axial movement in the slot 169 provided in the outer shaft 110 and controlled by a clutch collar 170. The clutch collar 170 is in turn controlled by a bell-crank lever 172 pivoted to bracket 174 which is connected to brake shoe support 176 of brake mechanism, generally referred to as 178. During the period when the agitator 10 is being operated, the clutch collar 170 is held in an elevated position by means of the bell-crank lever 172, whereby the key or projection 168 is disengaged from the upper operating end of the spring clutch element 166. When the bell-crank lever 172 is tripped, the clutch collar 170 moves downwardly under the action of gravity to position the key 168 in the

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path of movement of the upper operating end of the spring clutch element whereby the said spring clutch element is expanded to frictionally engage the inner wall of the outer shaft 110, at which time a driving connection is effected between the shafts 122 and 110 to rapidly rotate the inner tub 8.

As will be noted, the damper mechanism 120 is provided with a hollow sleeve 180 which surrounds and embraces the outer shaft 110 and has upper and lower journal bearings 182 and 184 mounted coaxially with and journaled on the hollow shaft 110 to provide an annular space between the sleeve 180 and shaft 110 within which the clutch collar 170 is axially movable. The hollow sleeve 180 of the damper mechanism is further provided with an upper and outwardly extending spherical shaped wall 186, to the upper surface of which friction material 188 is connected in any suitable manner, which frictionally engages or mates with a complementary spherical surface formed on the under side of the central crowned portion 56 of the outer tub 6.

The brake shoe support 176 is mounted upon and secured to the lower end of the sleeve 180 of the damper mechanism 120 and is adapted to support a plurality of brake shoes, such as the one indicated at 190, which are normally urged into engagement with the brake drum 192 mounted upon and secured to the lower end of the outer shaft 110, by means of a spring or the like, whereby the outer shaft 110 and the inner tub 8 connected thereto may be brought to rest quickly after a spinning operation. During the time when the inner tub 8 is rotated through the frictional spring clutch connection between the inner shaft 122 and the outer shaft 110, the brake shoes 190 are withdrawn from frictional engagement with the brake drum 192 by means of an operating lever 194 which is controlled by a solenoid 196 incorporated in the control circuit shown in Figure 5 of the drawings. Energization of the solenoid 196 moves the lever 194 to disengage the brake shoes 190 from the drum 192 and simultaneously trips the bell crank lever 172 to permit the clutch collar 170 to move downwardly under the action of gravity whereby the key or projection 168 engages the end of the spring clutch member 166 to effect a driving connection between the inner and outer shafts 122 and 110, respectively. When the solenoid 196 is deenergized, the control lever 194 permits the brake shoes 190 to be spring pressed into frictional engagement with the brake drum 192 and engages the bell-crank lever 172 to move the key 168 out of engagement with the spring clutch member 166. The brake shoe support 176 is flexibly connected through suitable means to the base structure 4 to hold the brake mechanism 178 against torsional movement when the brake is applied, irrespective of the wobbling or gyratory movement of the tub 8 and its associated mechanisms when the same are rotated.

In order to maintain the friction material 188 in effective cooperative relation with the spherical under-surface of the bottom wall 52 of the outer tub 6 and to reduce the amplitude or extent of horizontal movement of the inner tub 8, springs 198 are provided which have one end connected to the brake shoe support 176 and the other end connected to the bottom wall 52 of the outer tub 6 through the brackets 200. While any number of springs may be used, nevertheless, the present illustrative embodiment contemplates the use of four springs, the

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same being disposed 90° apart to position the springs of each pair in opposed relation to one another. Inasmuch as each of these springs extends at an angle to the vertical axis of the sleeve 180, a component of the spring force is applied in a vertical direction to the friction material 188. It will also be apparent that inasmuch as the springs are equally loaded and the springs of each pair are disposed in opposed relation to each other, the spring forces acting through the hollow sleeve 180 will tend to return the tub 8 to its neutral or vertical position where the spring forces are all equal and opposite should the tub 8 tend to move away from its normal vertical position. It is further apparent that the friction material 188 is forced by the springs into effective frictional engagement with the spherical under-surface of the bottom wall 52 of the outer tub and that as the receptacle tends to move in a horizontal plane, a certain portion of the energy is absorbed by the friction material. This friction material, therefore, tends to reduce the amplitude or extent of horizontal movement of the inner tub and absorbs some of the energy applied thereto when the said tub wobbles or moves laterally under eccentric loadings in the tub during a spinning operation.

As will be apparent, the entire spinning structure and associated mechanisms are entirely supported on the resilient bushing 116 and that when the inner tub 8 and its associated mechanisms are rotated during the spinning operation, the assembly will tend to wobble due to unbalanced loadings, with the greatest off-center movement being at the top of the inner tub, inasmuch as the bottom point of support of the bearing 112 is held fixed in place and is only free to tilt in the bushing 116. As the spinning structure is brought up to speed it will pass through the critical speed of oscillation determined by the weight of the spinning structure, including the water and the material within the inner tub and the resiliency of the springs 198. These springs 198 are for the purpose of keeping the spinning structure centered. When the spinning structure passes through its critical speed of rotation there will be a tendency for the amplitude of the wobble or gyratory movement of the spinning structure to increase and this will be dampened out by the damper mechanism 120. In addition to the centering effected by the springs 198 and the action of the damper mechanism 120, the balancing ring 94 which is mounted adjacent the top of the inner tub 8 further assists in preventing too great a shift in the center of gravity of the spinning structure. The balancing ring does not become effective upon acceleration until after the critical speed has been passed, but upon deceleration it is effective through the critical speed of rotation of the spinning structure. Above the critical speed, the spinning structure tends to rotate a new center of mass different from the geometrical center of the tub 8, depending upon the character of the unbalanced load in the tub. This shift in the center of rotation is toward the center of mass of the unbalanced load which causes the fluid in the balancing ring to move in the opposite direction, thereby tending to compensate for this unbalanced load condition.

