

Oct. 19, 1943.

J. B. DYER

2,331,897

DOMESTIC APPLIANCE

Filed Jan. 8, 1940

3 Sheets-Sheet 1

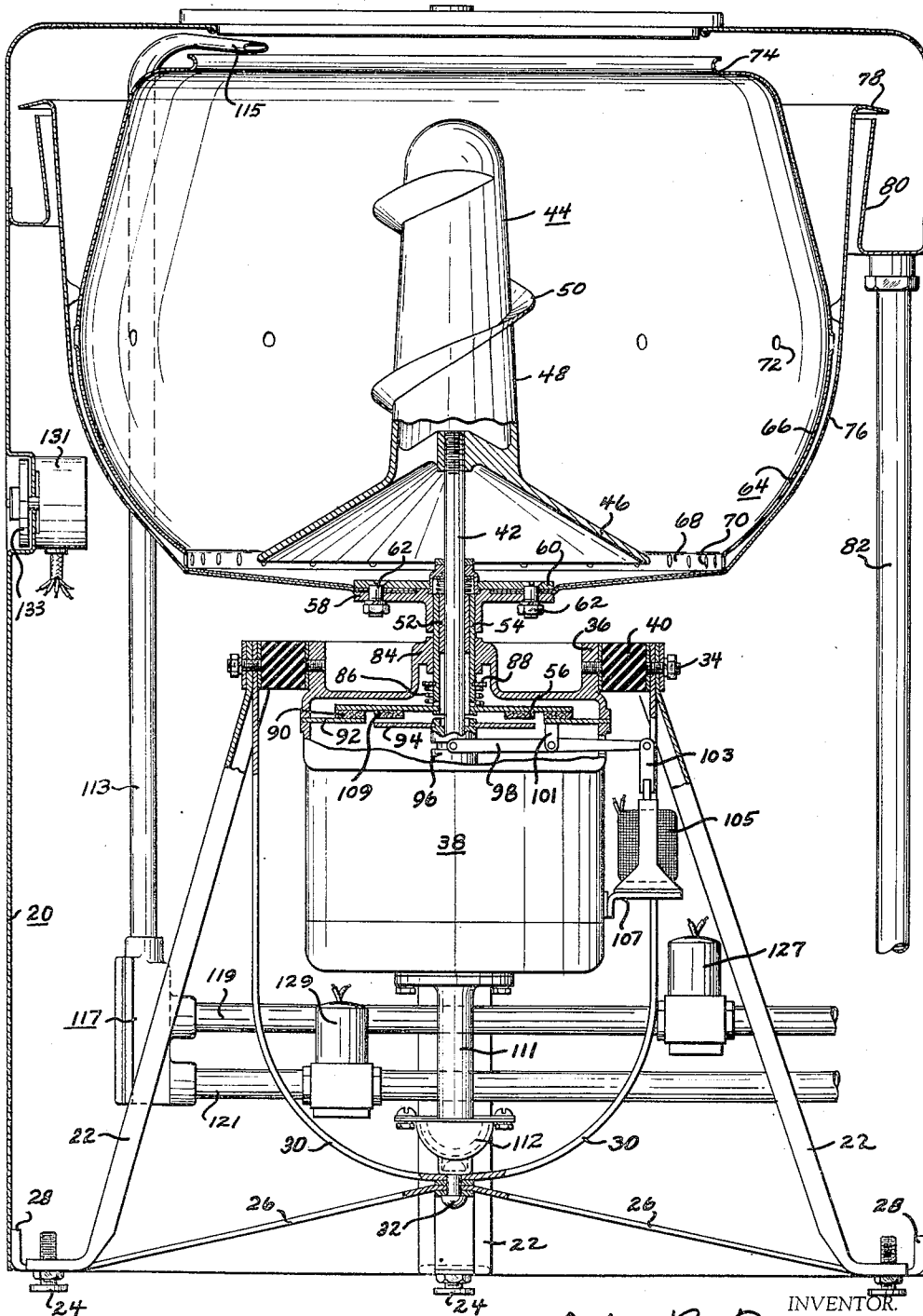


Fig. 1

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3 Sheets-Sheet 2

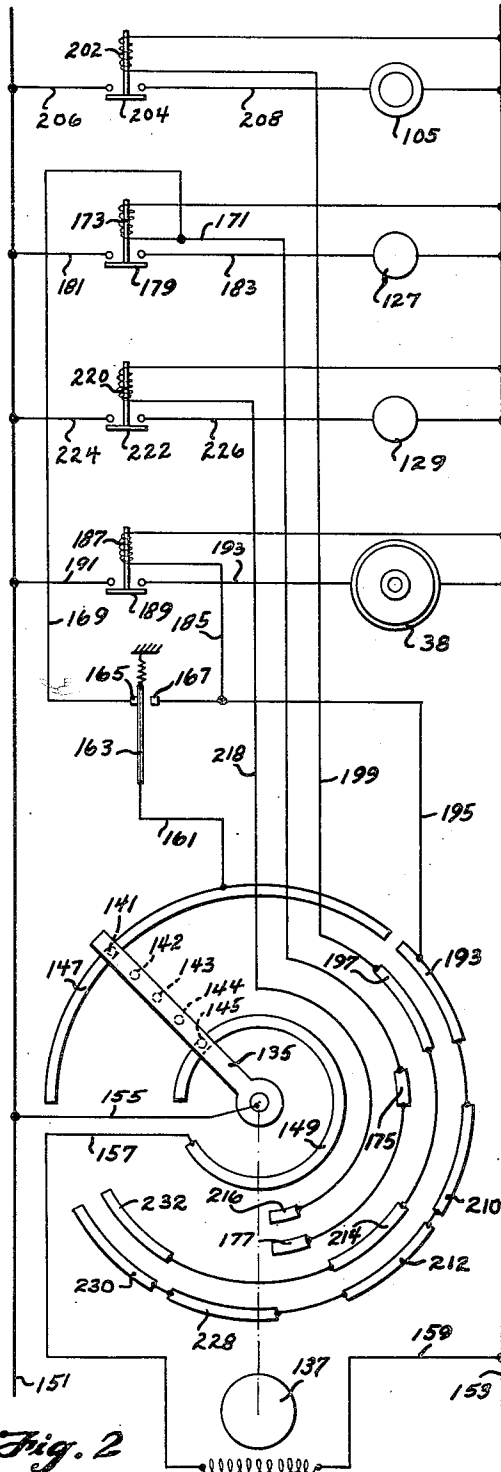


