

Jan. 20, 1959

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2,869,346

DOMESTIC APPLIANCE FOR WASHING, DRYING AND FLUFFING CLOTHES

Filed Sept. 2, 1955

6 Sheets-Sheet 1

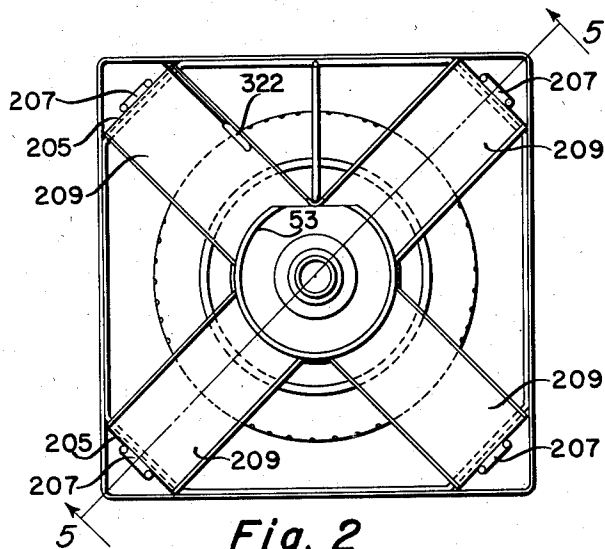


Fig. 2

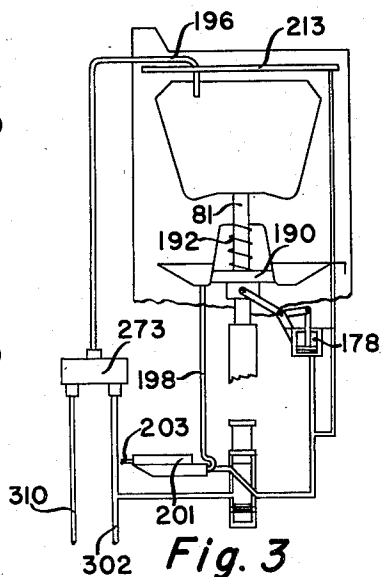


Fig. 3

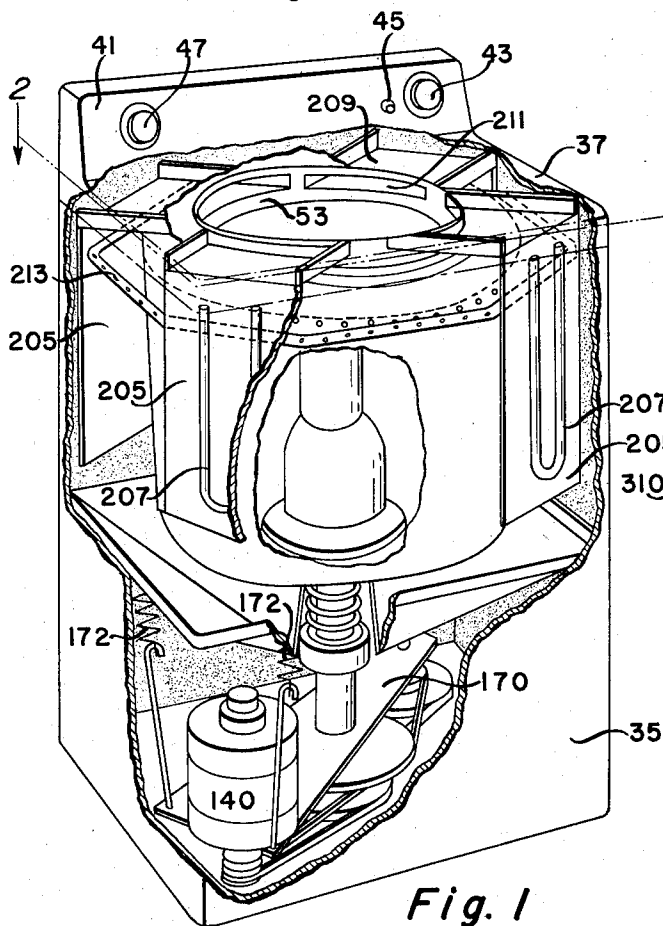


Fig. 1

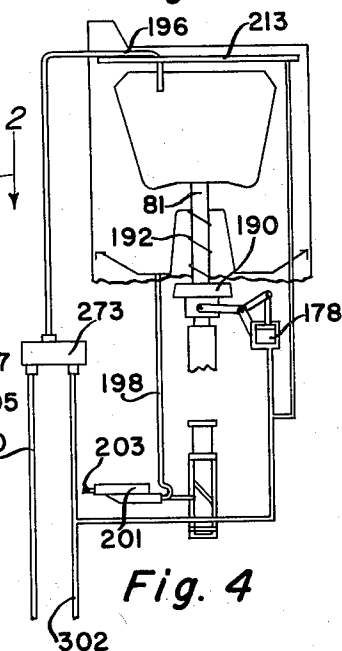


Fig. 4

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Fig. 5

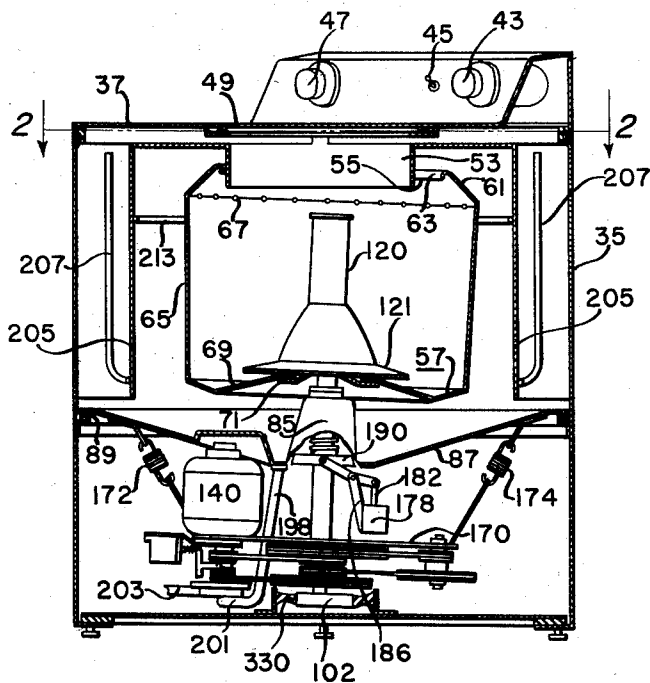
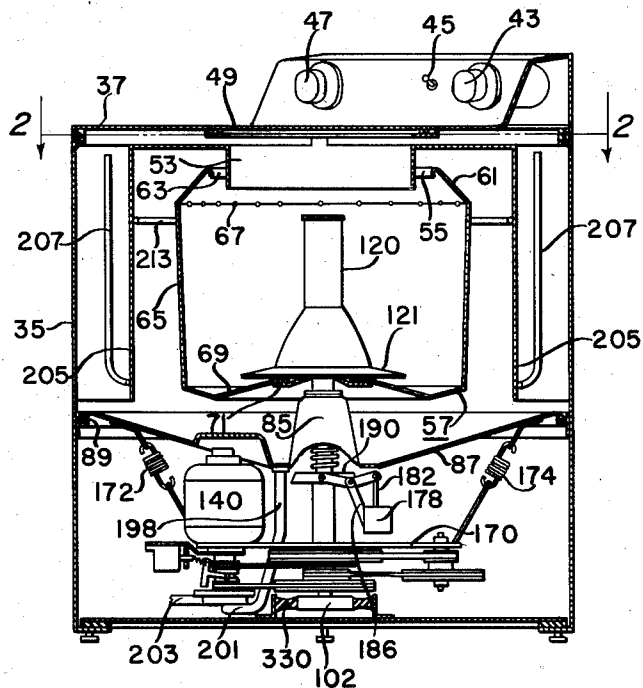