In addition to the above described structures, the driving means for the agitator embodies the oscillating mechanism 132 located within the housing 102 associated with and forming a part

of the bottom wall 72 of the inner tub, thus providing an additional mass extending laterally of the normal vertical axis of the spinning structure and being spaced a suitable distance above the support point therefor so that such mass is exceedingly effective in correcting any tendency of the inner tub 8 and its contents to wobble or move laterally from its normal vertical position.

Washing fluid is delivered from the thermostatically controlled mixing valve 34 to a conduit which extends upwardly between cabinet 2 and the outer tub 6 and is connected at its upper end in any suitable manner to the inlet spout 202 which extends laterally through an opening in the upper part of the tub 6 and discharges such washing fluid through the opening 92 into the inner tub 8.

The lid 24 for the cabinet is formed with a base section 204 and a cover section 206 to provide a chamber or compartment for a plurality of switch assemblies constituting a part of the control mechanism 14. Each of the sections 204 and 206 is formed with flanges, such as 208, at the marginal edges thereof which are adapted to be disposed in abutting relation to form a unitary lid structure. The top and bottom sections 206 and 204 are formed with inter-engaging lugs 210 and 212, respectively, adjacent the rear edge thereof which are adapted to be brought into wedging relation with one another for holding the wall sections 206 and 204 of the lid together at this point when moved angularly with respect to one another into assembled relation. The top wall section 206 is formed adjacent the front thereof with a recess 214 adapted to receive a handle 216 which can be gripped by the operator for swinging the lid into and out of its closed position. The two wall sections 204 and 206 are held in assembled relation by means of screws 218, or the like, which extend through aligned openings provided in the wall sections and threadedly engage the handle 216 for securing the same within the recess 214. It is apparent that the screws 218 may be readily removed and the wall sections 204 and 206 moved apart for gaining access to the interior compartment formed by these wall sections for repairing, adjusting or replacing any of the switch control assemblies, or any part thereof, mounted therein. The base or lower wall section 204 is provided with apertures 220 and 222 through which certain elements of the control mechanism project for a purpose to be presently described.

The lid 24 is pivotally mounted with respect to the cover or top wall 20 of the cabinet by hinge means 224 constituted by hinge elements connected to the top wall 20 of the cabinet and the bottom wall section 204 of the lid.

As previously described, the float 148 is operated in accordance with the liquid level within the inner tub 8 for operating the control mechanism, generally referred to as 14, which has certain control elements mounted within the lid 24 of the washing machine. The float 148, upon the washing liquid attaining a predetermined height in the tub 8, is adapted to move a control button 226 which extends through the opening 222 in the base section 204 of the lid into the path of movement of the float 148. This control button is secured adjacent one end of a lever 228, which is pivoted at its other end, as at 230, in a bracket 232 secured, as at 234, to the base section 204. A bracket 236 is pivotally mounted on oppositely disposed pivot points, such as 238, on the bracket 232 and provides a support for two control switches 240

and 242 of the mercury type, the said bracket being moved about its pivot points 238 by the lever 228, which is adapted to engage the same when moved by the float 148. The mercury switches 240 and 242 are mounted in the bracket 236 with their longitudinal axes angularly disposed with respect to one another for a purpose to be hereinafter more fully described, and have their contacts 244 and 246 oppositely disposed, as more clearly shown in Figure 5 of the drawings. As shown in Figure 2 of the drawings, the button 226 is in its lowermost position, indicating that the inner tub 8 is empty or that the liquid is at such a level as to be ineffective to raise the float 148. Under such circumstances, the contacts 244 of switch 240 are bridged by the mercury contained in the switch whereas the contacts 246 are not bridged by the mercury in switch 242, which at that time is disposed at the lower end of the switch. However, upon introduction of a washing liquid into the inner tub 8 to a predetermined level, the button 226 is engaged by the float 148 and is raised into engaging relation with the switch bracket 236 causing the said bracket to pivot about its pivot points 238 into the position as shown in Figure 3 of the drawings, whereby the mercury within the switch 240 is moved to the end opposite the contacts 244 to render the switch inoperative and the mercury within the switch 242 is moved to bridge the contacts 246 thereof and to render said switch operative. The results accomplished by angularly disposing the switches 240 and 242 with respect to each other and the operation of the switch in the control circuit, as shown in Figure 5 of the drawings, will be more fully described hereinafter.

Mounted for pivotal movement about the pivot pin 230 and extending downwardly through the opening 220 in the base section 204 of the lid in opposed relation to the center post 140, is a safety shut-off lever 248 having a latch 250. Mounted for pivotal movement about oppositely disposed pivot points provided on the bracket 232, as at 254, is a bracket 256 on which is mounted a safety shut-off switch 258 of the mercury type, held in operative position by means of the inturned end 252 of the latch 250 which engages the shoulder 260 of the bracket 256. The switch 258 is eccentrically mounted with respect to the pivots 254 so that gravity always tends to rotate the switch about the pivots in a downwardly direction and, as will be hereinafter more fully described, is included in the main line circuit and when moved to inoperative position renders the entire electric circuit inoperative to stop the washing machine. The inter-engagement of the inturned end 252 and shoulder 260 is normally maintained by a coil spring 262 connected at one end to the latch 250 and at its other end to the post 264 extending upwardly from the base section 204 of the lid.

