

Nov. 11, 1958

K. O. SISSON

2,859,877

SUSPENSION SYSTEM FOR SPINNER TYPE WASHING MACHINE

Filed Aug. 30, 1954

4 Sheets-Sheet 1

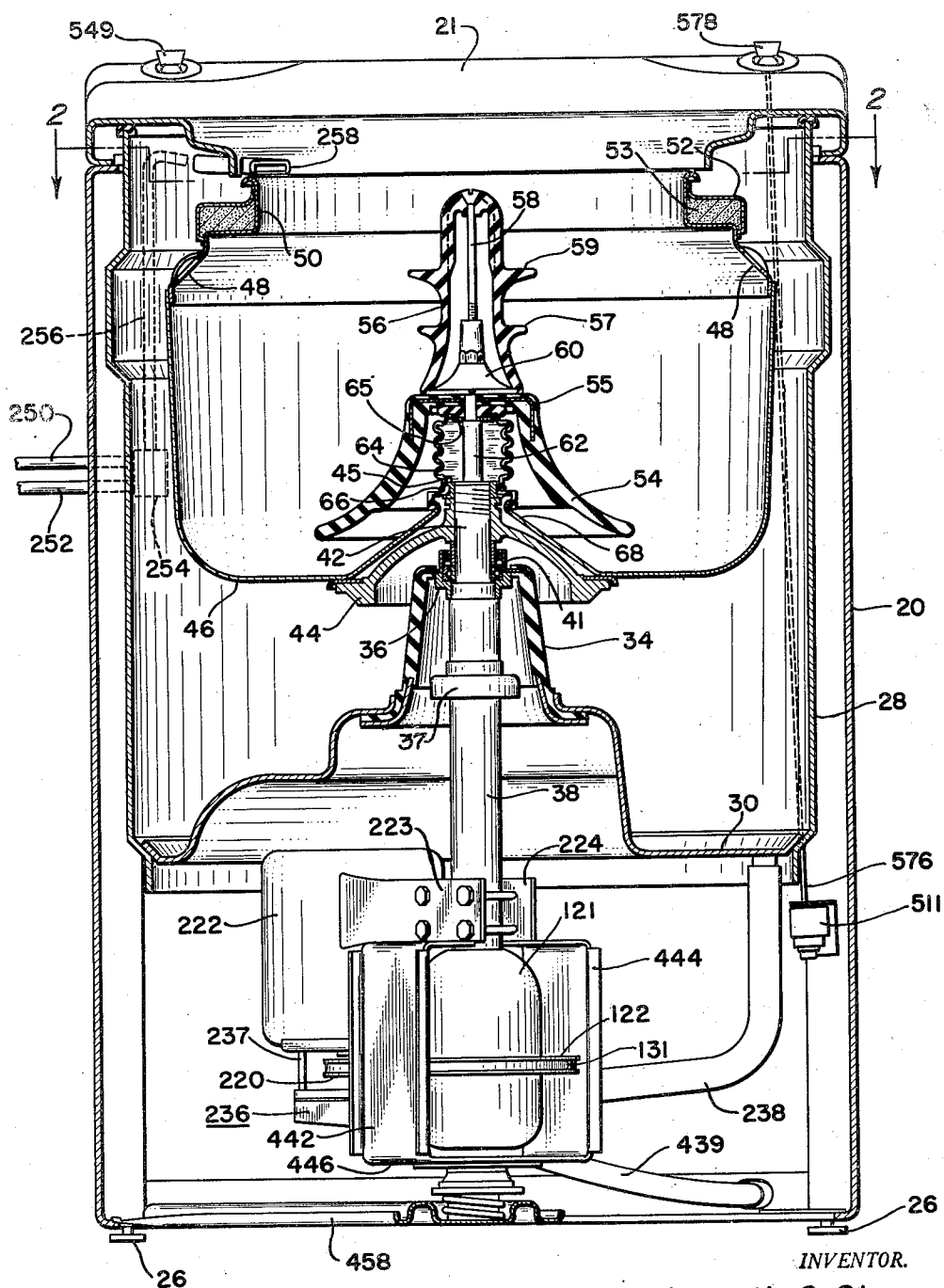


Fig. 1

INVENTOR.
Kenneth O. Sisson
BY *R. R. Clandor*
His Attorney