Fig. 2

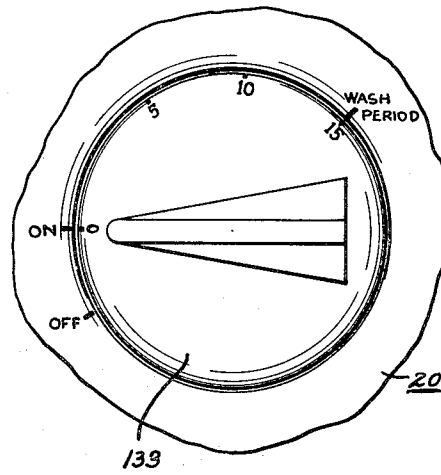


Fig. 3

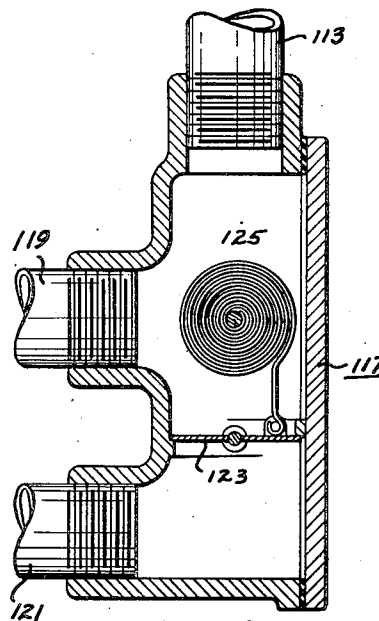


Fig. 4

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3 Sheets-Sheet 3

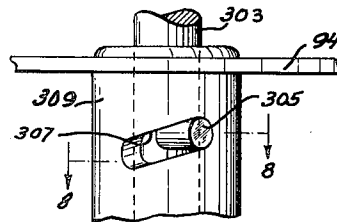
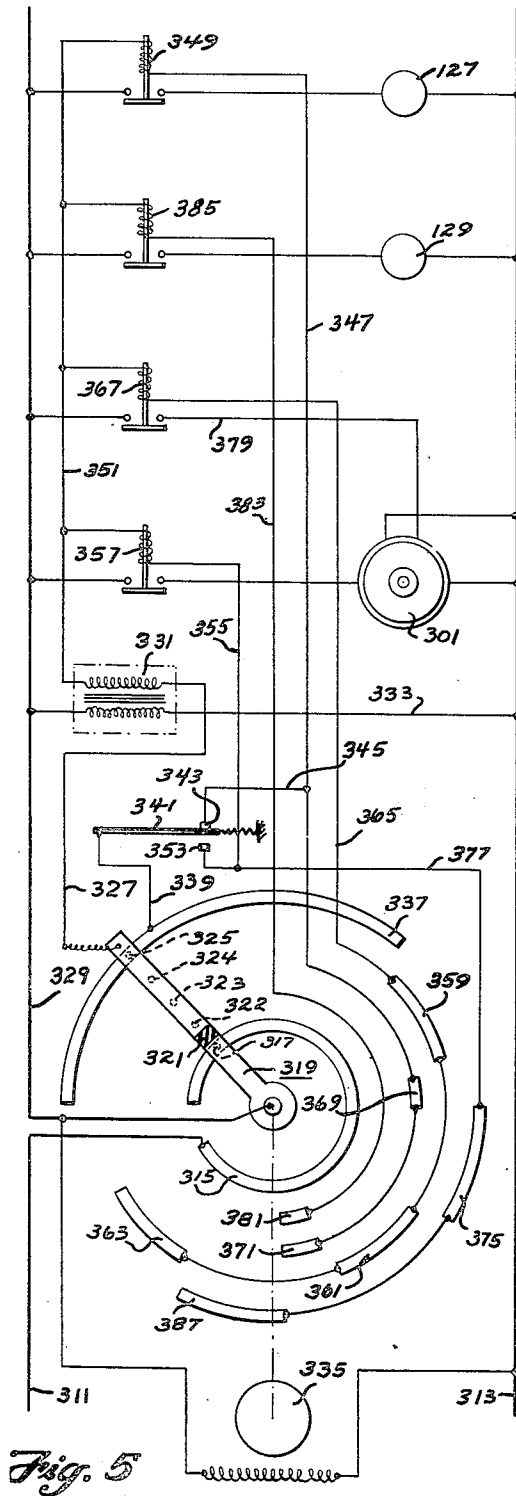