The lever 248 extends downwardly below the base section 204 of the lid in opposite and spaced relation to the center post 140 so that when the tub 8 wobbles or gyrates an excessive distance laterally from its normal vertical position due to an unbalanced load condition within the tub 8 during the rotation thereof, the center post 140 engages the lever 248 to move the latch 250 against the action of spring 262, which releases the bracket 256 for downward movement by gravity about the pivot points 254 which renders the switch inoperative, thus breaking the main electric circuit and stopping the entire machine. The switch 258 has its contacts disposed at the end thereof farthest away from the pivot point 224 for

the lid so that the switch is inoperative when the lid is raised, thus deenergizing the entire circuit and making it impossible for the operator to operate the washing machine until the lid is again closed. This arrangement provides a safety device which eliminates any possibilities of injuring the operator during the washing cycle, particularly when the inner tub 8 is rotated at a high rate of speed. The switch 258 is pivoted in such a manner that when the lid is raised, the bracket 256 will automatically swing back into a reset position whereby the returned end 252 of the latch 250 engages the shoulder 260 of the bracket 256 so that when the lid is again closed, the mercury for the switch 258 bridges the contacts thereof and the switch is again in position to act as a safety unbalance shut-off switch should gyratory movement of the inner tub become excessive due to unbalanced loadings. In the event that the latch 250 is tripped due to such unbalanced loadings, all the operator has to do is to open the lid, which automatically resets the safety switch 258. The operator then may redistribute the material within the tub 8 which caused the unbalanced load condition, after which the lid may be moved into its closed position. Upon closing of the lid the main line circuit is again completed and the machine then continues to operate in its normal cycle of operation.

In order to automatically operate the machine hereinabove described, there is provided a control means including a timer motor capable of rotating a plurality of cams for actuating switch means in a predetermined sequence to cause the apparatus to perform its various functions. A control circuit for causing the washing machine to operate automatically is disclosed in Figure 8 of the drawings, the same including a switch 266 which may be mounted in the control device for the circuit and which controls the main circuits L¹ and L². The main circuit includes the timer motor 36, the main driving motor 68, the mixing valve 34, the brake solenoid 196, the float switches 240 and 242, the unbalanced switch 258 and the pilot light 40. The pilot light 40 is directly connected across the lines L¹ and L² and is lighted when the line switch 266 is closed except when the unbalanced switch 258 is rendered inoperative either because of the lid 24 being in open position or because of the disengagement of latch 250 from the shoulder 260 as a result of excessive unbalance or eccentric loads in the receptacle 8 which has caused the center post 140 to engage the lever 248. As will be noted, the unbalanced switch 258 is incorporated in the main line L¹. Other pieces of control mechanism are connected directly to one side of the line through contacts operated by a plurality of cams 268, 270, 272 and 274 which are driven in one direction only by the timer motor 36.

The sequence of operation includes a period during which liquid is introduced into tub 8, a washing period, a spin period during which a flush rinse is applied for a short interval of time to remove soapy water from the clothing and tub, an agitate rinse period, a spin period for spin drying the clothes or material within the tub 8 and a reset or inactive period. As previously described, switches 240, 242 and 258 are disposed within the lid 24. When the tub 8 is empty and the lid 24 is closed, the switch 240 is in its closed position whereas the switch 242 is in its open position. The unbalance switch 258 is also in its closed position. At this

time the brake solenoid 196 is deenergized and the brake shoes 190 are in frictional engagement with the drum 192 whereby the outer shaft 110 and the tub 8 are held stationary. When the line switch 266 is closed and the knob 32 of the control device is moved to initiate a washing cycle, a circuit is completed whereby water from the mixing valve 34 is introduced through the nozzle 202 into the tub 8. The mixing valve 34 is constructed to introduce either warm, hot or medium hot water into the receptacle 8. The control circuit, however, is arranged so that for the washing period only a selection may be made by the operator as to whether warm, hot or medium hot water is to be introduced into the tub 8. The circuits for the introduction of these wash waters can be traced through main line L¹, conductor 276, contacts 244 of switch 240, conductor 278, to one of the contacts 280 of cam 274 (this being common to both cams 272 and 274), the other contact of cam 274 being connected through the conductor 282 to the movable contacts 284 and 286 of the switch for the mixing valve 34. When it is desired to introduce medium hot water into the tub 8 the control knob 32 of the control device for the mixing valve 34 is moved to position the contacts 284 and 286 in engagement with the contacts 288 and 290, respectively, as shown in Figure 8 of the drawings. Accordingly, the circuit for the introduction of medium hot water into tank 8 is completed through the solenoids 292 and 294 of the warm and hot water valves, respectively, and thence through the conductor 296 to the main line L². In the event that it is desired to introduce hot water into the tub 8, the control knob 32 of the control device for the mixing valve 34 is moved to its "hot" position at which time the circuit from cam 274 is completed through the conductor 282, contacts 286 and 298, solenoid 294 of the hot water valve, and thence through conduit 296 to the main line L². In the event that it is desired to introduce warm water into the tub, the control knob 32 of the control device for the mixing valve 34 is moved to its "warm" position, at which time the circuit from cam 274 is completed through conductor 282, contacts 284 and 302, solenoid 292, and thence through the conductor 296 to the main line L². Irrespective of the positioning of the knob 32, the control circuit during the flush and agitate rinse periods is such that warm water only can be introduced into the tub 8. This circuit can be traced from the main line L¹, conductor 276, contacts 244 of switch 240, conductor 278 to contact 280 of the cam 272, the other contact for the cam 272 being connected through conductor 300 to the solenoid 292 and thence by way of conductor 296 to the main line L².

Water is introduced into the tub 8 until such time as a predetermined liquid level is attained, at which time the float 148 rises and contacts the control button 226 which moves the lever arm 228 about its pivot point 230 and at the same time moves the switch bracket 236 about its pivot points 238. This operation causes switch 242 to be energized which immediately completes a circuit for starting the timer motor 36 and the driving motor 68. This circuit may be traced through the main line L¹, conductor 304, contacts 246, conductor 306, conductor 308, conductor 310 to the field winding for the timer motor 36 and thence through the conductors 312 and 314 to the main line L². The circuit for the driving motor 68 is also completed

through the switch 242 in the same manner as the circuit for the timer motor, the conductor 308 being connected by conductor 316 to the field winding for the motor 68 and thence through the conductors 318 and 314 to the main line L². Energization of these motor circuits starts the timer motor to operate whereby the cams rotated thereby take over control of the sequential operation of the machine. The driving motor 68 operates the driving mechanism heretofore described for oscillating the agitator 10, it being understood that at this time the tub 8 and the outer shaft 110 is maintained stationary by the brake shoes as previously described.