Nov. 11, 1958

K. O. SISSON

2,859,877

SUSPENSION SYSTEM FOR SPINNER TYPE WASHING MACHINE

Filed Aug. 30, 1954

4 Sheets-Sheet 2

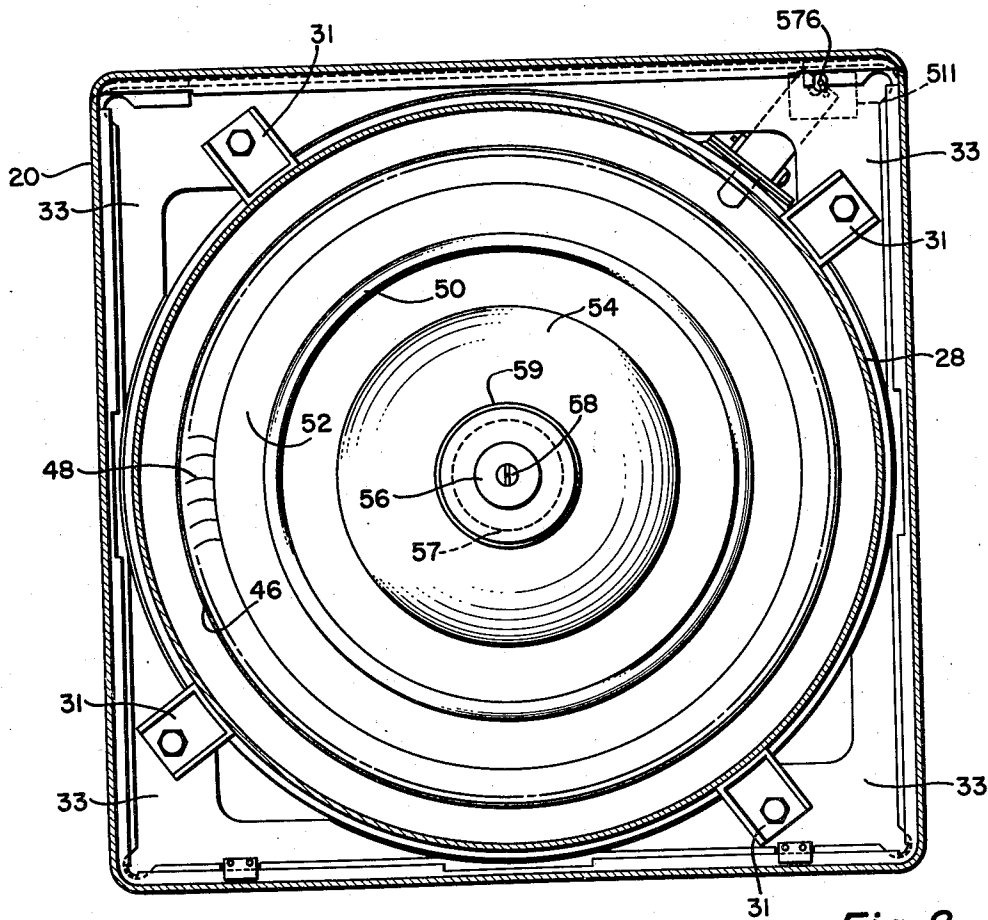


Fig. 2

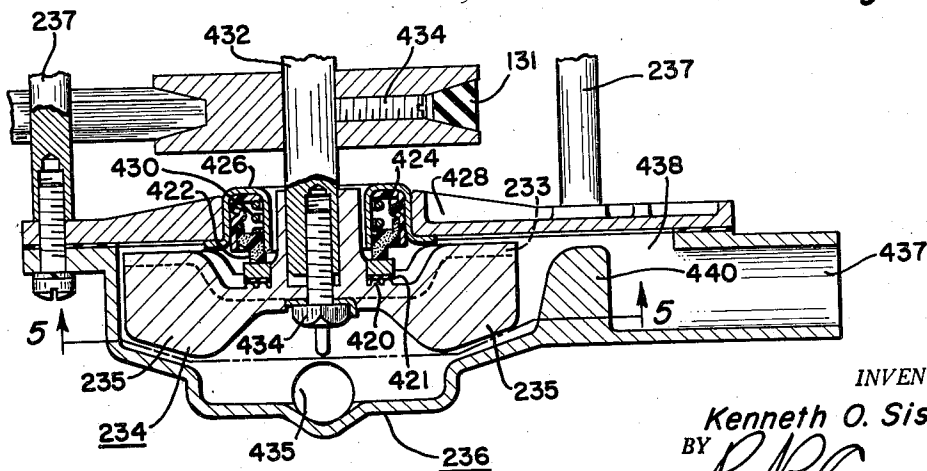


Fig. 4

INVENTOR.

