

April 26, 1960

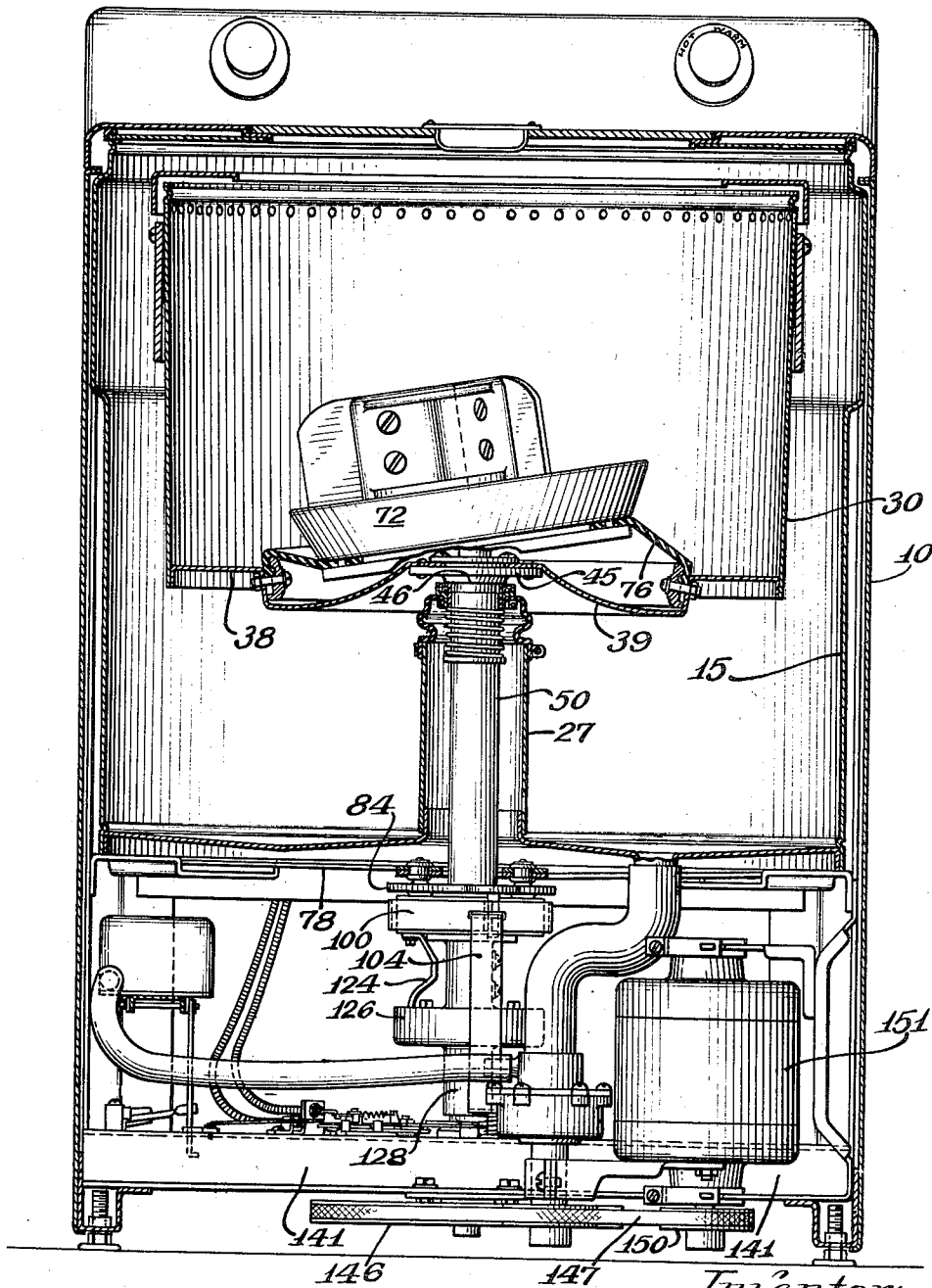
G. C. FIELDS
WASHING MACHINES

2,933,913

Original Filed Feb. 21, 1955

5 Sheets-Sheet 1

FIG. 1.