Fig. 6

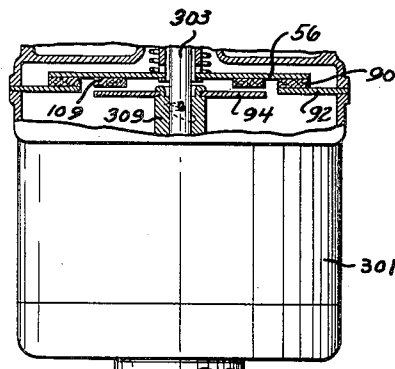


Fig. 7

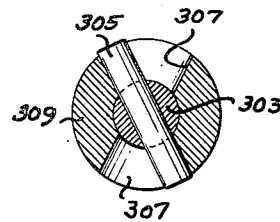


Fig. 8

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UNITED STATES PATENT OFFICE

2,331,897

DOMESTIC APPLIANCE

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Application January 8, 1940, Serial No. 312,837

7 Claims. (Cl. 68—23)

This invention relates to a domestic appliance, and more particularly to washing machines.

Heretofore, in washing machines, the agitating means and the wringing or drying means was operated by an electric motor through relatively complicated gearing or other drive mechanism. This made these washing machines comparatively expensive, somewhat undesirable mechanically, unprofitable to manufacture and difficult to market. Recently, there has been a considerable demand for automatic washing machines. To provide an automatic control mechanism for such already somewhat complicated washing machines, would be quite undesirable and would require a rather complicated control mechanism.

It is an object of my invention to provide a washing machine in which a simple substantially direct drive may be used for both the agitating means and the drying means.

It is another object of my invention to provide in a washing machine a simple, durable, inexpensive means for providing an automatic change from the washing or agitating period to the drying period.

It is another object of my invention to provide a simple, inexpensive, automatic control for the introduction of washing fluid, as well as washing, rinsing and drying in a direct drive washing machine.

It is another object of my invention to provide a simple means to control washing and drying by operating the driving motor in opposite directions.

It is still another object of my invention to provide an automatic direct drive washing machine operating through a means common to both the agitating means, and a centrifugal drying means at motor speed.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical sectional view through a washing machine embodying one form of my invention;

Fig. 2 is a wiring diagram of the automatic control mechanism for the washing machine shown in Fig. 1;

Fig. 3 is a view of the operating knob and dial

for the automatic control mechanism shown in Figs. 1 and 2;

Fig. 4 is a sectional view of the water mixing valve shown in Fig. 1;

Fig. 5 is a wiring diagram for an automatic control of a modified form of washing machine;

Fig. 6 is a form of clutch control for the modified washing machine replacing the clutch control shown in Fig. 1;

Fig. 7 is a view of the driving motor and casing including the modified clutch control shown in Fig. 6; and

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 6.

Brief description

Briefly, I have shown a washing machine provided with a spinning basket containing a rotatable agitating means having a helical vane for agitating the washing fluid and the clothes in the spinning basket during the washing and rinsing periods. The agitating means is connected through the bottom of the basket by a vertical shaft which may be a vertical extension of the motor shaft of an electric motor which is flexibly mounted beneath the spinning basket. The spinning basket is rotatably mounted upon a sleeve surrounding the shaft connecting the motor and the agitator, and this sleeve is provided at its lower end with a movable clutch plate which normally rests in engagement with a braking member. A clutch is also provided upon the motorshaft for lifting the clutch plate from the braking surface and making frictional engagement with the clutch plate to drive the spinning basket for centrifugal drying of the clothes in the basket. An electric control means is provided for controlling the introduction of washing fluid into the basket and for operating the motor and the clutch means. In a modified form, a reversing driving motor is provided which, by reversing, controls the clutch means to provide an agitating period and a spinning period in opposite direction of rotation.

The casing and framework

Referring now to the drawings, and more particularly to Fig. 1, there is shown a washing machine including an ornamental sheet metal casing 20 within which is provided a supporting frame construction which includes four diagonal supports 22, each provided at their lower ends with an adjustable glide 24 for supporting the washing machine upon the floor. The lower ends of the diagonally opposite diagonal sup-

ports 22 are connected by straps 28 having their extreme end portions 28 turned upwardly and fastened to the inner face of the sheet metal casing 20. The upper ends of the diagonally opposite diagonal supports 22 are connected to bowed connecting members 30 which are fastened together by a rivet 32 at the intersection of the members 28. The upper ends of the members 30 are each provided with an aperture which receives a stud 34 at the end of a rubber connecting member 40 extending from the flange 36 at the upper end of the motor casing 38. The rubber connecting member 40 resiliently locates the upper end of the motor mounting of the electric driving motor 38 within the framework provided by the diagonal supports 22 and the connecting members.