Kenneth O. Sisson
BY *R. R. Candor*
His Attorney

Nov. 11, 1958

K. O. SISSON

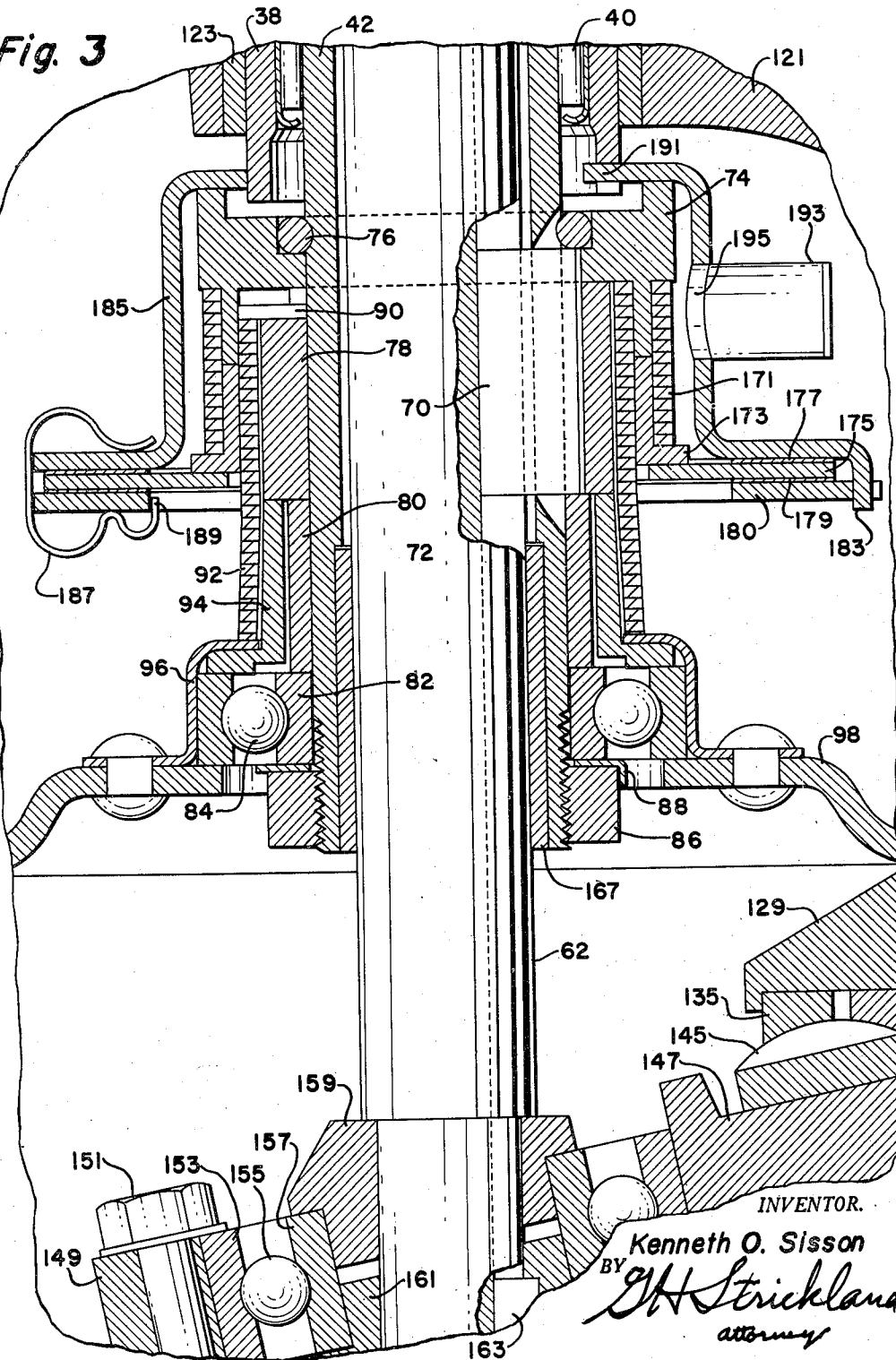
2,859,877

SUSPENSION SYSTEM FOR SPINNER TYPE WASHING MACHINE

Filed Aug. 30, 1954

4 Sheets-Sheet 3

Fig. 3



Nov. 11, 1958

K. O. SISSON

2,859,877

SUSPENSION SYSTEM FOR SPINNER TYPE WASHING MACHINE

Filed Aug. 30, 1954

4 Sheets-Sheet 4

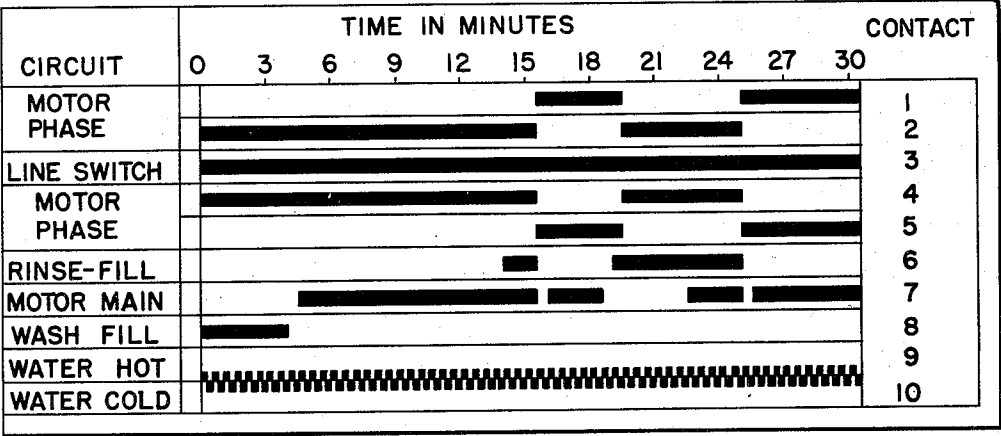


Fig. 8

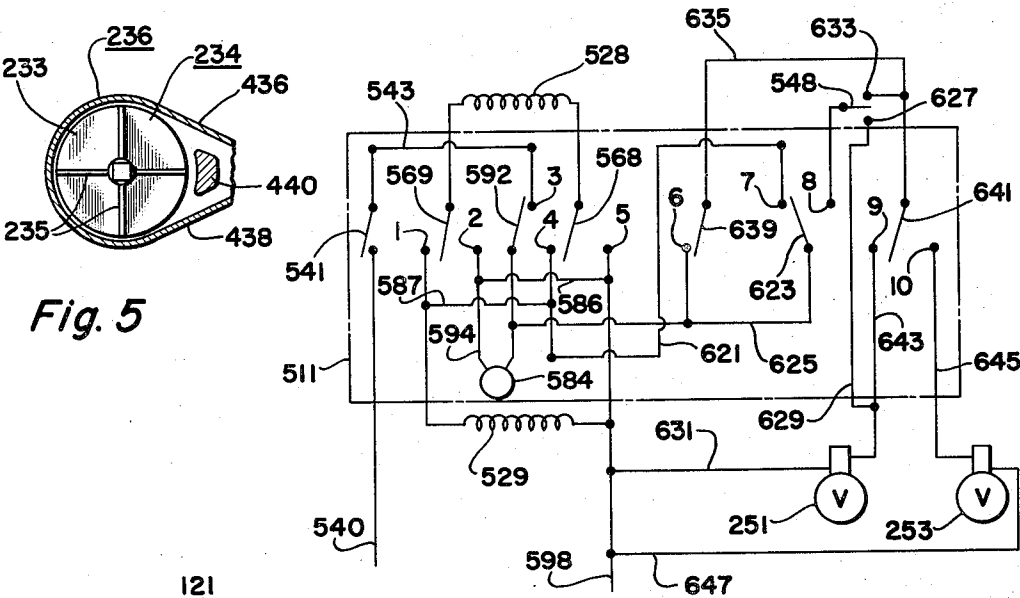


Fig. 5

Fig. 7

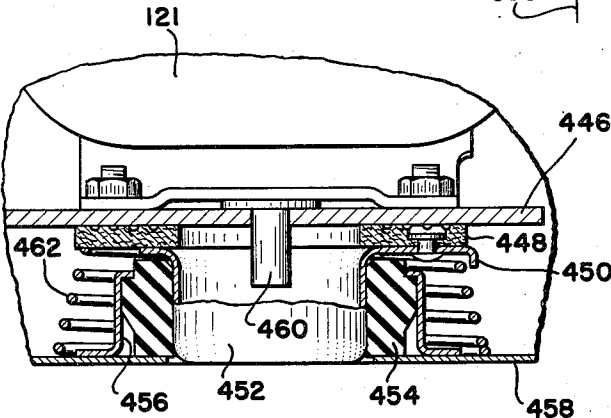


Fig. 6

INVENTOR.

Kenneth O. Sisson

BY

R R Candor

His Attorney

1

2,859,877

SUSPENSION SYSTEM FOR SPINNER TYPE WASHING MACHINE

Kenneth O. Sisson, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application August 30, 1954, Serial No. 452,772

1 Claim. (Cl. 210—365)

This application is a continuation-in-part of my co-pending application S. N. 281,062 filed April 8, 1952 which issued on August 14, 1956 as Patent 2,758,685.

This invention relates to a domestic appliance and more particularly to automatic washing machines having means for agitating the clothes within the tub and for rotating the tub to centrifugally dry the clothes.

At the present time, automatic washing machines cost much more to manufacture and sell than the best wringer washers. These automatic washers have agitating mechanisms involving a number of large expensive and complicated parts.

It is another object of my invention to provide an improved suspension system for the tub and agitating mechanism which is more simple and inexpensive and which reduces the transmission of vibrations and limits their amplitude.

It is another object of my invention to provide an improved support and snubber arrangement for the tub agitator and mechanism assembly of a centrifuging type automatic washer having a rotatable lower housing portion.

These and other objects are attained by providing a washing machine in which the catch basin surrounds the tub. The housing which supports the tub and agitator is resiliently mounted upon a conical rubber member supported by the catch basin. The tub is rotatably mounted upon the housing. At the bottom of the housing, the tub is connected by alternate two-way over-running clutch mechanisms either connected through a normally stationary friction device to the housing or connected to a second housing rotatably mounted upon the first housing. This second housing is reversibly rotated by a reversible motor through a pulley and a belt which surrounds the second housing. An agitator within the tub is connected by a shaft extending through the first housing into the second housing where it is connected by an angularly mounted bearing to a pivoted member connected to the rotatable second housing.

The drive motor rotates in one direction to rotate the second housing while the tub is kept stationary through the winding up and gripping of a wound spring clutch extending between a member connected to the tub and the friction device connected to the first housing. When the drive motor is reversed this wound spring clutch is released and a second wound spring clutch is wound and grips to provide a connection between the rotatable second housing and the shafts connecting with the tub.

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 invention is clearly shown.