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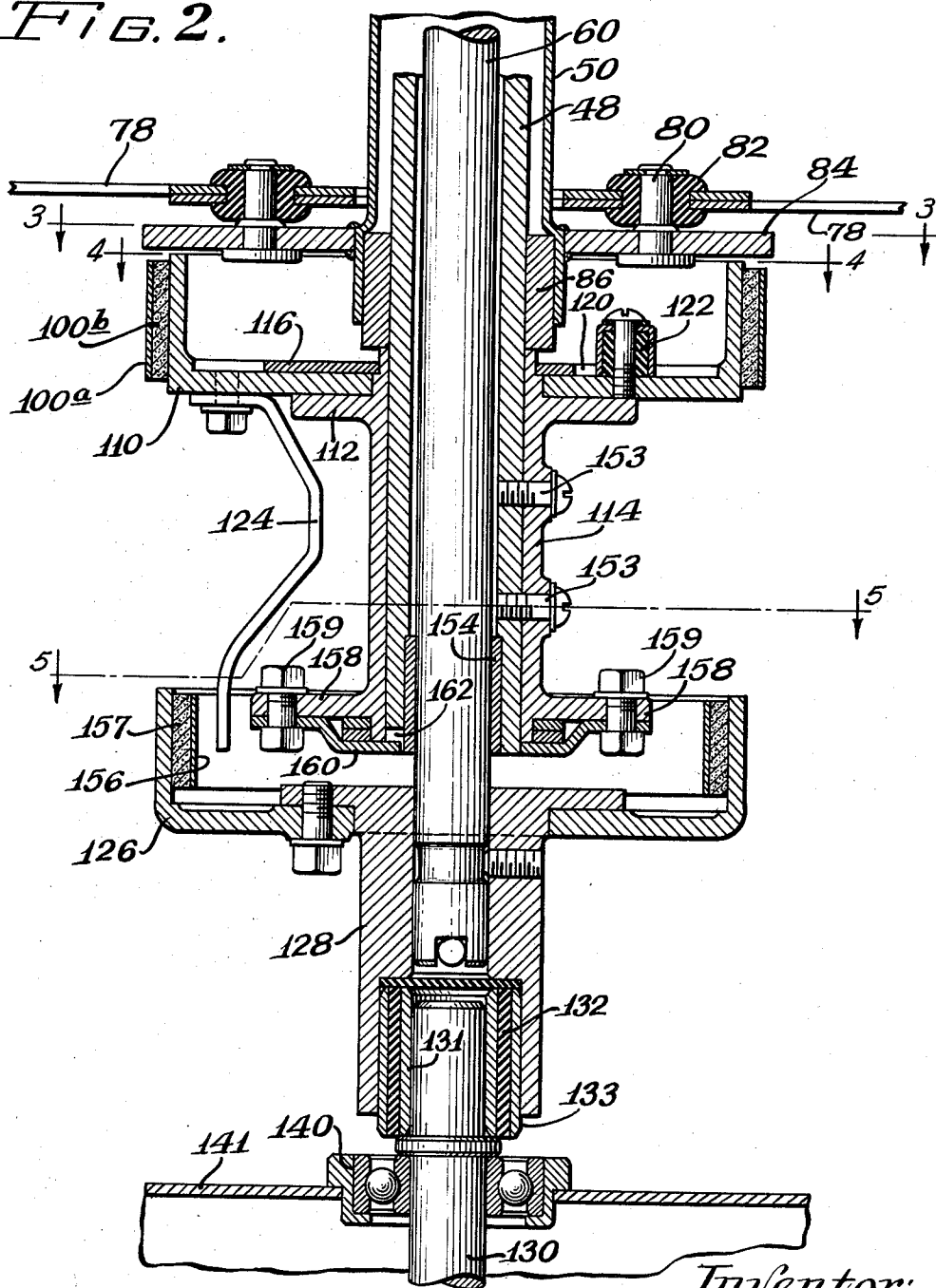
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FIG. 2.



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April 26, 1960

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FIG. 3.

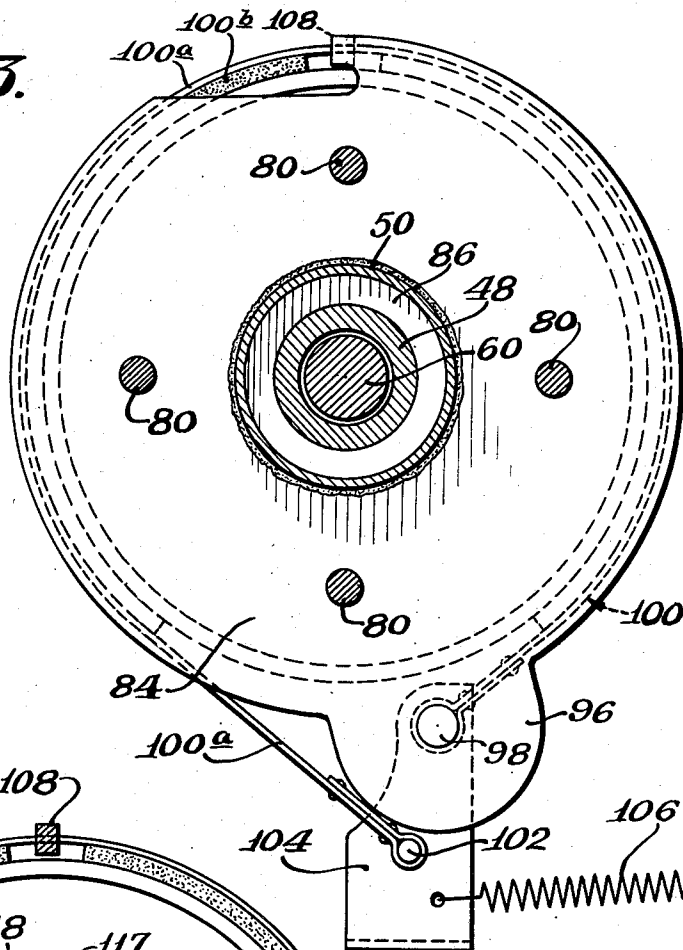
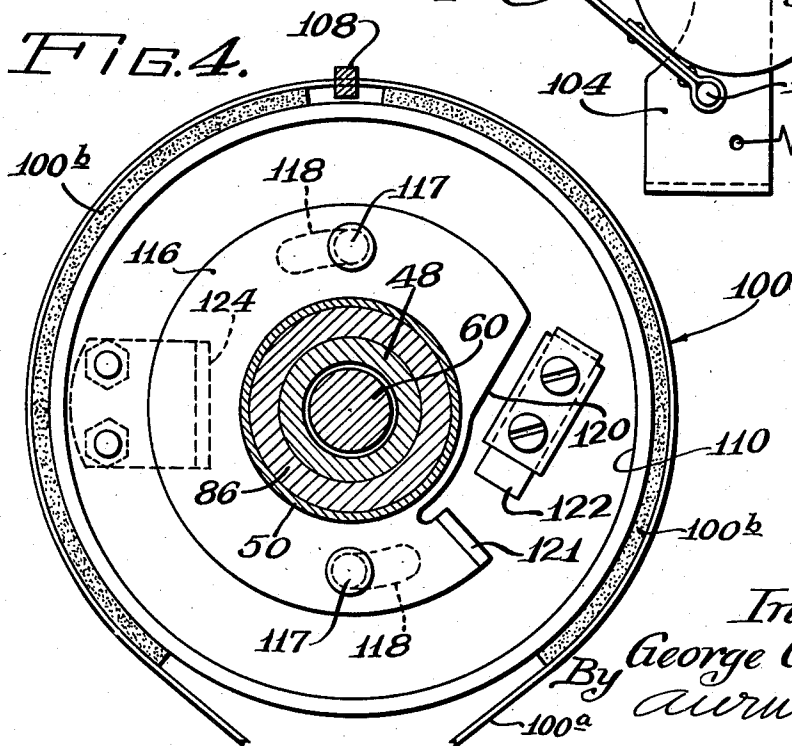