Fig. 6

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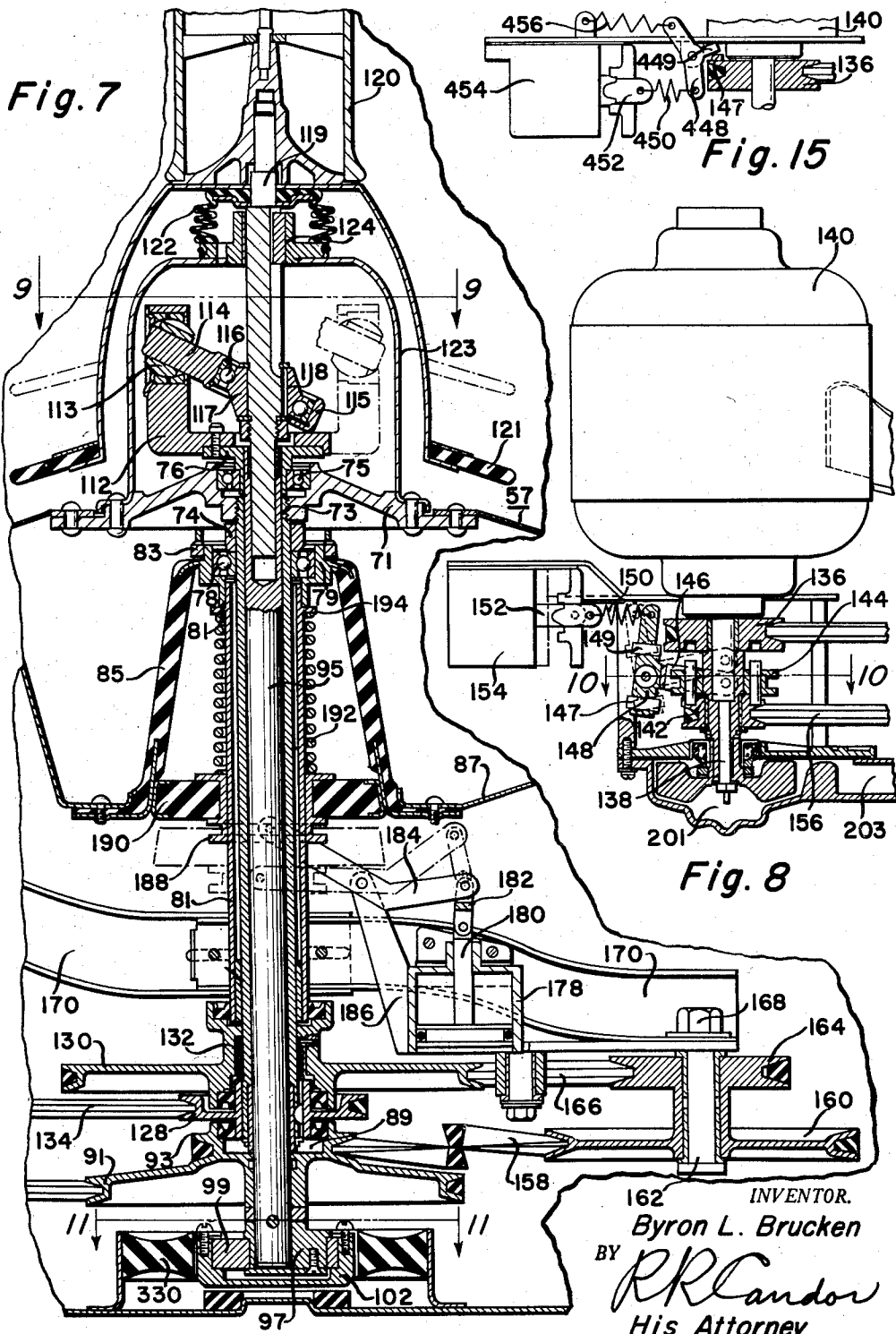
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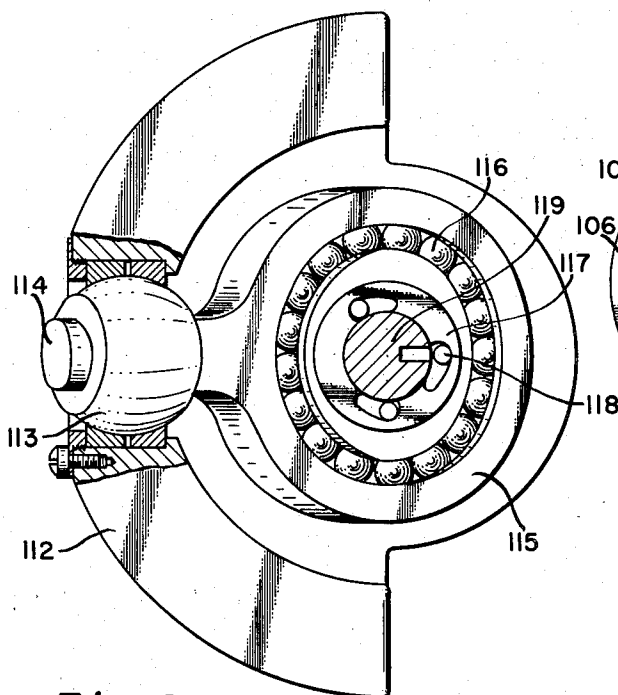