In the drawings:

Figure 1 is a vertical sectional view, partly diagrammatic, through an automatic washing machine embodying one form of my invention;

2

Figure 2 is a top horizontal sectional view of the machine taken substantially along the lines 2—2 of Figure 1;

Figure 3 is an enlarged view of the mechanism within the rotatable housing with the wound spring clutch members shown in position for the agitating operation;

Figure 4 is a sectional view through the rotatable pump drive shaft and the driving pulley;

Figure 5 is a miniature sectional view of the pump taken substantially along the lines 5—5 of Figure 4;

Figure 6 is a vertical sectional view of the snubber arrangement provided at the bottom of the rotatable housing;

Figure 7 is a wiring diagram; and

Figure 8 is a time chart applicable to the wiring diagram to show the various operations and connections throughout the washing cycle.

Referring now to the drawings and more particularly to Figure 1 there is shown an outer cabinet shell 20 provided with box-shaped front and side walls having their lower edges intumed to provide a mounting for the adjustable feet 26. Within the cabinet 20 there is provided a catch basin having a vertical tubular portion 28 extending substantially to the top of the cabinet. The vertical tubular portion 28 connects to a bottom portion 30 having a raised center provided with an opening. The vertical tubular portion 28 is provided with inverted L-shaped support brackets 31 adjacent its upper edges which extend over and are supported by gussets 33 provided at the corners of the outer cabinet shell 20. The outer shell 20 may be coated with porcelain enamel before the catch basin is assembled therein.

Extending over the opening in the raised center of the bottom portion 30 of the catch basin is a truncated cone-shaped rubber-like member 34 of a suitably compounded synthetic rubber. The upper end of this member 34 is provided with a supporting flange 36 fastened upon the supporting tubular housing 38. The tubular housing 38 is provided with a concentrically located stop collar 37 within and spaced from the lower portion of the truncated cone-shaped rubber-like member 34. This collar 37 upon extreme lateral movement of the housing 38 engages the adjacent portions of the member 34 to limit the lateral movement of the housing 38. Rotatably mounted within this supporting tubular housing 38 upon a lower bearing 40 and a suitable upper ball bearing 41 is a tubular shaft 42, the upper end of which connects to a hub member 44 to which the tub 46 is connected and sealed. The tub 46 is provided with a series of apertures 48 adjacent its upper periphery and also an upper rim 50 of reduced diameter which prevents the loss of the clothes during the spinning or centrifuging operation. To reduce the vibrations of the mechanism during the spinning of the tub, the upper rim is provided with a spaced housing 52 so as to hold metal particles 53 between it and the rim 50 to form a suitable flywheel.

Within the tub there is provided a flared agitator 54 which is bell-shaped and has an inner metal reinforcement 55 in its upper portion. On top of the flared agitator 54 is a pilot 56 extending above the water level to prevent clothes from being caught when the agitator 54 operates up and down through a stroke of about 7/8 of an inch with a clearance of about 1 1/4 inches between the bottom of its flared skirt and the bottom of the tub 46. The pilot is provided with integral flange rings or annular ribs 57 and 59 which agitate and aerate the liquid in the upper portion of the clothes and during the rinse cycle to disperse and dissolve any light foreign matter on the top of the liquid. The pilot is fastened by a long screw 58 extending downwardly through its top and threaded into a bell-shaped cap nut 60. This bell-

shaped cap nut clamps the central portion of the flared agitator member 54 and the top portion of the flexible rubber bellows seal 64 to a washer 65 on the top of the agitator shaft 62. The bottom of the bellows seal 64 is connected to a nut 45 threaded onto the top of the tubular shaft 42 on top of the hub member 44. The seal between the bellows 64 and the nut 45 is made by a wire ring 66. The bellows 64 extends downwardly below the nut 45 and is clamped to an outwardly curled inner neck portion 68 of the tub 46. This bellows seal 64 prevents any leakage of the fluid in the tub into the mechanism and also into the catch basin.

The lower portion of the tubular shaft 42 is provided with a key 70 fitting into a slot 72 in the inner shaft 62 connecting with the agitator to provide a slidable non-rotatable connection between the inner and outer shafts 62 and 42. The key 70 also provided a connection with the clutch member 74 mounted upon the outside of the shaft 42. This clutch member 74 is locked on its upper side by a ring 76 fitting in a notch provided in the outer surface of the shaft 42 and lodged within a recess in the member 74. The bottom of the clutch member 74 rests against a second clutch member 78 surrounding the shaft 42 in engagement with a spacing sleeve 80 resting upon the inner race 82 of a ball bearing 84. This assembly of the members 74, 78, 80 and 82 is locked in place against the ring 76 by the nut 86 which is threaded upon the bottom of the shaft 42 and locked in place by a suitable lock washer 88. The key 70 also engages a notch in the member 78. The member 78 holds the turned in end portion 90 at the upper end of a wound spring clutch member 92 which is wound in such a direction that the spring 92 will be unwound as shown in Figure 3 when the hub 94 is turned in the direction for the agitating operation. The hub 94 rests upon the outer race of the ball bearing 84 which is held in place by a cup member 96 riveted to the plate 98.