FIG. 4.



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April 26, 1960

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FIG. 5.

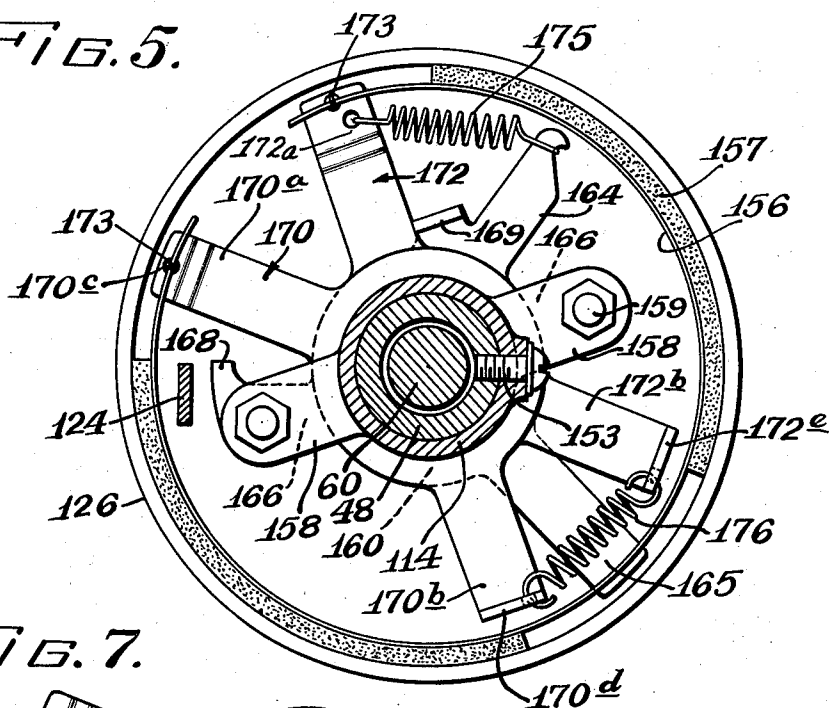


FIG. 7.

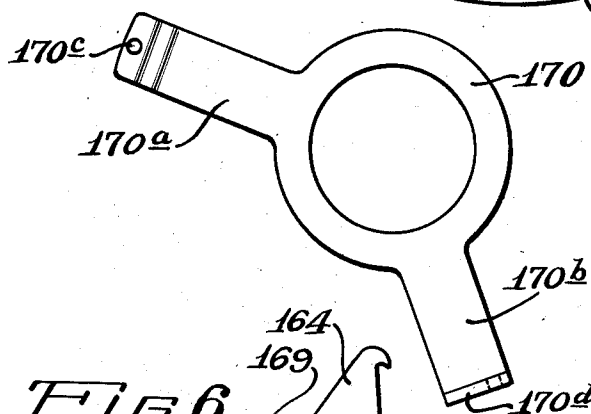
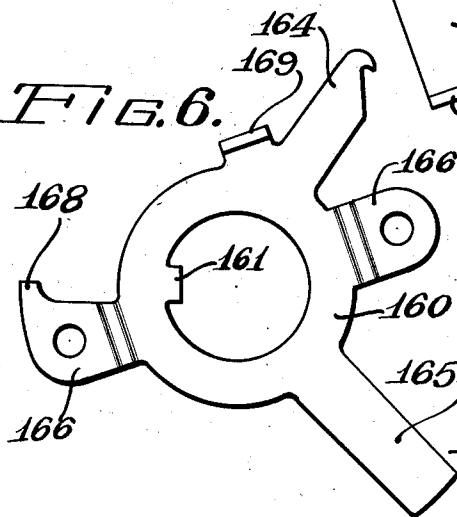


FIG. 6.



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FIG. 9.