The agitator and agitator drive

The rotor of the electric motor 38 is provided with an upwardly extending shaft 42 having a thimble-shaped agitator 44 threaded onto its upper end. This agitator 44 has a wide tapered flange 46 forming a skirt portion and a post portion 48 provided with a spiral vane 50. When this agitator 44 is rotated at motor speed, the water in the tub is churned to wash the clothes.

The tub spinning drive

Surrounding the shaft 42 is a bearing sleeve 52 and surrounding the bearing sleeve 52 is a driving sleeve 54 connected at its lower end to a clutch plate 56 and at its upper end to a flanged connector member 58 which is fastened by means of the plate 60 and the bolts 62 to the bottom of the spinning basket or tub 64.

The tub construction

This spinning basket or tub 64 is provided with an inner basket member 66 which includes an offset bottom portion 68 containing a plurality of drain apertures 70. At the mid portion of the side of the basket member 66 are additional drain apertures 72. The upper portion of the basket member 66 is tapered inwardly and provided with a strengthening flange 74.

Surrounding the basket member 66 is a flume member 76 which joins the basket member 66 at the bottom of the offset portion 68 to make a double thickness of metal which extends between the members 58 and 60 and is clamped therebetween by the bolts 62. The portion of the flume member 76 beneath the apertures 72 is spaced from but closely conforms to the shape of the adjacent portions of the basket member 66. However, the remaining portion of the flume portion 76 tapers outwardly slightly and at its upper edge is provided with an outturned flange 78.

This outturned flange 78 extends over the discharge flume 80 which is provided upon the inside walls of the casing 20. The bottom wall of this discharge flume 80 is provided with a slope, so that it drains to one side where there is located a discharge pipe 82 which extends directly downwardly.

Effect of rotation of agitator and tub

The construction is such that if the agitator 44 is rotated at motor speed and the tub member 64 held stationary, the washing fluid in the tub will be agitated in a doughnut-shaped path. When the tub 64 is rotated, the washing fluid will be pumped out of the flume member 76 and thrown over its flange 78 into the discharge flume

80, from which the washing fluid will be drained by the discharge pipe 82. This action will pump the greater portion of the washing fluid from the basket member 66 through the apertures 70 in the bottom of the tub so that the suds and curds which float on top of the water will be drained through the apertures 70 while the clothing lies around the mid portion of the basket member covering the apertures 72. The apertures 72 are employed for providing a means of escape for the remaining portion of the washing fluid which cannot be removed through the apertures 70.

The clutch and brake construction

The upper portion 36 of the housing of the motor 38 is provided with a bearing section 84 which surrounds and supports the sleeve 54 and the bearing sleeve 52. The lower end of the sleeve 54 below the bearing portion 84 is, as mentioned before, provided with a clutch plate 56. This clutch plate 56 is splined or otherwise connected to the bottom of the sleeve 54 so that it can move vertically, but cannot rotate with respect to the sleeve 54. A clutch spring 86, retained by a retainer ring 88 fixed to the sleeve 54, is provided for holding the clutch plate 56 at the bottom of its lower limit of vertical movement relative to the sleeve 54. At its periphery, the clutch plate 56 is provided with a clutch facing 90 normally held in engagement with a brake ring 92 which is provided within the housing of the motor 38.

Within the brake ring 92, there is provided a movable clutch disc 94 which is fixed to a clutch collar 96 which, in turn, is splined or keyed to the drive shaft 42. This clutch collar 96 is provided with a groove engaged by a forked lever 98 which is pivoted to a support 101 and connected at its outer end by a link 103 to the plunger of a solenoid magnet 105 anchored to a bracket 107 extending from the housing of the motor 38. The clutch plate 56 is provided with a second clutch facing 109 located within the confines of the clutch facing 90, so that when the solenoid 105 is energized, the lever 98 will be pivoted in a clockwise direction to move the clutch disc into engagement with the clutch facing 109, thereby clutching the driving motor 38 to the sleeve 54 and the tub 64, and at the same time lifting the clutch facing 90 away from the brake ring 92. When the solenoid 105 is deenergized, the clutch disc 94 will move downwardly, allowing the clutch facing 90 to again engage the brake ring 92 to stop the tub 64 and then the clutch disc 94 will move away from the clutch facing 109 to disconnect the motor 38 from the sleeve 54 and the tub 64. It should be noted that the spring 86 is contracted more and therefore exerts a greater pressure when the clutch disc 94 lifts the clutch plate 56 than when the clutch plate 56 is in engagement with the brake ring 92. This serves to compensate for the smaller size of the clutch facing 109. Thus, by this construction, there is provided a very simple means for clutching the tub to the driving motor and for stopping the tub.

The motor support

The bottom of the housing of the motor 38 is supported by a supporting member 111 which, in turn, is supported by a bracket 112 held in place by the rivet 32. The connecting members 26 and 30 are sufficiently flexible to allow some movement of the motor 38 and tub 64 with the

center of movement about in the location of the rivet 32. This will provide a means for absorbing vibration within the rubber members 40.