The outer periphery of the plate 98 is notched and its projections are fastened to the rotatable housing member 121. This rotatable housing member 121 surrounds the clutch mechanism shown in Figure 3 and has a plain bearing 123 at its upper end supported by the lower portion of the tubular housing support 38.

The rotatable housing member 121 is provided with a V groove pulley 112 which is fixed to its outer surface. This V groove pulley receives a V belt 131 by which the housing 121 is rotated in either direction. The housing 121 at one side is provided with an inwardly extending projection 129 which receives an inner spherical socket member 135 and an adjacent similar but oppositely turned outer spherical socket member. These spherical socket members hold the spherical bearing member 145 which has an inner cylindrical bearing and provides a pivotal and sliding connection between the housing member 121 and an extending pin 147 which slides within the cylindrical bearing provided in the spherical bearing member 145. The unbalance of these parts may be balanced by a suitable external counterweight. The extending pin 147 is in the form of a projection from the ring-shaped member 149 to which is clamped by three bolts 151 the outer race 153 of a ball bearing 155. The inner race 157 of the ball bearing 155 is mounted upon the angular support member 159 against the shoulder provided by a reduced end portion of the inner shaft 62. The inner race 157 is also held in place by a complementary lower angular support member 161 set at the same angle to the axis of the shaft 62 as the support member 159. It is keyed to the shaft 62 by the key 163 and locked in place by a nut (not shown) threaded onto the bottom of the stub end of the inner shaft 62. The shaft 62 is centrally located within the tubular shaft 42 by a plain bearing 167 located in the vicinity of the nut 86.

The clutch mechanism includes a second wound spring 75

clutch member 171 which is wound so as to grip internally. The upper end of this wound spring clutch member 171 is supported upon an outer spring engaging surface of the clutch member 74 while the lower end of this wound spring clutch member 171 is supported upon an outer spring engaging surface of an element 173 of a friction device. This element 173 is bonded directly to a friction disc 175 having friction facings 177 and 179 upon its upper and lower surfaces. Below the friction surface 179 there is provided a friction disc 180 having notches on its periphery which are engaged by tongues 183 extending downwardly from an inverted flanged cup-shaped member 185. A plurality of C-shaped spring members 187 having a projection 189 extending into the inner periphery of the friction ring disc 180 are provided for applying a limited pressure to the ring disc 180 to hold the facing 177 against the lower surface of the inverted cup-shaped member 185 and to hold the friction ring disc 180 against the facing 179. The upper portion of the inverted cup-shaped member 185 is provided with a plurality of inwardly extending tongues 191 engaging notches provided at the lower end of the tubular housing member 38. This arrangement therefore provides a friction device in which the elements 185, 187 and 180 are locked to the normally stationary housing 38 so that they do not turn.

The inverted cup-shaped friction element 185 through the friction facings 177 and 179 is connected to the member 173. The member 173 will be connected to the element 74 when the element 74 moves in such a direction as to wind the wound spring clutch member 171 tightly upon the spring engaging surfaces of the members 74 and 173. The member 173 is also connected to the member 74 when the wound spring clutch member 92 is unwound by the spring engaging surface of the member 94 so that the outer surface of the wound spring clutch member 92 then engages the inner spring engaging surface of the member 173 as shown in Figure 3. The wound spring clutch members 171 and 92 are both wound so that their natural tendency is to engage the inner spring engaging surfaces. They are arranged so that when the element 94 is turned in such a direction as to unwind the spring 92, the wound spring clutch member 171 will be wound tightly on its clutch engaging surfaces. At the same time, the unwinding of the wound spring clutch 92 will cause it to engage the inner spring engaging surface of the element 173. This will connect the tub shaft 42 and the agitator shaft 62 through the key 70, the element 74, the wound spring clutch members 171 and 92, the member 173, the friction elements 175, 180 and 185 with the tubular housing member 38.

The tub shaft 42 and the agitator shaft 62 are thereby prevented from rotating while the housing 121 is being rotated in this direction. This rotates in a circle the pivot point for the pivot member 149 thereby forcing the free end of this pivoted member 149 downwardly to the position shown in Figure 3 and thence upwardly to a position in which the inner race 159 has moved $\frac{7}{8}$ of an inch closer to the nut 86. A complete stroke occurs every revolution. This is caused by the fixed angular mounting of the inner race 157 of the ball bearing 155 on the agitator shaft 62. The upward and downward movement of the pivoted member 149 reciprocates the agitator shaft 62 and the agitator 54 through a stroke of about $\frac{7}{8}$ of an inch for agitating the washing liquid in the tub 86.

When the member 94 is turned in the direction to unwind the wound spring 92 and to wind the wound spring clutch member 171, the tubular tub shaft 42 will be connected through the key 70, the element 74, the wound spring clutch members 171 and 92 to the friction disc 175 frictionally connected with the elements 180 and 185 which are locked to the normally stationary tubular housing member 38. This acts as a friction braking device to hold the tubs stationary.