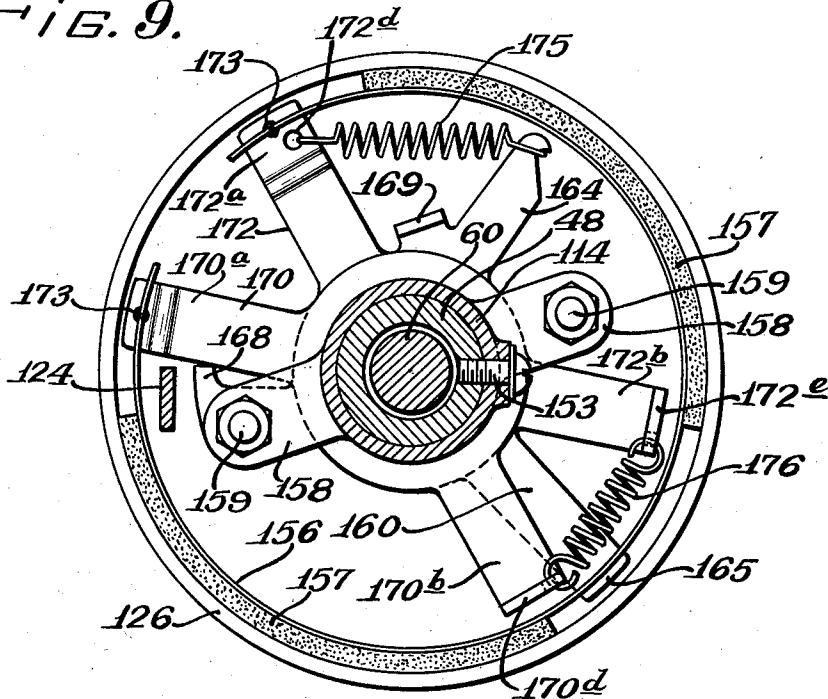
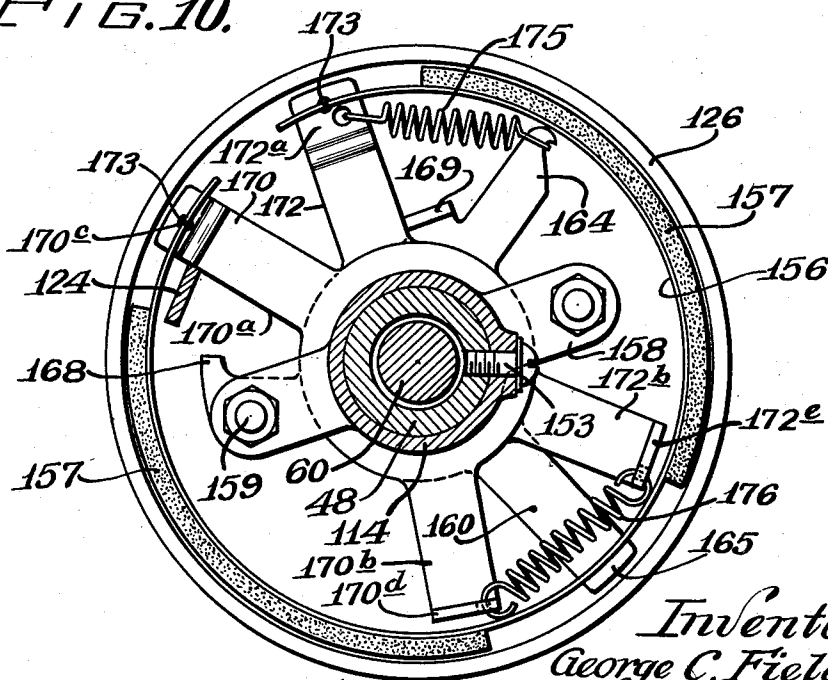


FIG. 10.



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2,933,913

WASHING MACHINES

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Original application February 21, 1955, Serial No. 489,323. Divided and this application June 3, 1959, Serial No. 818,499

10 Claims. (Cl. 68—23)

This application is a division of application Serial No. 489,323, filed February 21, 1955, now abandoned.

This invention relates to clothes washing machines of the type having a clothes tub, supported on a vertical, tubular shaft, and an agitator positioned within the tub and supported on the upper end of a drive shaft rotatable within the tubular shaft; the two shafts being driven by a single motor, with clutch means interposed between the motor and at least one of the shafts.

One of the objects of the present invention is to provide a novel clutch and brake assembly, which is constructed and arranged so as to insure against overloading the motor and which readily permits acceleration of the tub, containing clothes and washing liquid, up to a desired speed of rotation for performing a centrifugal extraction operation.

Another object is to provide a novel clutch construction for controlling the rotation of the tub of the machine, wherein the clutch is arranged so that its torque load, at all times, remains within the range of the torque output of the motor.

A further object is to provide a novel clutch construction adapted for clothes washing machines of the character above indicated, wherein the torque of the clutch remains constant irrespective of the load imposed thereon, or overloading of the machine, or variations in weather conditions.

Still another object is to provide a novel clutch and brake assembly for clothes washing machines of the character indicated, wherein operation of the agitator tends to effect rotation of the tub, and wherein the energy of the tub, while tending to rotate, is utilized, while the brake is applied, to cause the brake to maintain the clutch for driving the tub shaft totally disengaged.

For these purposes the invention advantageously provides novel drive means for such a machine, including a clutch drum rotating with the agitator drive shaft, a clutch band within said drum, clutch band operating means carried on a support rotatable with the tubular tub shaft, and an actuating member adapted incident to rotative movement, imparted to the tub during normal washing operation of the agitator, to actuate the clutch band operating means for disengaging the band from the drum, thereby precluding rotation of the tubular shaft and drum by said clutch.

Other objects and advantages of this invention will be apparent from the following description, taken in connection with the accompanying drawings in which:

Figure 1 is a vertical sectional view through a clothes washing machine embodying the present invention.

Figure 2 is an enlarged, vertical, fragmentary sectional view through the axis of the machine, showing the novel brake and clutch construction embodying the present invention.

Figure 3 is a horizontal sectional view, looking down on the brake unit, taken substantially as indicated at line 3—3 on Figure 2.

Figure 4 is a horizontal sectional view through the

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brake assembly, taken substantially as indicated at line 4—4 on Figure 2.

Figure 5 is a horizontal sectional view, looking down on the clutch assembly, taken substantially as indicated at line 5—5 on Figure 2 and showing the clutch in engaged condition, as for an extracting operation.