The water supply system

For supplying water or washing fluid to the tub 64, there is provided a pipe 113 extending upwardly through the bottom of the discharge flume 80 and provided with a spout 115 extending over the rim 74 of the basket 66 so as to discharge the water or washing fluid into the tub 64. At the bottom of the pipe 113, is provided a mixing valve 117 which is shown in section in Fig. 4. This mixing valve 117 is connected to a hot water inlet pipe 119 and a cold water inlet pipe 121. Within the housing of the valve 117 there is provided a butterfly valve 123 between the connection to the hot water inlet pipe 119 and the cold water inlet pipe 121. This butterfly valve 123 is actuated by a spiral bimetal thermostat 125 which is located adjacent the hot water inlet pipe 119. This bimetal thermostat 125 is so set as to hold the butterfly valve 123 open an amount sufficient to mix the cold water and the hot water coming from the pipes 121 and 119 so as to cause properly tempered water to be supplied to the pipe 113 and to the tub 64.

The hot water inlet pipe 119 is provided with a solenoid valve 127 which is opened when energized and closed when deenergized. The cold water inlet pipe 121 is provided with a similar valve 129. By this arrangement, when the cold water valve 129 is closed and the valve 127 is opened, only hot water is discharged into the tub 64. When the cold water valve 129 is opened and the hot water valve 127 is closed, only cold water will be supplied to the tub 64. However, when both the valves 127 and 129 are opened, the butterfly valve 123 will so proportion the amount of water flowing through the valve 117 that tempered water will be supplied to the tub 64.

The automatic control system

An automatic control 131 provided with a control knob 133 upon the outside of the casing 20 is provided for automatically controlling the washing machine. This automatic control, as is better shown in Figs. 2 and 3, is so made that the knob 133 can be turned to any desired washing period from 1 to 15 minutes and the complete washing, rinsing and drying operations will be thereafter automatically performed, after which the machine will be stopped automatically. As shown in Fig. 3, indices "off," "on" and "washing period" are provided on the outside of the cabinet which cooperate with the knob 133 provided with the indices "0," "5," "10," and "15." When the knob 133 is turned to the "off" position, everything is deenergized and the entire machine is idle. In order to start the machine, the knob must be turned so that some point between the indices "0" and "15" is placed opposite the washing period. This will govern the length of time the clothes are washed. This knob 133 is connected to a rotatable contactor 135 which is shown in Fig. 3 in a position it assumes when the knob 133 is turned to start the machine.

This rotatable contactor 135 is directly connected to the knob 133 and also to a timing driving motor 137 which is preferably of such a type having a relatively constant speed and preferably it is somewhat similar to the motor of an electric clock. This contactor 135 is provided

with five sliding contacts designated by the reference characters 141, 142, 143, 144 and 145.

The timing driving motor

The contact 141 is shown in engagement with the stationary contact slide 147. The sliding contact 145 is shown in engagement with the contact slide 149. The conductors 151 and 153 connect to a suitable source of electric energy. The conductor 151 is, in turn, connected by the conductor 155 to the rotatable contactor 135. This rotatable contactor 135 provides an electrical connection with the sliding contact 145 and the contact slide 149. The contact slide 149 is, in turn, connected to the conductor 157 which, in turn, connects to the timing driving motor 137 of an automatic control. This timing driving motor 137 is, in turn, connected by the conductor 159 to the supply conductor 153. This will start and keep in operation the timing motor 137 for the duration of the entire washing, rinsing and drying operations, since the contact slide 149 is sufficiently long to keep this circuit closed throughout these operations.

The initial hot water charge

The contact arm 135 also conducts current to the slide contact 141 and to the contact slide 147. This contact slide 147 is, in turn, connected by the conductor 161 to a bimetal timer 163 which cooperates with and operates between the contacts 165 and 167. The contact 165 is connected by a conductor 169 to a conductor 171. This conductor 171 has one end connected to a solenoid 173 and extends to the supply conductor 153 while the other end connects to the contact slides 175 and 177. When the contactor 135 has the slide contact 141 in engagement with contact slide 147, and the bimetal timer 163 is in engagement with the contact 165, electric current will flow from the conductor 155 through the contact line 135, the contact slide 141, the conductor 161, the bimetal timer 163, the contact 169 and the conductor 171, which includes a solenoid 173 to the power source 153. This will cause the solenoid switch 179 operated by the solenoid 173 to close the circuit which includes the conductors 181 and 183, as well as the solenoid of the hot water valve 127 so that current will flow from the source conductor 151 through the solenoid of the hot water valve 127 to the source conductor 153 to open the hot water inlet valve 127. This circuit, however, will only be maintained for a relatively short time until the tub 64 receives an adequate supply of hot water. The amount of this supply is timed by the bimetal timer 163 which when heated sufficiently will leave the contact 165 and move into engagement with the contact 167.