Preferably, the switches 240 and 242 in the circuits heretofore described are angularly offset with respect to each other and the volume of mobile conducting fluid contained in the casings therefor is such that the motor circuits through the switch 242 are energized prior to the time when the level of the washing liquid within the tub 8 has attained a predetermined height found desirable for the washing operation, so that agitation of the clothes or other materials within the tub 8 is initiated prior to the time when the mixing valve 34 is closed. It will be apparent that because of the relative angular disposition of the switches 240 and 242 and the volume of mobile conducting material for the switches that a short time after agitation is effected switch 240 is deenergized which shuts off the flow of liquid into tub 8 independently of the operation of the timer motor 36.

As the timer motor continues to operate, the cams 268, 270 and 272 are progressively moved to initiate a spin period during which time liquid is introduced into the tub 8 for a short period of time for flush rinsing the clothes or materials contained therein. At the end of the washing period, motor circuits through the contacts for cam 270 are completed for spinning the tub 8, these circuits being entirely independent of the switches 240 and 242. The circuit for the timer motor may be traced from the main line L² through conductors 314 and 312 to the field winding for the timer motor 36, thence through conductors 310 and 308 to one of the contacts for the control cam 270 and thence through the other contact therefor and conductors 320 and 322 to the main line L¹, thus completing a circuit whereby the timer motor continues to operate and to move its cams through their cycle of operation. The circuit for the drive motor 68 can be traced from the main line L², conductors 314 and 310, through the field winding for the motor 68, conductors 316 and 308 to one contact of the control cam 270 and thence from the other contact for said control cam through conductors 320 and 322 to the main line L¹.

A circuit is also completed at this time for energizing the solenoid 196 to operate lever 194 to release the brake shoes 190 and to permit movement of the bell-crank lever 172 whereby the clutch collar 170 is moved downwardly under the action of gravity to effect an engagement of the key or projection 168 and the operating end of the clutch spring 166. Thus the outer shaft 110 is operatively connected to the inner shaft 122 through the spring clutch element 166 whereby the tub 8 may be rapidly rotated for causing the washing liquid to be discharged from the clothes or material contained

therein. This circuit can be traced from the main line L¹ through conductor 322, through one of the contacts of the control cam 268, through the other contact for the control cam, through conductor 324 to the winding for the solenoid 196 and thence from the said winding through conductor 326 to the main line L².

During this period of spin, cam 272 is moved to complete a circuit whereby warm water is introduced through the nozzle 202 into the tub 8. This circuit may be traced from the main line L¹, conductor 276, contacts 244 of switch 240 (which is in closed position when the tub 8 is empty), conductor 278 to one of the contacts of cam 272, the other contact for the cam 272 being connected by conductor 300 to the solenoid 292 of valve 34 and thence through conductor 296 to the line L², whereby the material and clothes are flush rinsed during the spinning operation.

Water overflowing from the tub 8 during the spinning operation is discharged into the outer tub 6 and flows through the discharge opening 54 and into the intake conduit for the pump 162. This pump, operated through the belt 152, discharges the water extracted from the clothes or other material in the tub 8 through the conduit 164 to drain.

At the end of the spinning period hereinabove described, the circuit for the solenoid 196 is deenergized, thus allowing brake 178 to operate to hold the tub 8 stationary during the agitate rinse period and the timer and drive motors are also deenergized. When the spinning period is terminated, control cam 272 causes a circuit to be completed through switch 240 whereby warm rinse water is introduced into the tub 8 while the tub is at rest. The circuit for the introduction of warm rinse water is the same as the circuit for introducing rinse water during the spinning period. After a predetermined liquid level has been attained in the tub 8, the float 148 engages the button 226 to render the switch 240 inoperative and to actuate switch 242 to complete the circuit as was done during the washing cycle to oscillate the agitator 10.

As the timer motor 36 continues to operate, the operation of agitator 10 is discontinued, at which time the brake solenoid 196 is again energized through the circuit previously described for releasing the brake shoes 190 from the drum 192 and to again permit clutch element 166 to effect a driving connection between the inner shaft 122 and the outer shaft 110 whereby the motor 68 rapidly spins the tub 8 for extracting the rinse water from the clothes or other materials contained in the tub 8. The control circuit for the motor 68 and timer motor 36 at this time are independent of either of the switches 240 or 242 and are traced in the same manner as the circuit heretofore traced for the previous spin period.

At the end of the spin period, continued operation of the timer motor moves the control cams into their reset or inactive position, at which time the drive motor 68 and timer motor 36 are rendered inoperative and the brake solenoid 196 is deenergized whereby the brake shoes 190 engage the brake drum 192 to hold the tub 8 stationary and to recondition the entire control circuit for a repetition of the cyclic operation as hereinabove described.

The unbalanced switch 258 is normally held in operative position by means of latch 250 when the lid 24 is in closed position. This unbalanced

switch is cut into the main line circuit L¹ so that so long as the switch is held in its closed position by the latch 250, the circuits hereinbefore described are sequentially completed for automatically operating the machine. Under most operating conditions, the clothes or other materials within the tub 8 are uniformly distributed to such an extent that no excessive lateral displacement of the tub takes place as the same is brought up to its spinning speed. There are occasions, however, where excessive eccentric loadings occur in the tub which will cause undesirable lateral displacement of the tub as the same is caused to rotate during a spinning period. In that event, the center post 140 engages the lever 248 to disengage latch 250 from the shoulder 260 whereby the switch 258 will drop downwardly by gravity about pivot points 254 thus causing the switch to open and to deenergize the entire control circuit. When this happens, the circuit for the pilot light 40 is broken and the panel 38 is no longer illuminated, thus drawing to the attention of the operator the fact that the machine is no longer operating. Deenergization of the control circuit immediately deenergizes the brake solenoid 196 which causes the brake shoes 190 to immediately engage with the brake drum 192 to bring the tub 8 to a stop. The machine may be put back into operation again merely by the expediency of lifting the cover 24 which causes the switch 258 to pivot about its pivot points 254 so that the latch 250 will engage the shoulder 260. When the lid 24 is again closed the switch 258 completes the control circuit and the machine then continues in its cycle of operation.