Figures 6, 7 and 8 are plan views of three elements of the clutch.

Figure 9 is a view similar to Figure 5, showing the clutch in a different, engaged condition.

Figure 10 is further a view similar to Figure 5, showing the clutch parts in disengaged position, as during a washing operation.

Referring to Figure 1: the machine comprises, within an outer sheet metal cabinet 10, a stationary tub or receptacle 15, and, in the upper portion thereof, a rotatable tub 30, adapted to contain clothes to be washed and centrifuged. This rotatable tub 30 has a bottom 38, a relatively large central portion of which is shown as forming a depressed portion or sump 39.

The rotatable tub 30 is secured to a flange 45 of a mounting member 46 supporting this tub. The mounting member 46 is rigidly attached to an upright, tubular drive shaft 48 (Figure 2), which extends downwardly through a tubular member 50, positioned within a sleeve 27 (Figure 1). Sleeve 27 has a lower end secured to the bottom of stationary tub 15 and member 50 terminates therebelow, on the top surface of a stationary, horizontal plate 84. The tubular drive shaft extends through this plate and is connected to the rotatable tub 30, in order to impart rotation to the same for centrifugal extraction of the washing fluid from the clothes in the tub, as hereinafter described. Tubular members 50 and 27 serve to preclude water from coming into contact with the driving mechanism.

Extending upwardly and substantially concentric within the tubular drive shaft 48 is an agitator drive shaft 60 (Figure 2), the upper end of which is attached to a suitable crank head, not shown, having a portion extending at a slight angle to the axis of this shaft. The crank head is operably connected to an agitator and mounting member structure 72 (Figure 1). In order to seal the driving mechanism from contact by washing fluid within rotatable tub 30, an annular, flexible sealing member 76 is employed.

Stationary plate 84 is suitably secured to structural means 78 by pins 80 seated in rubber grommets 82 (Figure 2). Extending through a central opening in plate 84, and secured thereto, is the lower extremity of tubular member 50, and mounted in said lower extremity of member 50 is a bearing 86 which surrounds and guides the tubular drive shaft 48.

Extending laterally from one edge of stationary plate 84 is a lug 96, as seen in Figure 3, to the underside of which is welded a downwardly extending pivot pin 98. Mounted on said pivot pin 98 is one end of a brake band assembly, indicated generally at 100, and the opposite end of said brake band assembly is attached to an upstanding pin 102, mounted on a top horizontal leg of a brake actuating member 104, which in turn is pivotally mounted on said pin 98. The brake band is normally tensioned by a coil spring 106, connected at one end to the top horizontal leg of the brake actuator 104, the other end being suitably connected to the cabinet structure. Thus it will be seen that plate 84 provides a stationary brake element. Struck out of said element, approximately diametrically opposite the aforementioned lug 96, is a depending lug 108, which straddles the upper edge of the brake band 100, for maintaining said band in proper operating position. The brake band assembly comprises a metal band 100a, the inner surface of which has friction lining segments 100b rigidly attached thereto. These

segments surround a brake drum 110 (Figures 2 and 4), which are concentrically mounted on tubular shaft 48, a web portion of this drum being seated on a flange 112 of a tub driving sleeve member 114, secured to said shaft (Figure 2). Mounted on the inner surface of the web of the brake drum is a plate 116, as seen in Figure 4, and said plate and flange 112, together with the web of the brake drum are interconnected by bolts 117; the web of the brake drum being provided with arcuate slots 118, in such registration with said bolts as to permit a limited amount of rotative movement of the brake drum with respect to plate 116 and the tub driving members.

As may further be seen in Figure 4, plate 116 has a cut-away portion 120. Formed at one end of this cut-away portion is an upwardly extending lug or abutment 121, positioned so as to encounter a rubber bumper 122 which is rigidly attached to the upper portion of the web of the brake drum 110. The purpose of abutment 121 and bumper 122 is to provide a resilient stop, limiting any relative rotary movement of the tub driving member 114 with respect to the brake drum 110, so as to hold the tub against rotation, which movement normally occurs when the tub tends to rotate incident to the performance of the washing action therein, during the time of application of the brake band pressure to the brake drum; such relative movement being accommodated by the arcuate slots 118 in the brake drum as above described.

Bolted to the underside of the brake drum 110 is a depending clutch actuating member 124 (Figures 1 and 2). The clutch assembly is positioned below the brake mechanism and comprises an upwardly open cup-shaped drum 126, having the web portion thereof bolted to a driving hub 128, which hub is secured to the lower portion of the agitator drive shaft 60 (Figure 2) and also surrounds the upper portion of a stub shaft 130, disposed below and aligned with the agitator drive shaft 60 and flexibly coupled thereto by rubber sleeve 132 press-fitted between metal sleeves 131, 133 rigidly secured to said shafts, the latter being press-fitted into an opening in the lower end of the driving member 128. The flexible coupling sleeve 132 permits a limited amount of gyration of the upper part of the machine, including the tub and associated parts, without impairment of the driving connection to the stub shaft 130. The stub shaft is journaled in a bearing 140, which is mounted on the top of the web portion of an inverted channel member 141 (Figures 1, 2) which member is the main support for the entire mechanism within the cabinet 10. Below said channel, the lower end of the stub shaft has rigidly mounted thereon a pulley 146 (Figure 1), around which is trained a drive belt 147, which belt extends around a pulley 150, connected to the drive shaft of the motor 151.

It will be apparent that when the motor is energized, the belt 147 drives the pulley 146, stub shaft 130, driving hub 128 and agitator shaft 60.