The washing period

When this is done, the current will then flow through the conductor 185 including solenoid 187 to the supply conductor 153. This will close the solenoid switch 189, thereby completing the circuit from the conductor 151 through the conductors 191 and 193 and through the driving motors 38 to the supply conductor 153. This will cause the driving motor 38 to rotate the agitator 44 at motor speed. This agitator 44, through its spiral vane 50, will cause agitation to take place at all points within the tub. The tub 64, however, at this time will remain stationary because of the engagement of the clutch facing 90 with the brake ring 92 under the influence of the spring 86.

All during the washing period, the length of which is governed by the initial setting of the knob 133 and the contact arm 135, the motor 38 will remain energized to agitate the clothes. When the knob 133 is set for the full fifteen minute washing period, the contact arm 135 will begin at the lower end of the slide 147. For a lesser period, the contact arm 135 will be initially set at an intermediate point upon the slide contact 147. When the contact arm, which is continuously rotated by the motor 137, reaches the end of the slide contact 147, the solenoid 187 will be deenergized, thereby opening switch 189 and deenergizing motor 38.

The first spinning operation

A short time after this, the contact 141 will engage the contact slide 193 which is connected by a conductor 195 with a conductor 185 and the solenoid 187 so that the solenoid 187 and the motor 38 will be again energized and start operation of the motor. However, at this time also, the contact 142 will also engage the contact slide 197 which is connected by the conductor 199 to the solenoid 202, and the solenoid switch 204, which will allow electric current to flow from the source conductor 151 through the conductors 206 and 208 to energize the clutch solenoid 105. This will raise the clutch collar 96 and cause the clutch disc 94 to engage the clutch facing 109 and lift the clutch facing 90 off the brake ring 92 so that the tub 64 is released from the brake ring and is clutched to the motor 38 in a direct drive so that it rotates at motor speed along with the agitator 44. This will cause the centrifugal draining of the basket member 66 largely through the outlet apertures 70, as mentioned before, when the tub 64 was described. This continues for a period of about five minutes in proportion to the length of the contact slide 193 so that the tub 64 is completely emptied and the clothes dried.

The second hot water charge

After this, the contact arm 135 continues to move and the contact 143 makes engagement with the contact 175 while the only other contact active is the contact 145. This allows direct current to flow from the contact arm 135 through the conductor 171 and the solenoid 173 to again close the circuit of the hot water valve 127 to allow hot water to flow again into the tub 64. At this time, the amount of hot water is controlled by the length of the contact slide 175. When the contact arm 135 reaches the end of this contact slide 175, the supply of hot water is shut off by the deenergization of the solenoid of the valve 127.

The first rinsing

At the same time, the contact 141 again makes engagement with a contact slide 210 which is connected to the contact slide 193 and, in turn, is connected to the solenoid 187 of the switch 189 to close the circuit of the motor 38. This will cause agitation of the clothes in fresh hot water to give the clothes a hot water rinse. When at the end of about five minutes, the contact arm 135 reaches the end of the slide contact 210, the motor 38 is stopped for an interval of about one minute.

The second drying period

After this, the slide contact 141 again makes engagement with a contact slide 212 which is in series with the contact slides 210 and 193 for again energizing the driving motor 38. At this

time, the contact 142 is in engagement with the contact slide 214 which is connected in series with the contact slide 197 to again energize the solenoid 105 to clutch the tub to the driving motor, in order to spin the tub and remove the hot rinse water.

The tempered water charge

When the contact arm 135 reaches the end of the contact slides 212 and 214, the contact 143, after a brief interval, will make engagement with the contact slide 177 which closes the circuit of the conductor 171 to energize the solenoid 173 of the switch 179 to energize the solenoid of the hot water valve 127 to open this valve. At the same time, however, the contact 144 will make contact with the contact slide 216 which will close the circuit through a conductor 218 which includes a solenoid 220 for closing the switch 222 which will close an electric circuit to allow current to flow from the supply conductor 151 through the conductors 224 and 226, as well as the solenoid of the cold water valve 129 to the supply conductor 153 for allowing both hot and cold water to flow to the mixing valve 117 which will mix the hot and cold water so that tempered water will be supplied to the tub.

The second rinsing

When the contact arm 135 reaches the end of the contact slides 177 and 216, the contact 141 will engage another contact slide 228 which will connect through the contact slides 212, 210 and 193 to the conductors 195 and 185 to again energize the driving motor 38. This will again operate the agitator 44 so as to agitate the clothes in tempered rinse water.

The final drying period

There is a brief interval provided between the contact slide 228 and the next contact slide 230 which is also engaged by the slide contact 141 and is connected to the contact slide 228. This again energizes the driving motor 38. Another contact slide 232 is provided which is engaged at the same time by a slide contact 142 which is connected to the contact slides 214 and 197 in order to energize the clutch solenoid 105 to release the tub 64 from its brake and to clutch the tub to the driving motor 38. This will operate the agitator 44 and the tub 64 at motor speed in order to remove the water from the tub 64 and dry the clothes.

Modified form

In Figs. 5 to 8, I have shown a modified system which includes a reversing motor and a clutch mechanism operated by the reversing of the motor to control the spinning of the tub. As is best shown in Fig. 7, the modified reversing motor and motor housing 301 has the motor shaft 303 provided with a clutch operating pin 305, the opposite ends of which extend and ride within inclined slots 307 provided in a modified clutch collar 309. When the motor operates in one direction, the pin will move into the upper end of the slot and cam the clutch disc 94 downwardly so that the clutch plate 56 will have its outer facing 90 resting upon the brake ring 92, thereby stopping and preventing rotation of the tub 64.