When the member 94 is turned in the opposite direc-

tion to wind inwardly the wound spring clutch member 92 upon the outer spring engaging surfaces of the members 94 and 78, there is provided a connection with the member 78 which is keyed by the key 70 to the tubular tub shaft 42 as well as to the agitator shaft 62. At the same time the wound spring clutch member 171 is unwound to disengage the members 74 and 173. This is the position the clutches assume during the spinning or centrifuging operation.

When the driving motor is stopping for terminating the spinning operation the wound spring clutch 92 will be unwound to provide a connection from the tub shaft 42 through the key 70, the clutch member 74 and both wound spring clutch members 171 and 92 to the friction elements 173 and 175 which rotate relatively to the elements 180 and 185 to permit the tub 46 to continue its rotation at a continuously reducing speed as its inertia is gradually absorbed by the friction upon the friction surfaces 177 and 179.

The rotatable housing 121 is filled with liquid lubricant oil in the amount of between fourteen and twenty ounces. This amount fills the lower portion when the housing is not rotating. When the housing is rotating the centrifugal force throws the lubricant against the inner surfaces of the outer wall of the housing 121. To supply lubricant to the bearings 40 and 123 and the bearing surfaces below them, the inverted cup-shaped friction member 185 is provided with an oil scoop 193 extending out into the lubricant rotating with the housing so that the lubricant is scooped and splashed inwardly so as to supply lubricant to all the bearings in the housing. An aperture 195 is provided at the base of the scoop 193 to direct the lubricant to flow into the portion where the wound spring clutch elements 171 and 92 are located.

The belt 131 connects to a V groove drive pulley 220 provided upon the bottom of a reversible electric motor 222. The motor 222 is supported by the arms 223 and 224 clamped to opposite sides of the lower portion of the tubular housing member 38 by suitable bolts. Below the pulley 220 the motor shaft is provided with an impeller 234 of a centrifugal pump 236. This pump 236 is supported by the rods 237 from the motor 222. The impeller 234 includes a disc-shaped portion 233 and four radial blades 235. The die-cast impeller of soft metal has a sintered bronze ring 420 tightly fitted about its hub. This ring 420 rests upon a ring 421 of rubber-like material which in turn rests upon the annular beads beneath the impeller so that the ring 420 will align itself to the tight bearing provided upon its inner surface with the hub of the impeller 234. A non-metallic type of seal ring 422 or a seal ring of sintered powdered metal has its lower face in sealing relatively rotating engagement with the ring 420. The outer periphery of this ring 422 is sealed to a bellows type sealing member 424 of flexible plastic or rubber which is sealed into an inverted cup 426 tightly fitted into the shaft opening in the top wall 428 of the reversible pump 234. A coil spring 430 holds the adjacent faces together with sealing rings 422 and 420. The hub of the impeller 234 has a recess into which fits the lower end of the motor shaft 432. The impeller 234 is fastened to the lower end of the motor shaft 432 by a suitable screw 434.

The pump 236 is made reversible in an efficient manner by providing converging tangential outlet walls 436 and 438 between which there is provided a trapezoidal-shaped island 440. The pump has an inlet 435 connecting to the outlet tube 238 for the catch basin. The inlet 435 directs the flow of liquid to the center of the pump. The impeller 234 rotates in either direction with the operation of the motor 222 and causes the principal discharge flow on one side or the other of the island 440 depending upon the direction of rotation. A discharge tube 439 connects to the outlet 437 and extends to a suitable drain.

A flanged supporting framework 442 and 444 extends around the rotatable housing 121 and has its upper por-

tion fastened to the tubular housing member 38 immediately beneath the arms 223 and 224. The bottom portion of this framework includes a transverse portion 446 having a flat smooth bottom surface. Engaging this flat bottom surface is a grooved bearing ring 448 of graphited sintered bronze or other suitable material. These surfaces are kept free of lubricant excepting the lubricant which might be obtained from the contacting surfaces themselves such as powdered graphite. The ring 448 is riveted at three points to an inverted hat-shaped member 450 having its crown portion 452 inserted in the center of a circular ring 454 of natural or synthetic rubber. This ring 454 is held in place by a flanged metal member 456 which is fastened to the diagonal cross brace 458. This diagonal brace 458 is fastened at its ends to the intumed flanges at the bottoms of the outer walls. A pin 460 is fastened to the plate 446 and extends downwardly through a large aperture in the ring 448. The lower end of this pin 460 extends into the interior of the crown portion of the hat-shaped member 450. Extreme lateral movement is limited by the engagement of the pin 460 with the inner surface of the crown 452 of the member 448. To apply a proper load to the adjacent friction surfaces of the members 446 and 448 there is provided a conical compression type coil spring 462 which surrounds the ring 454 and has its lower end supported upon the cross brace 458 and its upper end supported within the rim of the inverted hat-shaped member 450.