The tub driving member 114 (Figure 2) is rigidly secured to the tubular shaft 48 by screws 153. Press-fitted in the lower end of the tubular shaft 48 is a bearing 154, which surrounds and guides the agitator drive shaft 60.

Mounted within the clutch drum 126 as shown in Figure 2 and particularly in Figure 5 is a metal band 156, to the outer surface of which are secured segments of friction lining material 157, adapted to engage the inner peripheral wall of the cup-shaped drum 126 under certain conditions of operation of the machine.

The lower end of the tub driving member 114 (Figure 2) is formed with a pair of laterally extending arms 158 (Figures 2, 5), to which are secured by bolts 159, lugs 166 of a clutch support plate 160 (Figure 6). The clutch support plate 160 is provided with a central aperture for seating over the lower end of the tubular shaft 48, and is provided with an internal key 161, for seating in a

keyway 162, formed in the lower end of the tubular shaft 48 for indexing connection therewith. The support plate 160 is driven with said tubular shaft 48, through its bolted connection to the arms 158 of the tub driving member 114. The clutch support plate 160 is further formed with radially extending arms 164 and 165. Also, one of the lugs 166 is formed with an abutment or stop member 168, as will hereinafter be described. Extending upwardly from plate 160, adjacent arm 164 thereof, is still another lug 169, which functions as a stop member as will hereinafter be described.

Loosely mounted on the lower end of tub driving member 114, and carried on support plate 160 are two clutch band actuating members 170 and 172 (Figures 7 and 8). Member 170 is provided with a pair of radially extending arms 170a and 170b, and member 172 is likewise provided with a pair of radially extending arms 172a and 172b. Arm 170a is provided with an aperture 170c at its outer end, and the outer end of the arm 170b is provided with an upstanding apertured lug 170d. The outer end of arm 172a of member 172 is provided with a pair of apertures 172c and 172d, and the outer end of arm 172b is provided with an upstanding apertured lug 172e. The outer ends of metal clutch band 156, are fitted respectively over the ends of arm 170a on member 170, and of arm 172a on member 172, and are anchored in position by pins 173 in apertures 170c and 172c. Arm 172a of clutch member 172 is interconnected with arm 164 of clutch support plate 160 by a coil spring 175, with one end of said spring being seated over the hooked portion of the outer end of the arm 164, and the other end being hooked through aperture 172d of member 172. Another coil spring 176 interconnects upstanding apertured lugs 170d and 172e of members 170 and 172. Clutch actuating arm 124, depending from the brake drum, has its lower end extending within the clutch assembly between arms 170a, 170b of member 170, and so as not to interfere with lugs 166, one of which is also disposed between said arms.

In operation both the brake and the clutch tend to assume engaged positions, due to forces applied respectively by brake spring 106 (Figure 3) and clutch spring 176 (Figure 5). The agitator driving shaft 60 rotates counterclockwise. Such rotation of shaft 60 causes a well-known wobbling action of agitator 72 (Figure 1) relative to tub 30 when tub 30 is held stationary by disengagement of the clutch and engagement of the brake. The same rotation of same shaft causes coincident rotation of tub 30 and agitator 72 when the clutch is engaged and the brake disengaged.

When the machine initially commences operation shaft 60 (Figure 2) begins to rotate. Action is then taken to allow engagement of the brake and thereby to cause disengagement of the clutch, in order to hold tub 30 against rotation and thus to cause wobbling of agitator 72. At or about this time the brake (Figure 3) is allowed to become engaged, by suitable release of member 104, which until then had been caused by control equipment (shown only in general in the lower part of Figure 1) to counteract the pull of brake spring 106 (Figure 3). The clutch (Figure 5) had been engaged in a previous spinning action; it now becomes disengaged (Figure 10), as follows.

Rotation of shaft 60 tends to move agitator 72, thereby agitating water and fabrics in tub 30, which agitation in turn tends to rotate the tub. Actually, as the brake is being applied, the tub is permitted to move rotatively by a small amount, in response to said action of water and fabrics. Lost motion is for this purpose provided in the web portion of the brake drum by slots 118 and bolts 117 (Figure 4). This limited rotation leads to the engagement of abutment lug 121 on brake plate 116 with rubber bumper 122 on drum 110. In other words, deceleration of the counterclockwise rotation of brake drum 110, by band 100, leads in effect to clockwise rotation of

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said drum relative to shaft 60 and to parts rotating therewith, limited by stop unit 121, 122.

As the brake drum moves through such limited range relative to shaft 60, clutch actuator member 124, depending from said brake drum (Figures 4 and 5), also moves clockwise relative to shaft 60, so that it now engages and moves clutch member 170 in clockwise direction, thereby establishing the position of Figure 10, against the resilient resistance of spring 176. By virtue of this movement of clutch member 170, the clutch band friction lining 157 is now disengaged from the clutch drum 126. The clutch then remains disengaged, as seen in Figure 10, throughout the washing and rinsing operations of the machine.

In order to terminate those operations and to commence an extraction operation, brake actuator 104 is reinserted to release brake band 100 (Figure 4) from engagement with brake drum 110. Clutch member 172 (Figure 10) is substantially stationary at this time, due to the restraint imposed on this member 172 by spring 175 holding the member against lug 169 and thus against stationary tubular shaft 48. However, clutch member 170, which at this moment is in engagement with clutch actuating arm 124, moves said clutch actuating arm in counterclockwise direction as soon as the release of the brake allows this. Simultaneously, this movement of clutch member 170 causes engagement of the friction lining of the clutch band with clutch drum 126; this occurs by way of snap action, which action also arrests further movement of clutch member 170. Momentum has, however, been imparted to arm 124, and this arm now moves out of engagement with clutch member 170 and again attains a position substantially as seen in Figures 5 and 4. As the clutch now is in engagement, rotation is now imparted to driving member 114 for rotating tub 30 through tubular shaft 48.