When the motor 301 operates in the opposite direction, the pin 305 will ride to the lower end of the slots 307, thereby elevating the disc 94 into engagement with the clutch facing 109, thereby raising the clutch facing 90 from the

brake ring and clutching the tub to the driving motor. This will cause the rotation in the reverse direction of the tub 64 along with the agitator 44, making it possible to centrifugally remove the water and dry the clothing in the tub. This movement of the pin 305 in the slots 307 takes place by reason of the inertia of the clutch disc 94 which may be weighted at its rim to increase its moment of inertia and the sudden start of the motor.

The modified automatic control

A modified form of automatic control is shown in Fig. 5 for this reversing type motor and clutch mechanism. This is operated by the knob shown in Fig. 3 and is fastened to the casing as shown in Fig. 1. This automatic control is connected to the supply conductors 311 and 313. The supply conductor 311 connects to a contact slide 315 which, in turn, makes contact with the slide contact 317 upon the rotatable arm 319. This rotatable arm 319 differs from the rotatable arm 135 in that an insulating section 321 is provided between the contact 317 and the remaining contacts 322, 323, 324 and 325. The extreme end of the arm 319 is shown connected to an electrical conductor 327 by a flexible conductor for illustrative purposes. However, in actual practice, this connection would be made by a contact slide which would extend in a complete circle and make contact at all times with the end portion of the arm 319.

The rotatable arm 319 is connected to a conductor 329. This conductor 329 supplies the current to a transformer 331 which is connected in a circuit 333 extending between the conductor 329 and the conductor 313. The timing driving motor 335 is also connected across the conductors 329 and 313, so that both the transformer 331 and the motor 335 are energized whenever the automatic control is used.

The first hot water charge

Whenever the rotatable arm 319 is set to begin washing, the contact 325 will be in engagement with the contact slide 337 which will close the circuit which includes the conductor 339, the timing bimetal 341, the contact 343, the conductors 345 and 347, the solenoid switch 349, the conductor 351 and the secondary coil of the transformer 331. Through the transformer 331, electric energy will be supplied to the solenoid switch 349 to connect the solenoid of the hot water valve 127 across the conductors 329 and 313 to open the hot water valve to supply the tub 64 with sufficient hot water or hot washing fluid. This circuit will remain energized until the bimetal 341 heats up sufficiently to disengage itself from the contact 343. This disengagement will stop the flow of hot water into the tub 64.

The washing period

The bimetal 341, when heated, will engage the opposite contact 353 which will close the circuit from the transformer 331 through the conductors 327, the outer end of the arm 319, the contact 325, and the contact slide 337, the conductor 339, the bimetal 341, the contact 353, the conductor 355 and the solenoid switch 357 which, in turn, is connected to the conductor 351. The energization of the solenoid switch 357 will connect the motor 301 across the conductors 329 and 331 in such a manner as to cause the motor to operate in one direction which may be termed the forward or normal direction of operation. This

will continue and cause the agitator 44 to be rotated to wash the clothes until the rotatable arm 319 reaches the end of the contact slide 337, which will cause the motor 301 to be stopped.

The first drying period

Shortly after, the contact 324 will engage the contact slide 359 which is connected to other contact slides 361 and 363. The contacting of the contacts 324 and 359 will close the circuit which includes the conductor 365, the motor reversing solenoid switch 367, the conductor 351, transformer 331, the conductor 327 and the end portion of the arm 319. This will close the motor reversing switch 367 and energize the motor 301 to operate in the reverse direction. This reversal of the motor will cause the pin 305 to move to the opposite end of the slots 307 so as to cause the clutch disc 94 to raise the clutch plate 56 to drive in a reverse direction the tub 64 as well as the agitator 44. This will continue until the contact 324 reaches the end of the contact slide 359.

The second hot water charge

Shortly after, the contact 323 will engage the contact slide 369 which, incidentally, is connected to another contact 371. The engagement of the contact 323 with the contact slide 369 will close an electric circuit which includes the conductor 347, the hot water solenoid switch 349, the conductor 351, the transformer 331 and the conductor 327. This will supply hot rinse water to the tub 64 for a period corresponding to the length of the contact slide 369.

The first rinsing

After this, the contact 325 will engage the contact 375 which closes a circuit through the conductors 377 and 355, the motor solenoid switch 357, the transformer 331, and the conductor 327. This will close the motor solenoid switch 357 to cause the motor 301 to rotate in the normal or forward direction to rotate the agitator 44 at motor speed. This will thoroughly rinse the clothes in the hot water. This will continue until the contact 325 reaches the end of the contact slide 375.