The washer is supplied with hot and cold water through the hot and cold water supply pipes 250 and 252. The valves 251 and 253 control the flow of water from the supply pipes 250 and 252 into a mixing chamber 254. The mixing chamber 254 connects to a pipe 256 which directs a stream of water across an air gap to a nozzle 258 for discharging water into the tub 46. The selection of either initial hot or initial mixed water fill is made by a switch 548 controlled by the knob 549 upon the top 21 of the cabinet 20. The cabinet 20 is also provided with a timing control 511 having its knob shaft 576 connected to a knob 578 also provided upon the cabinet top 21. This timing control 511 may be like the control shown in Figure 4 of my copending application S. N. 320,598 filed November 14, 1952, now Patent No. 2,748,585, but modified as shown in Figures 7 and 8 to provide for motor reversing.

The general control arrangement is shown in Figure 7 in which a supply conductor 540 through a push-pull switch 541 actuated by the knob 578 is connected by the conductor 543 to the switch terminal 3. The switch terminal 3 is adapted to be connected by the switch 592 to the timer motor 584 having its other terminal connected by a conductor 594 to a switch terminal 2. The conductor 594 is connected by the conductor 586 to the second supply conductor 598. This conductor 598 connects to the terminal 5. The terminal 5 is adapted to be contacted by the switch 568 connected to one terminal of the phase winding 528 of the motor 222. The other terminal of the phase winding 528 is connected by the switch contact 569 either to the terminal 2 or the terminal 1 which is connected to one terminal of the main winding 529 of the motor 222. A second terminal of the main winding 529 is connected to the supply conductor 598. The terminal 1 is also connected by the conductor 587 to the terminal 4.

The terminal 4 and the conductor 587 are connected by the conductor 621 to the terminal 7. The terminal 7 is adapted to be engaged by a double throw switch 623 connected to the conductor 625 which connects to the terminal 6 as well as to one terminal of the timer motor 584 which connects to the switch 592. The switch 623 is also adapted to contact the terminal 8 which is connected to the water control switch 548. This switch 548 is adapted to engage the terminal 627 connected by the conductor 629 to one terminal of the hot water valve 251 while its other terminal is connected

by the conductor 631 to the supply conductor 598. The switch 548 is also adapted to contact the terminal 633 connecting to a conductor 635 which connects to a switch 639 adapted to make engagement with the terminal 6. The conductor 635 also connects to a switch 641 adapted to make contact with either of the terminals 9 or 10. The terminal 9 is connected by a conductor 643 with one terminal of the hot water valve 251 while the terminal 10 is connected by the conductor 645 to one terminal of the cold water valve 253. The other terminal of the cold water valve 253 is connected by the conductor 647 to the supply conductor 598.

The various terminals numbered 1 to 10 are connected in circuit by their respective switch members in the timer 511 as shown in the time chart, Figure 8. The contacts 9 and 10 are alternately engaged to provide mixed hot and cold water which is effective when the switch 548 is in contact with the terminal 633 during the initial fill. This is also effective during the rinse fills when the switch 639 engages the terminal 6. An initial hot water fill is obtained when the switch 548 engages the terminal 627. As shown by the chart, Figure 8, the motor operates in one direction when the contacts 2 and 4 are engaged by their switches 568 and 569 to hold the tub shaft 42 stationary while the agitator 54 reciprocates. During the initial period the contact 8 is also engaged to provide either a hot or mixed water initial fill. Toward the end of this agitating phase, rinse water is added by having the switch 639 engage the terminal 6 as shown by the chart causing the tub to overflow to carry away scum. The motor is then reversed by causing the switch members 569 and 568 to engage the terminals 1 and 5. This causes the housing 121 to be coupled to the tub shaft 42 to spin the tub 46 to extract water therefrom. After the termination of this spinning period there follows a rinse fill with agitation followed by a second spin period or the final spin dry period as shown in Figure 8.

In accordance with the provisions of Rule 78a, reference is made to the following prior filed application: S. N.

316,375 filed October 23, 1952, now Patent 2,795,126, June 11, 1957.

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 claim which follows.

What is claimed is as follows:

A washing machine including a tubular supporting means, a centrifuging tub rotatably mounted upon one end of the supporting means, a rotatable housing enclosing a rotatable mechanism rotatably mounted at the opposite end of said supporting means having means connected to the tub for rotating the tub, a second supporting means connected to the tubular supporting means and extending around said rotatable housing to a point in alignment with the axis of said tubular supporting means, a cabinet surrounding said tub and housing and supporting means, a member extending transversely across the bottom portion of said cabinet beneath said point, and a snubber having one portion in the form of a ring of resilient material with its periphery held by said member and a second portion in the form of a projection extending loosely into the interior of said ring but normally spaced a substantial distance from said ring and connected to said second supporting means, said second supporting means being provided with a friction contact surface, said member being provided with a friction contact surface in contact with the friction contact surface of said second supporting means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,161,604	Watts	June 6, 1939
2,269,190	Dunham	Jan. 6, 1942
2,346,158	Dyer	Apr. 11, 1944
2,366,236	Clark	Jan. 2, 1945
2,434,199	Dyer	Jan. 6, 1948
2,580,435	Kirby	Jan. 1, 1952
2,646,673	McCarty	July 28, 1953