Fig. 9

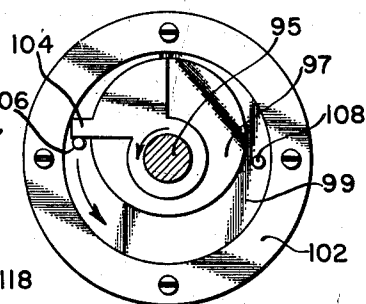


Fig. 11

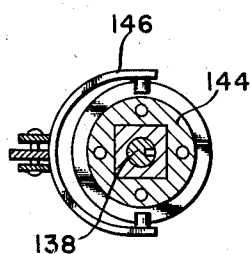


Fig. 10

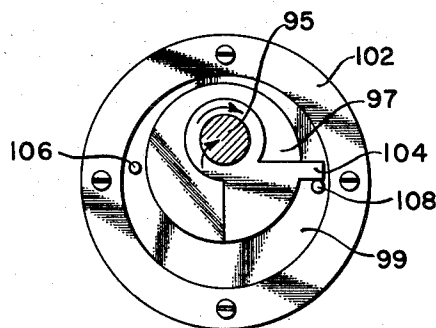


Fig. 12

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DOMESTIC APPLIANCE FOR WASHING, DRYING AND FLUFFING CLOTHES

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—→ WASH
- - -→ DRY
- - -→ SPIN

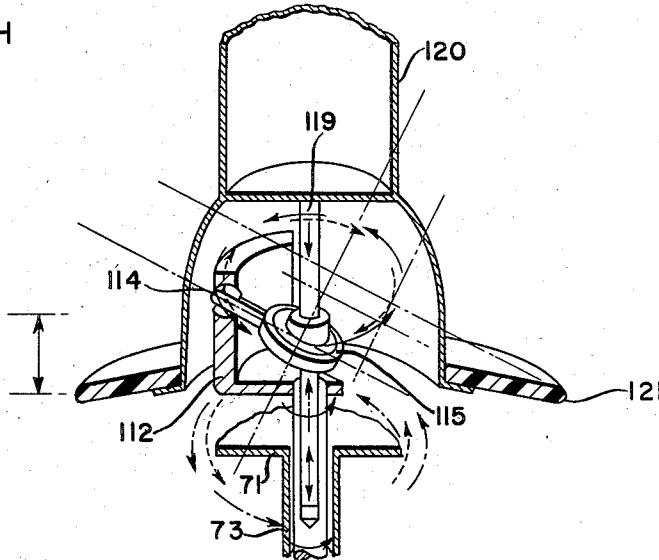
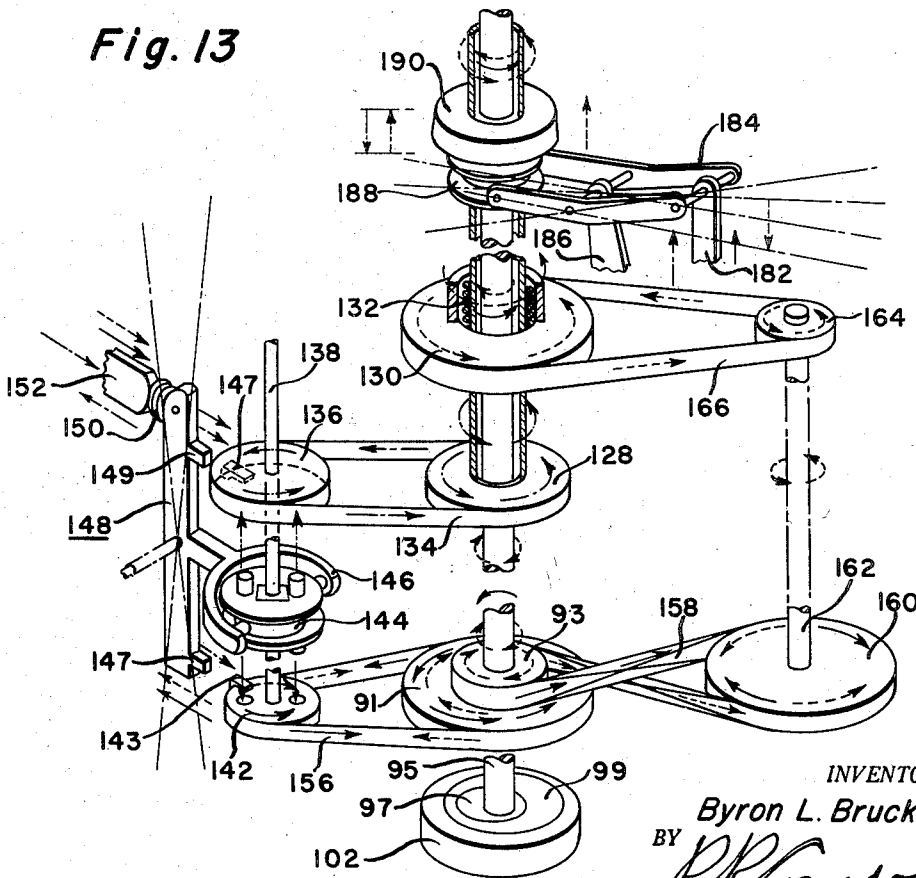