The second drying period

Shortly after this, the contact 324 will engage the contact slide 361 to close the circuit which includes the conductor 365 and the motor reversing solenoid switch 367. This will close a circuit extending from the conductor 329 through the conductor 379 and includes reversing connections with the driving motor 301. This will cause the driving motor 301 to operate in the reverse direction, thereby operating the clutch collar 309 and the clutch disc 94 to cause the tub 64 to be clutched directly to the motor 301 so that the tub will be drained and the clothes dried by centrifugal action. The contact slide is sufficiently long that substantially all of the rinsing water will be expelled by the time the contact 324 reaches the end of the contact slide 361.

The tempered water charge

Shortly after this, the contact 323 will engage the contact slide 371 to open the hot water valve 127, while at the same time the contact 323 will engage the contact slide 381 to close a circuit which includes the conductor 383, the cold water solenoid switch 385, the conductor 351, the transformer 331 and the conductors 327. This will close the solenoid switch 385 to energize the solenoid in the cold water valve 129, thereby causing

this valve to open. Thus, at this time, both the solenoid valves 127 and 129 will be opened to admit both hot and cold water to the mixing valve 117 which will mix the two supplies of water in such proportions, by means of the butterfly valve 123, so that properly tempered water is supplied to the pipe 113 for discharge into the tub 64. The amount of tempered water supplied is governed by the length of the contact slides 371 and 381 which are made so as to provide a sufficient amount of water.

The second-rinsing

Shortly after this, the contact 325 engages another contact slide 387 which is connected in series with the contact slide 375 for causing the motor 301 to operate in the forward direction so as to rotate the agitator 44 at motor speed.

The final drying period

When the contact 325 reaches the end of the contact slide 387, after a short interval, the contact 324 will engage the contact slide 363 which is connected in series with the contact slide 361 and 359, in order to cause the motor 301 to operate in the reverse direction, thereby clutching the tub 64 to the motor 301 to expel the water and dry the clothes by centrifugal action. The contact slide 363 is made sufficiently long to properly dry the clothes.

Summary

Thus, I have provided a washing machine in which the agitator and the tub are directly connected to the driving motor to provide agitation and centrifugal drying at motor speed. Preferably, some form of motor preferably of the induction type is provided, having a maximum speed of not over nine hundred R. P. M. For the reversing motor 301, it is desirable that the motor have a high starting torque, so as to better operate the clutch collar 390 through the medium of the pin 305 and the inclined slots 307. It will be seen that the mechanism is very simple as compared to most other machines, and free from likelihood of mechanical failure.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A washing machine including a shaft means, a tub rotatably mounted upon the shaft means, an agitator means mounted upon the shaft means within the tub, means for preventing the rotation of the tub, means for rotating the shaft means and the agitator means, and means rendered effective by the rotation of the shaft means in one direction for causing said means for preventing the rotation of the tub to prevent rotation of the tub, and rendered effective by the rotation of the shaft means in the opposite direction for causing said means for preventing the rotation of the tub to release said tub for rotation.

2. A washing machine including a rotatable agitator means and a rotatable tub rotatable with respect to each other, a driving means, means for operably connecting the agitator means and the driving means, selective means effective in one position for preventing rotation of the tub, said

selective means being effective in a second position for rotating the tub, an operating means for said selective means rendered effective by rotation of the agitating means in one direction for moving said selective means to one position for preventing rotation of the tub and rendered effective by rotation of the agitating means in the opposite direction for moving said selective means to said second position for rotating the tub.

3. A washing machine including a reversible motor having a direct connected shaft means, a tub rotatably mounted upon the shaft means, an agitator means mounted within the tub, means for preventing rotation of the tub, means for operably connecting said agitator means to said shaft means for causing said agitator means to agitate the contents of the tub, means rendered effective by the rotation of said shaft means and the operation of the motor in one direction for causing said means for preventing the rotation of the tub to prevent rotation of the tub, and means rendered effective by the rotation of said shaft means and the operation of the motor in the opposite direction for causing said means for preventing the rotation of the tub to release said tub for rotation and to operably connect said tub to said shaft means to cause rotation of said tub.

4. A washing machine including a rotatable agitator means, a rotatable tub rotatable with respect to the agitator means, a reversible driving means, means for operatively connecting the agitator means and the driving means, and selective means effective in one position for preventing the rotation of the tub, such selective means being effective in a second position for rotating the tub, and an operating means for said selective means rendered effective by rotation of the driving means in one direction for moving said selective means to said one position for preventing rotation of the tub and rendered effective by rotation of the driving means in the opposite direction for moving said selective means to said second position for rotating the tub.

5. A washing machine comprising a rotatable tub, an agitator within the tub, a movable member operably connected to said tub, a driving means operably connected to said agitator, a relatively stationary means, and means for selectively operably connecting said movable member and either of said means.

6. A washing machine comprising a rotatable tub, an agitator within the tub, a movable member operably connected to said tub, a driving means operably connected to said agitator, a relatively stationary means, said movable member being biased into connection with one of said means, and means for opposing said bias to break said connection and for connecting said movable member with the other of said means.

7. A washing machine comprising a rotatable tub, an agitator within the tub, a movable member operably connected to said tub, a driving means operably connected to said agitator, a relatively stationary means, said movable member being biased into frictional engagement with said stationary means, and means for opposing said bias to break said connection and for simultaneously subjecting said movable member to frictional engagement with said driving means.

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