It is also to be noted that the unbalanced switch 258 also serves to prevent the operator from contacting any moving parts of the machine during its operation even though the lid is opened during the washing cycle.

In the operation of the washing and drying machine according to the disclosure heretofore presented, the operator opens the lid 24 and places the clothes or other material to be washed into the tub 8 and then pours the proper quantity of detergent into the said tub. The lid is closed and the water temperature is selected by positioning the water selector knob of the control for the mixing valve 34. If medium hot water is desired, the temperature selecting knob on the top of the machine is adjusted to move contacts 284 and 286 into engagement with contacts 288 and 290, respectively, as shown in Figure 5 of the drawings. The timer control knob, also mounted on the top or cover of the cabinet, may be pulled outwardly to close the line switch 266 after which the same is rotated to a position corresponding to the length of time desired for the washing period as shown by indicia on the knob. This is the only manual operation that is required by the operator.

When the timer control knob is turned, cam 274 for the timer is turned to a position whereby water is supplied by the mixing valve 34 to the tub 8 through the nozzle 202. Water continues to flow into the tub 8 until such time as the float 148 rises and engages button 226 to move the switch 242 to closed position, all as hereinbefore explained. This energizes the timer and drive motor circuits whereby the timer starts to operate for rotating the control cams driven thereby to effect a cycle of operation in accordance with the operation of the control circuit. At this time the brake is deenergized so that brake

shoes 190 are in engagement with the brake drum 192 to hold the tub 8 and the outer shaft 110 stationary and, because of the position of the operating lever 194 of the brake mechanism, the bell-crank lever 172 holds the key or projection 168 out of engagement with the operating end of the spring clutch element 166. Accordingly, the motor 68 operating through its belt 152 rotates pulley 154 and through the constant torque slip clutch assembly hereinbefore described, the inner shaft 122 is rotated to oscillate the agitator 10 through the oscillating mechanism disposed within the casing 102. Because of the particular construction of switches 240 and 242 and their relative angular disposition, water will continue to be introduced into the receptacle 8 until a predetermined desired liquid level is attained. This level is determined by optimum washing conditions within the tub 8 and although it has been pointed out that a lag may exist between the time when the switch 242 is energized and switch 240 is deenergized, nevertheless, under certain circumstances it may be desirable to have such energization and deenergization of these switches occur substantially simultaneously which would result in causing agitation to take place in the tub 8 simultaneously with the discontinuance of flow of liquid from the mixing valve 34. Under the conditions of operation assumed in the illustrative embodiment of the invention, water will continue to flow for a short time into the tub 8 although agitation for washing has already started through the operation of switch 242.

After the agitator has been operated to effect a washing operation within the tub 8 for a predetermined length of time, continued rotation of the control cams 268 and 270 completes circuits for spinning the tub for a predetermined length of time, during which time water is introduced through the mixing valve 34 to flush rinse the clothes or material contained therein. One of such circuits is controlled by cam 268 and includes the solenoid 196, as previously traced, which energizes the same to release the brake shoes 190 from drum 192 and at the same time causes the lever 194 to disengage the bell-crank lever 172 whereby the collar 170 drops to permit key 168 to engage with the operating end of the spring clutch element 166. The other of the circuits is controlled by the cam 270 and includes the motor 68. This circuit is independent of switches 240 and 242. The motor 68, accordingly, continues to operate to drive the outer shaft 110 from the inner shaft 122 through the clutch element 166. Such rotation of the outer shaft 110 causes the entire tub assembly connected thereto to rotate while the agitator 10 is maintained stationary with respect to the tub.

Due to the fact that the agitator and the tub 8 with the water and material therein have relatively high inertia, the initial torque or load of the driving motor will be very high. Because of this initial load, the operating mechanism herein disclosed embodies the constant torque slip clutch associated with the pulley 154 which operates to permit the motor 68 to gradually bring the tub up to full operating speed without overloading the motor. As the motor comes up to speed, and the speed of rotation of the tub 8 increases, the water therein is forced up along the side wall 70 and is discharged over the upper edge of the tub into the bottom of the stationary tub 6 where the same is discharged through the outlet 84 to drain.

The provision of maintaining water in the tub 8 during the first part of the spin period is important because it tends to maintain the tub 8 in a balanced condition at this time. Thus, for example, if the material is not equally or uniformly distributed about the tub, as will be more common in the majority of cases, the tub, as it is brought up to its operating speed of rotation, will move in a horizontal plane or wobble about its vertical axis and may, under certain conditions, be moved laterally to the extent where the same strikes the outer stationary tub 6 which may either cause damage thereto or prevent the tub 8 from accelerating to its normal operating speed of rotation. In other words, it would be very unlikely that the tub could be rotated through its critical speed. By maintaining the water within the tub 8, uneven distribution of the material becomes unimportant as the weight of the water will maintain the tub in a substantially perfect balance at this time. As the tub picks up speed it passes through a critical period of oscillation determined by the weight of the tub, the water and the material disposed therein, and the resiliency of the springs 198. The supporting springs 198 are for the purpose of keeping the tub centered and when the tub passes through its critical speed, there will be a tendency for the amplitude of the gyratory movement thereof to increase. Accordingly, it is necessary to provide means for dampening out such gyratory movement. This is effected by the stabilizing and damping assembly 120 mounted in association with the hollow shaft 110. As the spinning tub wobbles due to its out of balance condition, the hollow member 180 will move with the hollow shaft 110 thus causing the spherical surface provided on the friction material 188 to be moved over the spherical under-surface of the center portion 56 of the tub 6. The contacting surfaces of the friction material 188 and the central portion 56 of the tub 6 being spherical, allow even and continuous contact between the same while the hollow member 180 is wobbling due to unbalanced loads in the tub 8.