When the machine is in spinning condition, the various elements of the clutch assume, as mentioned, the relationship shown in Figure 5 of the drawings. At such time the friction lining 157 of the clutch band 156 is in engagement with the clutch drum 126, under the influence of the action of coil spring 176 which by means of arms 170b, 172b, spreads the band-engaging arms 170a, 172a. The other coil spring 175 holds arm 172a of clutch member 172 resiliently against lug 169 of supporting plate 160, thus exerting a predetermined torque load on clutch member 172 so as to limit the torque output of the clutch.

While the clutch is about to assume its load and the tub is being accelerated up to its full speed, clutch members 170, 172 move counterclockwise relative to member 160, 164, under the control of the torque limiting spring 175; clutch member 170 then engages abutment lug 168 of clutch support plate 160; and the parts thus attain the position seen in Figure 9.

When the tub has attained its normal high speed of rotation, that is, substantially the same speed as clutch drum 126, clutch members 170 and 172 again assume a position substantially as seen in Figure 5, with clutch member 172 abutting against stationary lug 169. Any time that the load imposed on the clutch is increased above the normal torque load, the clutch members 170 and 172 tend to accommodate the excess load (which may be occasioned by an out-of-balance load or overload condition in the tub) and at such times clutch members 170 and 172 temporarily assume positions, under the control of the spring 175, intermediate the positions of Figures 5 and 9, such as to limit the torque output of the clutch, thereby precluding excessive torque load on the motor.

The time required for the machine to pass from the condition of Figure 10 through one like that of Figure 9 and into that of Figure 5 depends on a number of variable, such as the initially mentioned weather conditions, as will be understood one consideration of the mode of operation which has been described.

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To summarize: the clutch forming part of the new device is always disengaged when the brake is engaged. The invention utilizes a reaction, set up as a result of a washing action, which action tends to rotate the tub, said reaction being used for effecting disengagement of the clutch, by limited movement of a portion of the brake structure. Incident to this action and reaction the force of the brake spring, applied mainly to restrain the tub from rotation during the period of washing, is additionally used to disengage the clutch. Automatic, efficient and reliable resetting of clutch and brake actuators is also achieved, with the mere use of inexpensive and relatively simple linkage for the utilization of inertial forces and related actions.

While only a single embodiment of the invention has been described, it should be understood that the details thereof are not to be construed as limitative of the invention, except insofar as is consistent with the scope of the following claims.

I claim:

1. In a clothes washing machine having a clothes tub mounted on an upright, rotatable tubular shaft, an agitator positioned within the tub and mounted on an upright drive shaft positioned within the tubular shaft, means for driving the drive shaft, and an electric motor operably connected to said driving means; a tub driving member carried on and rotatable with the tubular shaft, a clutch comprising a drum connected for rotation with said drive shaft, a clutch band within the drum, clutch band operating means carried on the tub driving member, an actuator positioned to control the clutch operating means incident to rotative movement imparted to the tub during normal washing operation of the agitator, for actuating the clutch band operating means for disengaging the band from the drum and thereby precluding rotation of the tubular shaft and drum by said clutch, said clutch band operating means comprising a pair of members having arms connected to the ends of the clutch band, spring means acting on the arms in a direction to effect engagement of the band and drum, and a spring connected to one of said members for limiting the torque output of the clutch, one of said members having a portion positioned to coact with said actuator whereby rotative movement of the tub driving member causes one of said members to engage the actuator and move it relatively to the other and thereby collapses the clutch band with respect to the drum.

2. In a clothes washing machine having an upright drive shaft, an upright, rotatable tubular shaft surrounding the drive shaft, a clothes tub supported on the tubular shaft, an agitator positioned within the tub and supported on the upper end of the drive shaft, and means for operating the drive shaft and actuating the agitator; a tub driving member carried on and rotatable with the tubular shaft, brake mechanism comprising a drum operably associated with and rotatable with the tub driving member, means providing a lost motion connection between the drum and tub driving member, whereby said tub, tubular shaft and tub driving member are permitted to rotate a limited amount, independent of the drum and while the brake is in operative position, incident to rotative movement imparted to the tub and tubular shaft during normal washing operation of the agitator a clutch comprising a drum connected for rotation with the drive shaft, a clutch band within the drum, clutch band operating means carried on the tub driving member, and an actuating member carried on the brake drum and having a portion extending into coacting relation to said clutch band operating means, whereby said limited permissible rotation of the tub driving member, while the brake is in operative position, causes the clutch operating means to disengage the band from the clutch drum.

3. In a clothes washing machine having an upright drive shaft, an upright, rotatable tubular shaft surrounding the drive shaft, a clothes tub supported on the tubular

shaft, an agitator positioned within the tub and supported on the upper end of the drive shaft, and means for operating the drive shaft and actuating the agitator; a tub driving member carried on and rotatable with the tubular shaft, brake mechanism comprising a drum operably associated with and rotatable with the tub driving member, means providing a lost motion connection between the drum and tub driving member, whereby said tub, tubular shaft and tub driving member are permitted to rotate a limited amount, independent of the drum and while the brake is in operative position, incident to rotative movement imparted to the tub and tubular shaft during normal washing operation of the agitator, a clutch comprising a drum connected for rotation with the drive shaft, a clutch band within the drum, clutch band operating means carried on the tub driving member, an actuating member carried on the brake drum and having a portion extending into coacting relation to said clutch band operating means, whereby said limited permissible rotation of the tub driving member, while the brake is in operative position, causes the clutch operating means to disengage the band from the clutch drum, and spring means associated with the clutch band operating means for limiting the torque output of the clutch.