Fig. 13



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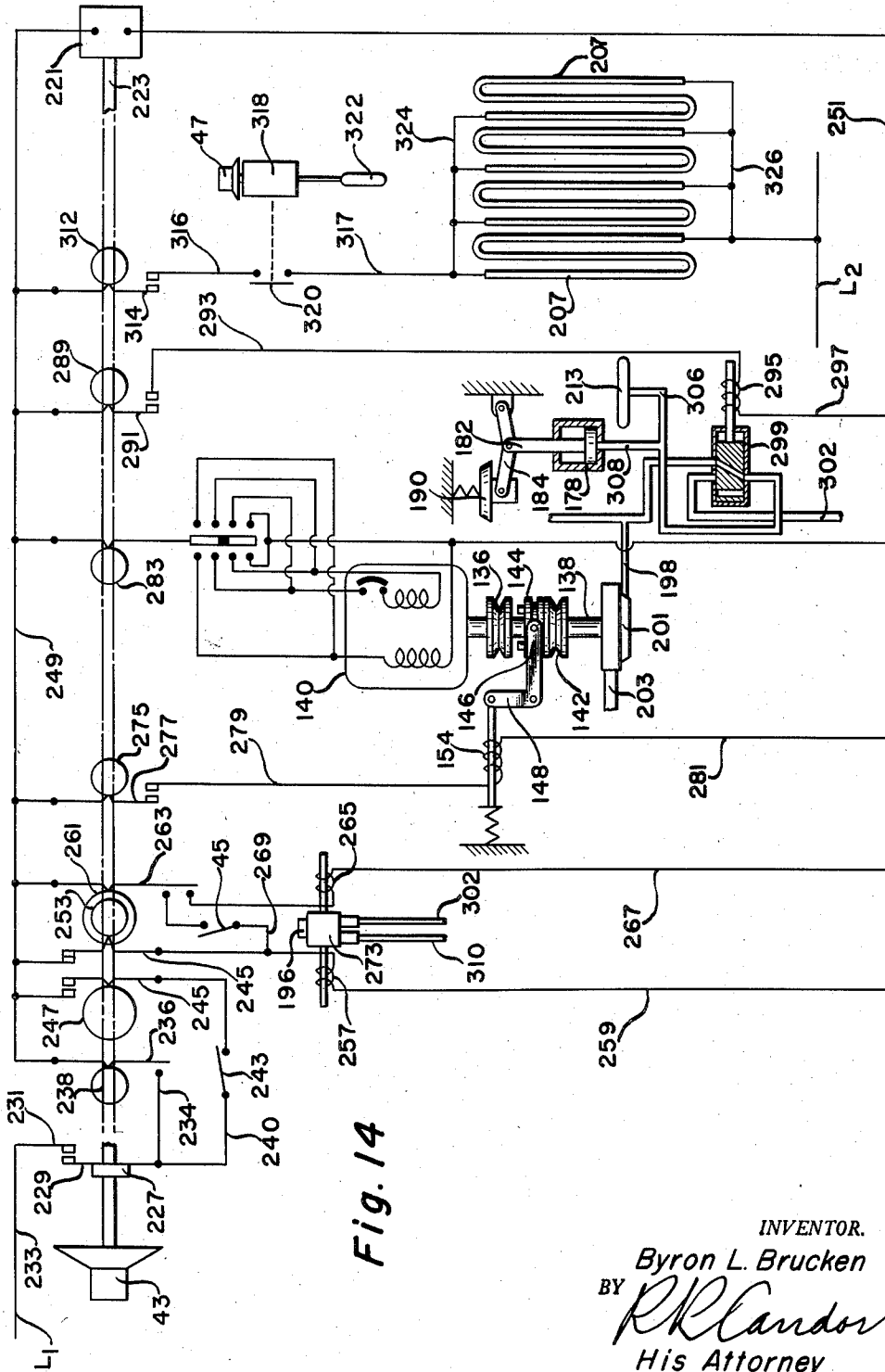
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DOMESTIC APPLIANCE FOR WASHING, DRYING AND FLUFFING CLOTHES

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2,869,346

DOMESTIC APPLIANCE FOR WASHING, DRY- ING AND FLUFFING CLOTHES

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Application September 2, 1955, Serial No. 532,236

6 Claims. (Cl. 68—19)

This invention relates to a domestic appliance and more particularly to a combined washer-dryer having a vertical reciprocating agitator within an upright centrifuging tub.

Washing machines having vertically reciprocating agitators within an upright centrifuging tub have been widely used and have many advantages. To arrange such a machine to dry the clothes has been a difficult problem since all the dryers now being produced and used for domestic use are of the horizontal drum type.

It is an object of this invention to provide a simple, effective, practical apparatus for drying and fluffing clothes in the upright tub of a washing machine having a vertically reciprocating agitator within an upright centrifuging tub.

It is another object of this invention to provide an arrangement for effective fluffing and drying the clothes in an improved manner following centrifuging.

These and other objects are obtained in the form of a combined washer-dryer disclosed in this application in which an independent agitator is vertically reciprocated within a centrifuging tub for washing. The tub is rotated upon its own axis for centrifuging the washing liquid from the clothes. For fluffing and drying the clothes following centrifuging, the lower end of the agitator shaft is moved eccentrically at a predetermined rate to wobble the tub in the presence of heated circulated air while the tub is being rotated in the opposite direction at a much slower rate. All of the steps in the washing and drying cycles are automatically controlled.

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:

Figure 1 is a perspective view of a combined washer-dryer embodying one form of my invention with a portion of the walls broken away to reveal the interior parts;

Figure 2 is a horizontal sectional view taken along the line 2—2 of Figures 1, 5 and 6 showing the heating duct;

Figure 3 is a diagrammatic vertical sectional view showing the water flow during the washing operation;

Figure 4 is a diagrammatic vertical sectional view similar to Figure 3 showing the water flow during the drying operation;

Figure 5 is a vertical sectional view taken along the line 5—5 of Figure 2 showing the position of the parts and the water flow during the washing period;

Figure 6 is a vertical sectional view also taken along the line 5—5 of Figure 2 showing the position of the parts as well as the water and air flow during the drying period;

Figure 7 is an enlarged vertical sectional view of the agitation, spinning and drying mechanism;

Figure 8 is an enlarged view partly in section of the motor, clutch and pump mechanism;

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Figure 9 is an enlarged fragmentary horizontal sectional view taken along the line 9—9 of Figure 7;

Figure 10 is a fragmentary sectional view taken along the line 10—10 of Figure 8;

Figure 11 is a horizontal sectional view taken along the line 11—11 of Figure 7 showing the eccentrics oppositely positioned and the agitator shaft centered;

Figure 12 is a similar sectional view also taken along the line 11—11 of Figure 7 but showing the eccentricity compounded;

Figure 13 is a diagrammatic perspective view of the agitating and driving mechanisms;

Figure 14 is a wiring diagram of the control system; and

Figure 15 is a view partly in section illustrating a modified clutch and pulley stop arrangement.

Referring now to the drawing and more particularly to Figures 1 to 5 there is shown a combined washer-dryer including an upright rectangular cabinet 35 provided with a top 37 which is removable for access to the interior. The top 37 is provided with a back splash panel portion 41 having thereon a timer dial knob 43, a water temperature selector switch 45 and a dryer temperature selector control 47. The top 37 is also provided with a recessed lid 49 as shown in Figure 5 and 6 which is substantially square. The central portion of the top 37 beneath the lid 49 is provided with a downwardly flanged circular opening 53. The cylindrical flange of this opening 53 extends downwardly into the round centrifuging tub 57 for providing access to the tub. The lid 49 is preferably hinged at the rear with a piano type hinge.