In addition to the stabilizing effect of the damper mechanism 120 and the springs 198, the oscillating mechanism for the agitator has been located within the housing 102 associated with the bottom wall 72 of the tub 8 to provide a substantial mass located a considerable distance above the bearing support 112 which is utilized as a stabilizing mass to aid in the balancing of the tub and its contents during the period when the same is rapidly rotated. In addition to the location of such a stabilizing mass at an effective distance from the support 112, a still further balancing device in the form of the hollow toroidal shaped member 94 is provided and rigidly fastened to the tub 8 adjacent the top thereof. This balancing ring is partially filled with a heavy liquid and, if so desired, by steel wool or the like for dampening the flow of liquid therein. The balancing ring is placed near the top of the tub 8 so that it will be most effective for each unit of weight of liquid provided inside the ring. The balancing device does not become effective on acceleration of the tub 8 until after the critical speed has been passed, but upon deceleration is effective through the critical speed of rotation. Above the critical speed the tub and its contents tend to rotate about a new center of gravity which is different from the geometrical center of the tub depending upon the unbalanced load therein. This shift in the center of rotation is toward the

center of mass of the unbalanced load which causes the fluid in the hollow toroidal shaped member to move in the opposite direction, thereby tending to compensate for this unbalanced load condition. Due to the fact that under normal conditions there is water within the inner tub when the same starts to spin, this mass of water restricts the degree of wobble which might be caused by an unequal distribution of material. By properly selecting the springs 198 and the amount of friction created between the surfaces of the friction material 188 and the surface of the center portion 56 of the stationary tub 6, as well as the mass of the tub 8 and the oscillating mechanism within the housing 102, the critical speed is held low enough so that there is still a large quantity of water within the tub 8 as it passes through its critical speed of rotation. This acts as a means for balancing the unbalanced load up to and through the critical speed of rotation of the tub, after which the balancing ring becomes effective to maintain the tub in its normally vertical position. The critical speed is low enough so that when the tub reaches such speed, very little water in the tub has been thrown out of the same and as the tub is rotated past its critical speed, water is then finally thrown out of the tub and out of the material contained therein but at these speeds the balancing ring has taken over and once the balancing ring is activated above critical speed, it will tend to maintain the tub in substantially its vertical position as the same decelerates through and below its critical speed of rotation.

The lever 248 is so positioned with respect to the center support 140 that the same will be engaged thereby to break the main line circuit so that the tub will come to rest should the tub wobble or gyrate laterally due to unbalanced loads beyond a predetermined safe limit. This prevents such lateral displacement of the tub 8 as would cause damage thereto or prevent the same from being accelerated through its critical speed of rotation. If the tub is brought to rest under such conditions, the operator need only to open lid 24 to automatically reset the switch 258, redistribute the material within the tub 8 and again close the lid, at which time the machine will continue in its cycle of operation.

During the spinning operation hereinabove described, warm water is introduced into the tub 8 through the mixing valve 34 to flush rinse the clothes therein, the circuit for the operation of the mixing valve 34 being completed through the switch 240, as hereinbefore described. It is at this time that fresh water is admitted to the rotating tub to remove a relatively high percentage of the soap remaining in the clothes after washing. This rinse water is discharged over the upper edge of the tub 8 into the tub 6 and then to drain by means of the pump 162.

At the termination of the spinning period, cam 268 causes deenergization of the solenoid circuit whereby the clutch element 166 is rendered inoperative and brake shoes 190 are set to bring the tub 8 to a stop. The inner shaft 122 is then free to be rotated independently of the outer shaft 110.

Simultaneously with the above operation, warm water is introduced into the tub 8 from the mixing valve 34. Water for this rinsing operation is introduced into the tub 8 until the float 148 is actuated to render switch 240 inoperative and to actuate switch 242. Actuation of switch 242 energizes the circuit, as previously de-

scribed, to operate timer motor 36 and drive motor 68 and to cause the agitator 10 to be oscillated whereby the clothes or other materials within the tub 8 are thoroughly agitated for a brief period of time. Continued operation of the timer motor 36 positions cams 268 and 270 to complete circuits including the solenoid 196 and the motor 68 independently of the switches 240 and 242, as hereinbefore described, whereby the outer shaft 110 driven by the inner shaft 122 through the clutch element 166 and the tub 8 are gradually brought up to spinning speed to permit the material within the tub to be centrifuged until a large portion of the moisture has been removed therefrom. This completes the washing cycle after which the timer is moved into its reset or inactive position to deenergize the control circuit and to bring the tub 8 to rest. The lid 24 may then be raised by the operator to remove clothes or other materials from the tub 8. During this cycle of operation the material which was placed in the tub is subjected to a washing operation, a centrifuging action to remove water therefrom, a flush rinse to remove soapy water therefrom during rotation of the tub, a rinse followed by agitation, and finally a centrifuging action to remove a large percentage of water therefrom.

While the illustrative embodiment of the invention has been described in connection with a control circuit for operating the washing machine in a cycle of operation determined by the control cams of the timer motor, nevertheless, it will be clearly appreciated that it is possible to use the control device for the timer motor in such a way as to manually position the control cams for operating the various mechanisms incorporated in the machine. Furthermore, if so desired, the machine can be very readily made to operate semi-automatically.

While we 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 of the invention.

It is claimed:

1. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate lateral movement thereof during rotation, a movable lid for said container, control means rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, means operable when said lid is in its closed position for rendering said control means inoperative upon lateral movement of said container beyond a predetermined limit, and means effective upon movement of said lid into its open position for automatically rendering said control means operative to control said means for rotating said container when said lid is again moved into its closed position.

2. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate lateral movement thereof during rotation, a movable lid for said container, means including a resettable de-

vice rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, means associated with said container for operating said device to render said control means inoperative upon lateral movement of said container beyond a predetermined limit, and means effective upon movement of said lid into its open position for resetting said device to render said control means operative to control said means for rotating said container when said lid is again moved into its closed position.

3. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate tilting movement thereof during rotation, a movable lid for said container, circuit means including a resettable switch rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, means associated with said container for operating said switch to render said circuit means inoperative upon tilting of said container beyond a predetermined limit, and means effective upon movement of said lid into its open position for resetting said switch to render said control means operative to control said means for rotating said container when said lid is again moved into its closed position.

4. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate tilting movement thereof during rotation, a movable lid for said container, means including a control device carried by said lid and rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, said control device having means operable by said container when said lid is in its closed position for rendering said control means inoperative upon tilting of said container beyond a predetermined limit, and said control device having means effective upon movement of said lid into its open position for automatically rendering said control means operative to control said means for rotating said container when said lid is again moved into its closed position.

5. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate lateral movement thereof during rotation, a movable lid for said container, means including a resettable device carried by said lid and rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, releasable means for normally positioning said resettable device for rendering said control means operative when said lid is in its closed position, and means operated by said container for releasing said resettable device to render said control means inoperative upon lateral movement of said container beyond a predetermined limit, said releasable means and device being operable upon movement of said lid into its open position whereby said resettable device is held in its nor-

mal position for rendering said control means operative when said lid is again moved into its closed position.

6. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate lateral movement thereof during rotation, a movable lid for said container, circuit means including a resettable switch carried by said lid and rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, releasable means for normally positioning said resettable switch for rendering said circuit means operative when said lid is in its closed position, and means associated with said container for releasing said switch to render said circuit means inoperative upon lateral movement of said container beyond a predetermined limit, said switch and positioning means being operable upon movement of said lid into its open position whereby said switch is held in its normal position for automatically rendering said control circuit operative when said lid is again moved into its closed position.

7. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate lateral movement thereof during rotation, a movable lid for said container, means including a control device carried by said lid and rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, said container having a center post, said control device having means carried by said lid disposed in opposed relation to said center post when said lid is in its closed position and being engageable by said center post for rendering said control means inoperative upon lateral movement of said container beyond a predetermined limit, and said control device having means effective upon movement of said lid into its open position for automatically rendering said control means operative to control said means for rotating said container when said lid is again moved into its closed position.

8. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate tilting movement thereof during rotation, a movable lid for said container, means including a resettable device carried by said lid and rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, said container having a center post, releasable means for normally positioning said resettable device for rendering said control means operative when said lid is in its closed position, and means carried by said lid disposed in opposed relation to said center post when said lid is in its closed position and being engageable by said center post for releasing said resettable device to render said control means inoperative upon tilting of said container beyond a predetermined limit, said releasable means and device being operable upon move-

ment of said lid into its open position whereby said resettable device is held in its normal position for rendering said control means operative when said lid is again moved into its closed position.

9. In a device for centrifuging material, the combination of a container adapted to receive material therein, means for rotating said container to extract liquid from the material contained therein, means providing a support for said container and to accommodate tilting movement thereof during rotation, a movable lid for said container, circuit means including a resettable switch carried by said lid rendered inoperative upon movement of said lid to open position whereby said first named means is rendered inoperative to rotate said container, said container having a center post, releasable means for normally positioning said resettable switch for rendering said circuit means operative when said lid is in its closed position, said releasable means being carried by said lid and depending therefrom in opposed relation to said center post and being engageable thereby to render said circuit means inoperative upon tilting of said container beyond a predetermined limit, said switch and positioning means being operable upon movement of said lid into its open position whereby said switch is held in its normal position for automatically rendering said control circuit operative when said lid is again moved into its closed position.

10. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, means providing a support for said tub and to accommodate tilting movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, control means rendered inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and means operable when said lid is in its closed position for rendering said control means inoperative upon tilting of said tub beyond a predetermined limit during rotation thereof, said last named means being resettable upon movement of said lid into its open position for rendering said control means operative to control said means for rotating said tub when said lid is again moved into its closed position.

11. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a center support disposed within said tub, means providing a support for said tub and to accommodate lateral movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, control means rendered inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and means operated by said center support when said lid is in its closed position for rendering said control means inoperative upon lateral movement of said tub beyond a predetermined limit during rotation thereof, said last named means being resettable upon movement of said lid into its open position for automatically rendering said control means operative to control said means for rotating said tub when said lid is again moved into its closed position.

12. In a washing machine, the combination of

a tub adapted to receive liquid and material to be washed therein, a center support disposed within said tub, means providing a support for said tub and to accommodate tilting movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, means including a timer for controlling a washing cycle including the operation of said second named means to effect a washing operation and for rotating said tub, said last named means including means for rendering said control means inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, a float carried by said center support and operated by the liquid in said tub, means operated by said float when a predetermined liquid level has been reached in said tub for initiating operation of said timer, and means operated by said center support when said lid is in its closed position for rendering said timer inoperative upon tilting of said tub beyond a predetermined limit during rotation thereof, said last named means being resettable upon movement of said lid into its open position for automatically rendering said timer operative to control said means for rotating said tub when said lid is again moved into its closed position.

13. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a center support disposed within said tub, means providing a support for said tub and to accommodate tilting movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, an electrical circuit for controlling the operation of said second named means, said circuit including a switch movably mounted on said lid rendered inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and means for positioning said switch to render said circuit operative when said lid is in its closed position and being engageable by said center support upon tilting of said tub beyond a predetermined limit during rotation thereof for releasing said switch to render said circuit inoperative, said switch being reset by said positioning means upon movement of said lid into its open position to render said circuit operative to control said means for rotating said tub when said lid is again moved into its closed position.

14. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a washing device having a center support disposed within said tub, means providing a support for said tub and to accommodate lateral movement thereof, means for operating said washing device to effect a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, an electrical circuit for controlling the operation of said second named means, said circuit including a switch movably mounted on said lid rendered inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and means for positioning said switch to render said circuit operative when said lid is in its closed position and being engageable by said center support upon lateral movement of said tub be-

yond a predetermined limit during rotation thereof for releasing said switch to render said circuit inoperative, said switch being reset by said positioning means upon movement of said lid into its open position to automatically render said circuit operative to control said means for rotating said tub when said lid is again moved into its closed position.

15. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a washing device having a center support disposed within said tub, means providing a support for said tub and to accommodate tilting movement thereof, means for operating said washing device to effect a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, means including a timer for controlling a washing cycle including the operation of said second named means to effect a washing operation and for rotating said tub, said last named means including means for rendering said control means inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, a float carried by said center support and operated by the liquid in said tub, means carried by said lid and operated by said float when a predetermined liquid level has been reached in said tub for initiating operation of said timer, and means carried by said lid and operated by said center support when said lid is in its closed position for rendering said timer inoperative upon tilting of said tub beyond a predetermined limit during rotation thereof, said last named means being resettable upon movement of said lid into its open position for automatically rendering said timer operative to control said means for rotating said tub when said lid is again moved into its closed position.

16. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a center support disposed within said tub, means providing a support for said tub and to accommodate lateral movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, means including a timer for controlling a washing cycle including the operation of said second named means to effect a washing operation and for rotating said tub, said last named means including means for rendering said control means inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, a float carried by said center support and operated by the liquid in said tub, means operated by said float when a predetermined liquid level has been reached in said tub for initiating operation of said timer, means operated by said center support when said lid is in its closed position for rendering said timer inoperative upon lateral movement of said tub beyond a predetermined limit during rotation thereof, said last named means being resettable upon movement of said lid into its open position for rendering said timer operative to control said means for rotating said tub when the lid is again moved into its closed position, and brake means rendered operative to stop rotation of said tub when said timer is inoperative.

17. In a washing machine, the combination of a tub adapted to receive liquid and material to

be washed therein, means providing a support for said tub and to accommodate tilting movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, means including a movable control member carried by said lid rendered inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and latch means releasably holding said control member in position to render said control means operative when said lid is in its closed position and being operable upon tilting of said tub beyond a predetermined limit during rotation thereof to release said control member to render said control means inoperative, said latch means being operable to automatically reset said control member upon movement of said lid into its open position to render said control means operative for rotating said tub when said lid is again moved into its closed position.

18. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, means providing a support for said tub and to accommodate tilting movement thereof, means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, electrical means for controlling the operation of said second named means including a switch pivotally mounted in an unbalanced condition for free movement into a position to render said electrical means inoperative, said switch rendering said electrical means inoperative upon movement of said lid to open position whereby said second named means is rendered inoperative to rotate said tub, and latch means releasably holding said switch in position to render said electrical means operative when said lid is in its closed position and being operable upon tilting of said tub beyond a predetermined limit during rotation thereof to release said switch for movement thereof into a position to render said electrical means inoperative, said latch means being operable to reset said switch upon movement of said lid into its open position to automatically render said electrical means operative for rotating said tub when said lid is again moved into its closed position.

19. In a washing machine, the combination of a vertically mounted rotatable tub adapted to receive liquid and material to be washed therein, a lower support for said tub, driving means for effecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a stationary casing surrounding said tub, a movable lid for said tub pivoted to said casing, control means for controlling the operation of said drive means in a timed sequence, said control means including a switch rendered inoperative upon movement of said lid to open position whereby said drive means is rendered inoperative to rotate said tub, and reset mechanism for normally holding said switch closed when said lid is in its closed position but operable upon excessive unbalanced loading of said tub during rotation thereof to open said switch to render said control means inactive, said reset mechanism and switch being returned to normal locking relation upon movement of said lid into its open position to render

said control means operative when said lid is again moved into its closed position.

20. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a lower support for said tub to accommodate tilting movement thereof due to unbalanced loading of the material in said tub, driving means for affecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, control means for controlling the operation of said driving means, said control means including a switch rendered inoperative upon movement of said lid to open position whereby said drive means is rendered inoperative to rotate said tub, and reset mechanism for normally holding said switch closed when said lid is in its closed position but operable upon excessive unbalanced loading of said tub during rotation thereof to open said switch to render said control means inactive, said reset mechanism and switch being returned to normal locking relation upon movement of said lid into its open position to render said control means operative when said lid is again moved into its closed position.

21. In a washing machine, the combination of a tub adapted to receive liquid and material to be washed therein, a single lower support for said tub to accommodate tilting movement thereof due to unbalanced loading of the material in said tub, drive means for affecting a washing operation within said tub and for rotating said tub to extract liquid from the material contained therein, a movable lid for said tub, electrical means for controlling the operation of said drive means including a switch pivotally mounted in an unbalanced condition for free movement into a position to render said electrical means inoperative, said switch rendering said electrical means inoperative upon movement of said lid to open position whereby said drive means is rendered inoperative to rotate said tub, and latch means for holding said switch in position to render said electrical means operative when said lid is in its closed position and being operated upon an unbalanced condition of said tub beyond a predetermined limit during rotation thereof to release said switch for movement thereof into a position to render said electrical means inoperative, said latch means being operable to reset said switch upon movement of said lid into its open position to render said electrical means operative for rotating said tub when said lid is again moved into its closed position.

22. In a device for centrifuging material, the combination of a vertically mounted rotatable tub adapted to receive material and liquid to be extracted, a lower support for said tub, driving means for rotating said tub to extract liquid from the material contained therein, a stationary casing surrounding said tub, a movable lid for said tub pivoted to said casing, control means for controlling the operation of said drive means in a timed sequence, said control means including the switch carried by a bracket in said lid and pivotally mounted in an unbalanced condition for free movement into a position to deenergize said drive means, said switch rendering said control means inoperative upon movement of said lid to open position whereby said drive means is rendered inoperative to rotate said tub, latch means engaging said bracket for holding said switch in position to render said control means

operative when said lid is in its closed position, and an abutment projecting from said latch means and being engaged by a portion of said rotatable tub upon an unbalanced load condition during rotation thereof to release the latch and permit said switch to move by gravity to a position to deenergize said drive means, said latch means being operable to re-engage said bracket upon relative movement therebetween when said lid is moved to its open position to render said control means operative for rotating said tub when said lid is again moved into its closed position.

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