4. In a clothes washing machine having a clothes tub mounted on an upright, rotatable tubular shaft, an agitator positioned within the tub and mounted on an upright drive shaft positioned within the tubular shaft, means for driving the drive shaft, and an electric motor operably connected to said driving means; a tubular driving member fixedly secured on the tubular shaft and having a transverse flange at its upper end, a brake operably connected to said flange and normally engaged during washing actuation of the agitator, said brake comprising a drum seated on said flange, lost motion driving connections between said drum and flange, premitting limited rotative movement of the tub, tubular shaft and driving member incident to normal washing operation of the agitator, a clutch operably connected to the drive shaft, and control means carried by the brake drum and response to said limited rotation of the tub, tubular shaft and driving member for causing disengagement of the clutch.

5. In a clothes washing machine having a clothes tub mounted on an upright, rotatable tubular shaft, an agitator positioned within the tub and mounted on an upright drive shaft positioned within the tubular shaft, means for driving the drive shaft, and an electric motor operably connected to said driving means; a tubular driving member fixedly secured on the tubular shaft and having a transverse flange at its upper and lower ends, a brake operably connected to said upper flange and normally engaged during washing actuation of the agitator, said brake comprising a drum seated on said upper flange, lost motion driving connections between said drum and flange, permitting limited rotative movement of the tub, tubular shaft and driving member incident to normal washing operation of the agitator, a clutch operably connected to the drive shaft, said clutch comprising a drum fixedly secured to said drive shaft and clutch band operating means carried on the lower flange of said driving member, and control means carried by the brake drum and responsive to said limited rotation of the tub, tubular shaft and driving member for actuating said clutch band operating means to disengage the clutch.

6. A clutch comprising a rotatable drum having a friction surface, a band having a friction lining for engaging said friction surface of the drum, a pair of separate clutch members mounted coaxially of the drum, each member having two, spaced apart, laterally extending arms, one of the arms of each member being connected respectively to the ends of said band, a spring interconnecting the other two arms of said two members for tensioning said members and causing the band to move said lining into firm engagement with the friction surface

of the drum, a third clutch member mounted coaxially with the drum and having a laterally extending arm, and a spring interconnecting one of said arms connected to the clutch band and said arm of the third clutch member for determining the torque output of the clutch.

7. A clutch comprising a rotatable drum having a friction surface, a band having a friction lining for engaging said friction surface of the drum, a pair of separate clutch members mounted coaxially of the drum, each member having two, spaced apart, laterally extending arms, one of the arms of each member being connected respectively to the ends of said band, a spring interconnecting the other two arms of said two members for tensioning said members and causing the band to move said lining into firm engagement with the friction surface of the drum, a third clutch member mounted coaxially with the drum and having a laterally extending arm, a driven member mounted coaxially with the drum and connected to said third clutch member, and a spring interconnecting one of said arms connected to the clutch band and said arm of the third clutch member for determining the torque output of the clutch.

8. A clutch comprising a rotatable drum having a friction surface, a band having a friction lining for engaging said friction surface of the drum, a pair of separate clutch members mounted coaxially of the drum, each member having two, spaced apart, laterally extending arms, one of the arms of each member being connected respectively to the ends of said band, a spring interconnecting the other two arms of said two members for tensioning said members and causing the band to move said lining into firm engagement with the friction surface of the drum, a driven member mounted coaxially with the drum, a third clutch member rigidly connected to said driven member and having a laterally extending arm, a spring interconnecting said arm of the third clutch member and one of the arms of one of said other clutch members which is connected to said band, and cooperating abutment features on the third and one of the other clutch members connected to said last mentioned spring means for limiting relative rotational movement of said members in the direction of urgency by said last mentioned spring means.

9. A clutch comprising a rotatable drum having a friction surface, a band having a friction lining for engaging said friction surface of the drum, a pair of separate clutch members mounted coaxially of the drum, each member having two, spaced apart, laterally extending arms, one of the arms of each member being connected respectively to the ends of said band, a spring interconnecting the other two arms of said two members for tensioning said members and causing the band to move said lining into firm engagement with the friction surface of the drum, a driven member mounted coaxially with the drum, a third clutch member rigidly connected to said driven member and having a laterally extending arm, a spring interconnecting said arm of the third clutch member and one of the arms of one of said other clutch members which is connected to said band, and cooperating abutment features on said third and said other clutch member which is not connected to the last mentioned spring means, engageable when the clutch is assuming its full torque output load.

10. A clutch comprising a rotatable drum having a friction surface, a band having a friction lining for engaging said friction surface of the drum, a pair of separate clutch members mounted coaxially of the drum, each member having two, spaced apart, laterally extending arms, one of the arms of each member being connected respectively to the ends of said band, a spring interconnecting the other two arms of said two members for tensioning said members and causing the band to move said lining into firm engagement with the friction surface of the drum, a driven member mounted coaxially with the drum, a third clutch member rigidly connected to

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said driven member and having a laterally extending arm, a spring interconnecting said arm of the third clutch member and one of the arms of one of said other clutch members which is connected to said band, cooperating abutment features on the third and one of the other clutch members connected to said last mentioned spring means for limiting relative rotational movement of said

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members in the direction of urgency by said last mentioned spring means, and cooperating abutment features on said third and said other clutch member which is not connected to the last mentioned spring means, engageable 5 when the clutch is assuming its full torque output load.

No references cited.