As better shown in Figures 5 and 6, the tub 57 is provided with an inwardly and upwardly extending top wall 61 provided with an opening and a curled edge 63 surrounding the downwardly flanged cylindrical portion 53 around the opening in the top wall 37. The tub 57 is provided with an upwardly and outwardly flared side wall 65. At the junction of the top and side walls 61 and 65 there is provided a series of perforations 67 permitting the free escape of liquid when the tub 57 is spun for centrifuging. The side walls 5 connect directly to the bottom of the wall 69 which in turn connects to a central casting 71 better shown in Figure 7. This central casting 71 has an inner hub threaded onto the upper end of a coaxial sleeve 73 forming the tub shaft. This central casting 71 also has an upper recess which holds the outer race of a ballbearing 75. The inner race of the ballbearing 75 is locked to a central member 76 surrounding the outer surface of the central vertical agitator shaft 95 which has a hollow upper portion.

The central casting 71 through a spacer 74 locks the inner race of the ballbearing 78 to the hollow tub shaft 73. The outer race of the bearing 78 is supported in a recess in the bearing support 79 provided upon the top of the tubular housing 81. This bearing support 79 is clamped by the threaded ring 83 to the top of a conical shaft resilient support member 85 of suitably reinforced synthetic rubber. This support provides controlled lateral and vertical resilience with an amount of damping effect. This support 85 is in turn supported upon the center of the bulkhead or catch basin 87 as shown in Figures 5 to 7. This bulkhead or catch basin 87 has its edges resting in the seal 89 supported upon the inner surface of the vertical walls of the cabinet 35.

At the lower end of the concentric sleeve or tub shaft 73, is fastened a small pulley 128. The lower projecting portion of this small pulley 128 extends downwardly into contact with a thrust bearing 89 provided within the small pulley 93. The small pulley 93 is made integral with the large pulley 91 which is fixed to the lower end

of the agitator shaft 95. The lower end of the shaft 95 is pinned to a small eccentric 97 rotatably mounted within the larger eccentric 99 which in turn is rotatably mounted in a cylindrical bearing ring 102 provided with flanges holding the outer eccentric in place. The two eccentrics have the same or equal throw. Suitable bearing surfaces are provided between the parts 97, 99 and 102.

The purpose of this double eccentric construction is to make it possible to rotate the bottom of the central agitator shaft either concentrically or eccentrically for a purpose hereinafter to be disclosed (see Figures 11 and 12). To do this automatically, the inner eccentric 97 is provided with a laterally extending arm 104 extending over the face of the outer eccentric 99. The outer eccentric 99 has two upwardly extending pins 106 and 108 extending upwardly in the path of relative rotation of the projection arm 104. If the central agitator shaft 95 and the inner eccentric are turned in the counter-clockwise direction as viewed in Figure 11, the arm 104 will engage the stop pin 106 holding the eccentrics in a counteracting or neutralizing relationship so that the shaft 95 and the two eccentrics 97 and 99 rotate concentrically within the ring bearing 102. However, as the central shaft 95 and the inner concentrics 97 are turned in the clockwise direction as viewed in Figure 12 the arm 104 engages the stop pin 108 to change the relative positions of the eccentrics 97 and 99 by 190° so that their eccentricity is additive or compounded. This causes the central agitator shaft 95 to move eccentrically about the center of the ring bearing 102. The ring bearing 102 is mounted within a ring 330 of a suitable resilient synthetic rubber as shown in Figure 7. The eccentric rotation of the bottom of the shaft 95 as shown in Figure 12 is used to provide a wobbling of the tub 57 for fluffing the clothes during drying as will hereinafter be described.

To minimize vibration during this wobbling action, the member 76 at the upper end of the agitator shaft 95 is provided with an eccentrically arranged upwardly extending arm 112 which extends circumferentially into a semi-circle and counterbalances the tub as indicated in Figure 9 during the wobbling of the tub 57. This arm 112 also includes a ball and socket joint 113 receiving the arm 114 of the ring member 115. This ring member 115 holds the outer race of the ballbearing 116. The inner race of this ballbearing 116 is formed by an inclined raceway upon the hub 117. This hub 117 is connected by a one-way clutch 118 to the agitator post 119. The lower end of the post 119 is slidably mounted within the upper tubular end of the agitator shaft 95. Mounted upon the agitator post 119 is the upper cylindrical pilot portion 120 and the flared skirt portion 121 of the reciprocating agitator. Within the agitator there is a flexible sealing bellows 122 of flexible elastic synthetic rubber making a sealing engagement with the top of an inverted metal shell 123 having its bottom portion connected and sealed to the central casting 71 for the purpose of enclosing and sealing the reciprocating mechanism including the members 112 to 119 inclusive. A bearing member 124 which in turn is connected to and sealed to the cover 123. This bearing member 124 guides the upper end of the agitator post 119. There is also provided a key and keyway between the post 119 and the member 124 to allow vertical reciprocation but to prevent relative rotation. When the pulley 91 rotates the shaft 95 and the member 76 and the arms 112 and 114, the hub 117 and the agitator post 119 as well as the agitator members 120 and 121 will be vertically reciprocated from the full line position to the dot-dash line position shown in Figure 7 and back again with each revolution of the shaft 95 which may revolve at 350 R. P. M. for example. Upon the upward movement the flared skirt 121 will allow

liquid to flow in between it and the metal cover 123 and upon the downward stroke the excess liquid will be forced outwardly thereby agitating the liquid and the clothes within the tub to provide a washing action. This washing action is not only effective for washing purposes but is also effective in keeping the clothes substantially evenly distributed about the tub so that normally the clothes will not be excessively unbalanced at the start of the centrifuging period.

Fixed to the bottom of the sleeve 73 is a small pulley 128. Above this small pulley 128 is a large pulley 130 which is connected to the sleeve 73 and the pulley 128 by a one-way wound spring clutch 132. As is better shown in Figure 13, the pulley 128 is connected by a V-belt 134 to a drive pulley 136 rotatably mounted upon the drive shaft 138 of a drive motor 140. Also rotatably mounted upon the motor shaft 140 is a smaller drive pulley 142. Between these drive pulleys 136 and 142 and splined to the motor shaft 138 is a vertically movable clutch member 144 provided with clutching pins extending in opposite directions which are adapted to engage recesses in either of the pulleys 136 and 142. The clutch member 144 is provided with an annular groove engaged by a shifting fork 146 extending from a T-shaped lever 148. The upper end of the T-shaped lever 148 is connected by a stiff spring 150 to the operating plunger 152 of a solenoid 154 (Figure 8). The T-shaped lever 148 may be provided with projections 147 and 149 for the purpose of engaging the projections 143 and 147 (Figure 13) upon the pulleys 142 and 136 when these pulleys are disengaged from the clutch member 144 in order to prevent the free rotation of these pulleys when so disengaged.

The pulley 142 is connected by a V-belt 156 to the large pulley 91. Integral with this large pulley 91 is a small pulley 93. This small pulley 93 is connected by the crossed-belt 158 to a larger pulley 160 rotatably mounted upon the lower end of a shaft 162 (Figure 7). This shaft 162 is fastened by the nut 163 at its upper end to the support 170. As shown best in Figures 5 and 6, the horizontal support 170 at one end is supported by two diagonally positioned coil springs and connectors 172 and a single spring support and connector 174 at the opposite end. These springs 172 and 174 are connected to connectors which in turn are bonded to the bottom of the bulkhead 87. The support 170 is fastened to the bottom of the housing sleeve 81 surrounding the sleeve 73, forming a tubular housing between the pulley 130 and the member 71.

Fastened to the support 170 is the hydraulic cylinder 178 containing a piston and a piston rod 180 connected by the link 182 to a lever 184 pivoted upon the bracket 186 extending from the cylinder 178. The opposite end of the lever 184 is provided with a fork connection to the annular groove in the shifting collar 188. This shifting collar 188 is connected directly to the plug 190 which is slidably mounted upon the sleeve 181 above the support 170. This plug 190 fits the inner periphery of the bottom of the synthetic rubber support 85 to limit the amount of movement between the sleeve 81 and the bulkhead 87 and particularly to form a universal pivot for the wobbling of the tub during drying. This plug is made of resilient material such as synthetic rubber and may be provided with a metal band around its periphery. This plug 190 is normally urged to its lower position as illustrated in Figure 4 being a compression type coil spring 192 which surrounds the housing sleeve 81 and extends between the plug 190 and the spring retainer 194. During drying, the plug 190 is moved up to the position shown in Figure 4 by the hydraulic cylinder 178. This makes the tub and the entire mechanism suspended upon the support 85 pivot substantially about the center of the plug 190 so that the tub 57 may be wobbled

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about this point by the compounded eccentrics at the bottom of the shaft 95 as shown in Figure 12.

The tub 57 is filled through the fill tube 196. The liquid is spun out of the clothes and the tub during the spin period through the perforations 67 into the bulkhead 87. The bulkhead is drained through the tube 198 to the drain pump 201 which is connected to the bottom of the shaft 138 of the motor 140 as shown in Figures 5, 6 and 8. This pump 201 operates whenever the motor 140 is operating. It will pump in the same direction regardless of the direction of rotation of the motor 140. The pump 201 pumps the liquid through the drain connection 203 to a suitable drain.

To provide a method of drying, there extends across each of the corners of the cabinet 35 above the bulkhead 87 a vertical partition wall 205 providing vertical ducts. Within each of these vertical ducts fastened to the partition walls 205 is a sheathed electric heater 207. The tops of these vertical ducts formed by the walls 205 connect to four radially inwardly extending ducts 209 connecting directly with the openings 211 in the downwardly extending flange 53 surrounding the opening beneath the lid 49. During the drying period, the tub 57 and the mechanism supported by the support 85 is wobbled as shown in Figure 6 by the rotation at a speed of about 350 R. P. M. of the compounded eccentrics as shown in Figure 12 and the counterbalance 112. The tub 57 is also turned in the opposite direction at about 50 R. P. M. through the pulleys 93, 160, 164 and 130, the belts 158 and 166 and the engagement of the one way clutch 132 to fluff the clothes. The wobbling of the tub within the chamber above the bulkhead 87 causes a forced circulation of air outwardly beneath the bottoms of the partition walls 205 up the corner ducts and thence inwardly through the radial ducts 209. The heaters 207 heat the air as the air flows upwardly through the vertical corner ducts increasing the capacity of the air to absorb and hold moisture.

In this forced circulation, the air is discharged from the openings 211 into the interior of the tub 57 where the hot dry air picks up moisture and escapes from the tub through the opening 55 around the flange 53. The moisture is condensed from the air by water from the condenser tube 213. This tube 213 extends around the inner surfaces of the side walls of the cabinet 35 and the inwardly facing surfaces of the partition walls 205 as shown in Figures 1, 2, 5 and 6. Water is discharged through perforations in the tube onto these adjacent vertical surfaces and flows downwardly in a thin film into the bulkhead 87 from which it is drained by the drain tube 198. The thin film of water from the tube 213 on these vertical surfaces condenses moisture from the heated moist circulated air and this condensed moisture together with any lint is carried with the condensing water to the bulkhead 87 and to the drain. The pump 201 assures that all will be pumped to the drain.

The machine is preferably controlled automatically by the control system shown in Figure 14. This system includes a timer motor 221 which drives a cam shaft 223. The cam shaft has an axially slidable front portion carrying a collar 227 connecting with an axially movable start and stop switch member 229 for making and breaking contact with the contact 231 connecting to the supply conductor L₁. The switch member 229 is connected by the conductor 234 to a switch 236 operated by a cam 238 which opens the switch 236 at the end of the washing and rinsing functions to stop the entire machine in the event that drying is not desired. The switch 229 also is connected by a conductor 240 to a manual switch 243 connecting to the switch member 245 operated by cam 247 on the cam shaft 223. This cam 247 is designed to open the switch 245 to stop the machine at the end of the functions. The switches 243 and 245 close one shunt or bypass circuit including the conductor 240 around the switch 236 to prevent the stopping of the

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machine at the end of the final rinse period. The switches 236 and 245 are connected by the conductor 249 to one terminal of the timer motor 221. The second terminal of the timer motor 221 is connected by the conductor 251 to the neutral supply conductor N.

The cam shaft 223 is provided with a cam 253 for closing the switch 255 connecting the conductor 249 with the hot water solenoid coil 257 and the conductor 259 connecting to the neutral supply conductor N. A second cam 261 controls a switch 263 having two contacts. One of the contacts connects with the cold water solenoid 265 which is also connected by the conductor 267 with the neutral supply conductor N. The second contact of the switch 263 connects to a shunt 269 provided with a manually operable water supply selector switch 45 which connects to the hot water solenoid 257 and which may be closed to obtain rinse fills of mixed hot and cold water. If the switch 45 is open the rinse fills will be of cold or tepid water from the cold or tepid water supply 302. The solenoid 265 controls the cold water valve in the valve body 273 while the solenoid 257 controls the hot water valve which controls the hot water flow from the hot water supply 310. Both valves discharge from the valve body 273 into the fill tube 196.

The cam shaft 223 is also provided with a cam 275 operating a switch 277 connected by the conductor 279 to the solenoid 154 of the clutch shifting mechanism. This solenoid 154 is connected by the conductor 281 to neutral supply conductor N.

The cam shaft 223 is also provided with a cam 283 which operates the reversing switch 285 to operate the motor 140 in either direction of rotation. The switch 285 alternately connects the opposite terminals of the motor through the conductor 287 to the neutral supply conductor N.

The cam shaft 223 is provided with a cam 289 operating the switch 291 connecting the conductor 249 to the conductor 293 which connects to the solenoid 295. This solenoid 295 is also connected by the conductor 297 to the neutral supply conductor N. The solenoid 295 controls a water valve 299 and normally shuts off the supply connection 302 and connects the hydraulic cylinder 178 through the conduit 304 to the drain conduit 203. However, when the solenoid 295 is energized by the closing of the switch 291, the water flows from the supply connection 302 to the valve 299 and the conduit 306 to the condenser spray tube 213. Also the water flows from the valve 299 through the conduit 308 to the hydraulic cylinder 178 to move its piston and the lever 184 and the plug 190 into the position shown in Figure 4.

The cam shaft 223 is provided with a cam 312 which operates a switch 314 connecting through the conductor 316 with the dryer temperature selector 318 having the thermostatically controlled contacts 320. The selector 318 also has a thermostat bulb 322 located on one of the upper ducts 209 as illustrated in Figure 2. The switch 320 connects through the conductor 317 with the common conductor 324 connecting with one terminal of each of the heaters 207. The opposite terminals of the heaters 207 are connected through the conductor 326 to the supply conductor L₂. When the switches 314 and 320 are closed, the heaters 207 have a voltage of about 236 volts applied to them to heat the atmosphere within the four vertical corner ducts. The dryer temperature selector 318 is adjustable by the selector knob 47 to select the temperature to be maintained during the drying period.

If it is desired only to provide a wash period, the switch 243 is opened. If it is desired to dry the clothes following the washing and rinsing periods the switch 243 is closed. The closing of the switch 243 shunts or bypasses the switch 236 which is operated to open position by the cam 238, at the end of the final centrifuging period of the washing cycle. To start operation at the beginning of the washing period, the knob 43 is turned to the start

position for the wash period. If only drying is desired, the knob 43 is turned directly to the starting position for the drying period. The cam 238 is arranged so that it recloses the switch 236 after the opening thereof at the end of the final centrifuging period.

The knob 43 is also pushed in to close the switch members 229 and 231. This energizes the timer motor 221 which operates the cams 253 and 261 to close the switches 255 and 263 to energize the solenoids 257 and 265 to cause hot water and cold water to flow from the spray pipes 310 and 302 through the water valve 273 and the fill tube 196 into the tub for a sufficient time to fill the tub 57 to a level sufficient for washing.

The timer motor 221 then moves the cam 283 in position to move the reversing switch 285 to the forward position to operate the motor 140 to drive through the shaft 138, the clutch member 144 and the pulley 142 in the forward direction indicated by the arrows in full line on Figure 13. The pulley 142 drives the belt 156 to rotate the inner shaft 95 to rotate the arm 112 and the arm 114 to reciprocate the agitator post 119 and the agitator elements 120 and 121 as a unit. This agitates the liquid and the clothes in the tub. In this direction of rotation, the eccentrics 97 and 99 move and rotate concentrically as shown in Figure 11. These eccentrics rotate within the ring 102 which is supported by the rubber mounting 330 as shown in Figure 7. The plug 190 is withdrawn from the support 85 by the spring 192.

At the end of the washing period, the cam 275 moves the switch 277 to closed position to energize the solenoid 154 to connect the clutch 144 to the pulley 136. At the same time the cam 283 holds the reversing switch 285 in the forward position thereby causing the motor 140 to continue to turn in the same direction as indicated by the dash dot arrows in Figure 13 to drive through the pulley 128 to rotate the tub shaft 73 to spin the tub 57 at a relatively high speed such as 1100 R. P. M. The liquid in the tub and in the clothes is centrifuged out through the perforations 67 in the upper portion of the tub 57 into the bulkhead 87 which is drained by the drain tube 198. The pump 201 pumps this liquid to the drain to the tube 203.

During both of these periods, the one-way clutch 132 unwinds so that the pulley 130 is disconnected from the tub shaft 73. A second rinse period similar to the first washing or agitating periods follows together with a second centrifuging period. If the switch 243 is open, the cam 238 will stop the operation at the end of the final centrifuging period by opening the switch 236. However, if the switch 243 is closed, the timer motor 221 will continue to operate. The cam 289 will then close the switch 291 to energize the solenoid 295 to move the valve 299 to a position connecting the cold water supply conduit 302 with the hydraulic cylinder 178 and also to the condenser spray tube 213. This connects the water system for the drying period as illustrated in Figure 4. The hydraulic cylinder moves the plug 99 up into position within the support as shown in full lines in Figure 7. The water, which flows through the conduit 306 to the condenser supply tube, is sprayed onto the inner walls of the cabinet to condense moisture out of the atmosphere which is circulated by the wobbling of the tub 57 in the chamber above the bulkhead 87.

The cam 283 also moves the reversing switch 285 to the reversing position. The cam 275 moves the switch 277 to the open position to deenergize the solenoid 154 to cause the clutch member 144 to re-engage the pulley 142. This causes the pulley 142 to operate in the reverse direction as indicated by the dotted arrows in Figure 13. The belt 156 drives the pulley 91 and the center shaft 95 in the reverse direction of rotation at a moderate speed for example 350 R. P. M. This moves the eccentrics 97 and 99 to the additive or compounded position illustrated in Figure 12. This causes the eccentric rotation of the bottom of the shaft 95 to cause the tub to wobble about

the point of the plug 190 as illustrated in Figure 6. The counterbalance 112 located on the opposite side of the shaft 95 is rotated eccentrically at the same speed in the same direction within the agitator to minimize vibration during the wobbling of the tub 57.

At the same time, the small pulley 93 through the crossed belt 168 and the pulleys 169 and 164 as well as the belt 166 rotates the pulley 130 in the opposite direction at a relatively slow speed such as 50 R. P. M. The rotation of the pulley 130 in this direction causes the one-way wound spring clutch 132 to engage and connect the pulley 130 to the tub shaft 73 to rotate the tub 73 in the opposite direction at a speed of about 50 R. P. M. This is called turn back. It assists in the distribution of the clothes during drying. This wobbling of the tub in one direction at a suitable rate of speed and the reverse rotation of the tub at a suitable slow speed of turn back provides an excellent distributing and fluffing action for loosening and untangling the clothes following centrifuging. This makes it possible for all of the clothes to be contacted by the warm air which is circulated by the eccentric movement of the tub within the cabinet upwardly through the ducts 205 and 209 and into and out of the tub.

This circulating air, which is heated by the heaters 207, removes moisture from the clothes and carries its moisture to the water film provided by the condenser tube 213 upon the inner surfaces of the cabinet to condense the moisture from this circulating air to dry the clothes. The temperature of the heaters 207 is selected by the knob 47 and controlled by the switch 329. After a sufficient period of time, the cam 312 opens a switch 314 to terminate the heating. The motor 140 continues to operate and wobble the tub until the clothes are cooled. The drying period is terminated by the opening of the reversing switch 285 by the cam 283 and by the opening of the switch 245 by the cam 247.

In Fig. 15 there is an additional solenoid 454 provided for holding the pulley 136 from rotation during agitating periods. This solenoid 454 is fixed to the motor 140 and has an armature 452 connected by the spring 450 to a T-shaped lever 448 provided with a projection 449 for engaging the projections 147 upon the pulley 136. The solenoid 454 is energized during the agitating period to pull the lever 448 and the projection 449 in a clockwise direction so that the projections 147 engage the projection 449 to prevent rotation of the pulley 136. This prevents the rotation of the tub 57 as well as the arm 112 during the agitating period so that the rotation of the shaft 95 is converted 100% to this vertical reciprocation of the agitator. When the solenoid 454 is deenergized, the return spring 456 returns the lever 448 in the counter-clockwise direction to the position shown in Figure 15 thereby withdrawing the projection 449 out of the path of the projections upon the face of the pulley 136. The spring 456 extends between a second arm upon the lever 448 to an ear upon the support for the solenoid 454, providing a stationary anchorage.

In accordance with the provisions of Rule 78a, reference is made to the following prior filed applications:

S. N. 392,222, filed November 16, 1953; S. N. 392,223, filed November 16, 1953, now Patent No. 2,801,549; S. N. 439,989, filed June 29, 1954.

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, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A washing machine including an upright centrifuging tub having a top opening, a bearing for rotatably mounting said tub upon an upright axis, an agitator within said tub, a drive means, a substantially vertical reciprocating means connecting said drive means and said agitator for substantially vertically reciprocating said agitator, a rotating connection connecting said driving means and said tub

for spinning said tub for centrifuging purposes, and means connecting said drive means and said tub for wobbling said tub at one speed and at the same time rotating said tub at a different speed for fluffing the clothes.

2. A washing machine including an upright centrifuging tub having a top opening, a bearing for rotatably mounting said tub upon an upright axis, an agitator within said tub, a drive means, a vertical reciprocating means connecting said drive means and said agitator for substantially vertically reciprocating said agitator, a rotating connection connecting said driving means and said tub for spinning said tub for centrifuging purposes, and means connecting said drive means and said tub for wobbling said tub at one speed and at the same time rotating said tub at a different speed for fluffing the clothes, a casing surrounding said tub, heating means within said casing adjacent said tub, and condensing means within said casing adjacent said tub.

3. A washing machine including an upright centrifuging tub having a top opening, a bearing for rotatably mounting said tub upon an upright axis, an agitator within said tub, a drive means, a vertical reciprocating means connecting said drive means and said agitator for vertically reciprocating said agitator, a rotating connection connecting said driving means and said tub for spinning said tub for centrifuging purposes, said reciprocating means having an eccentrically located mass, and means connecting said drive means and said reciprocating means for wobbling said tub and connecting said drive means and said tub for rotating said tub.

4. A washing machine including an upright centrifuging tub having a top opening, a coaxial first upright member rotatably mounted beneath the tub, an upright bearing between said member and said tub for rotatably mounting said tub upon said member, an agitator within said tub provided with a second upright member having an upright slidable nonrelatively rotatable connection with said tub, said second upright member having a portion extending above said bearing, one of said upright members being provided with an inclined bearing above said upright bearing and the bottom of the tub, the other of said members being provided with a first arm above said upright bearing and the bottom of the tub, a movable arm rotatably mounted on said inclined bearing above said upright bearing, a pivotal connection between said arms located above said upright bearing and the bottom of said tub, said arms and inclined bearing and pivotal connection being located substantially within said agitator, and means for rotating said coaxial first upright

member relative to said tub to reciprocate said agitator up and down relative to said tub.

5. A washing machine including an upright centrifuging tub having a top opening, a coaxial first upright member rotatably mounted beneath the tub, an upright bearing between said member and said tub for rotatably mounting said tub upon said member, an agitator within said tub provided with a second upright member having an upright slidable nonrelatively rotatable connection with said tub, said second upright member having a portion extending above said bearing, one of said upright members being provided with an inclined bearing above said upright bearing and the bottom of the tub, the other of said upright members being provided with a first arm above said upright bearing and the bottom of the tub, a movable arm rotatably mounted on said inclined bearing above said upright bearing, a pivotal connection between said arms located above said upright bearing and the bottom of said tub, said arms and inclined bearing and the bottom of said tub, said arms and inclined bearing and pivotal connection being located substantially within said agitator, and means for rotating said coaxial first upright member relative to said tub to reciprocate said agitator up and down relative to said tub, and means for rotating said coaxial first upright member and said tub in opposite directions at different speeds.

6. A washing machine including an upright centrifuging tub having a top opening, a bearing for rotatably mounting said tub upon an upright axis, an agitator within said tub, a drive means, a substantially vertical reciprocating means connecting said drive means and said agitator for substantially vertically reciprocating said agitator, a rotating connection connecting said driving means and said tub for spinning said tub for centrifuging purposes, said reciprocating means having an eccentrically located mass in its upper portions and an eccentric arrangement in its lower portion, and means connecting said drive means and said reciprocating means for operating said eccentrically located mass and said eccentric arrangement to wobble said tub and coincidentally connecting said drive means and said tub for rotating said tub.

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