Jan. 20, 1970 G. J. REED 3,490,569

CLUTCH AND BRAKE COMBINATION FOR AN AUTOMATIC CLOTHES WASHER

Filed Jan. 25, 1968 4 Sheets-Sheet 1

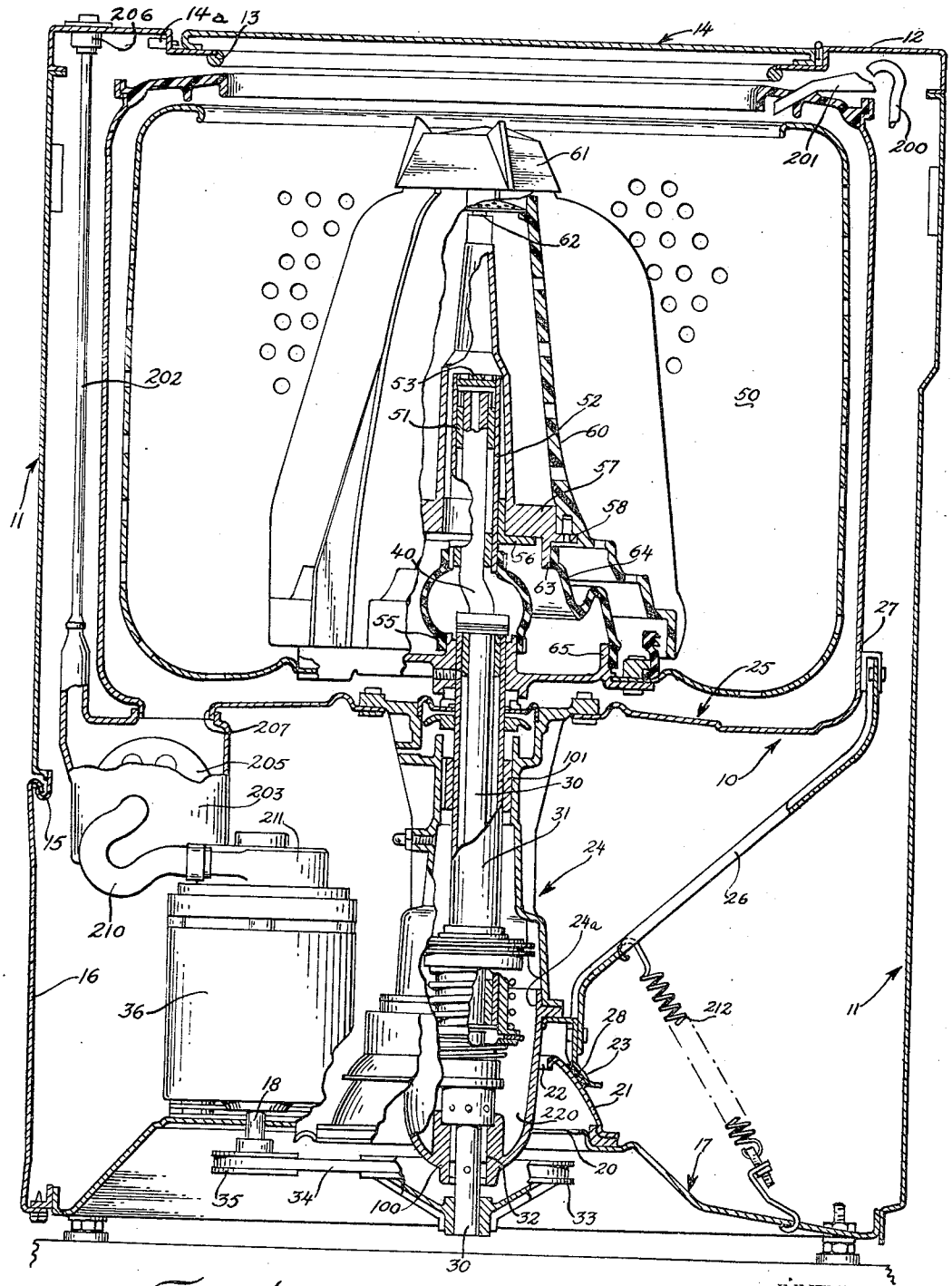


Fig. 1

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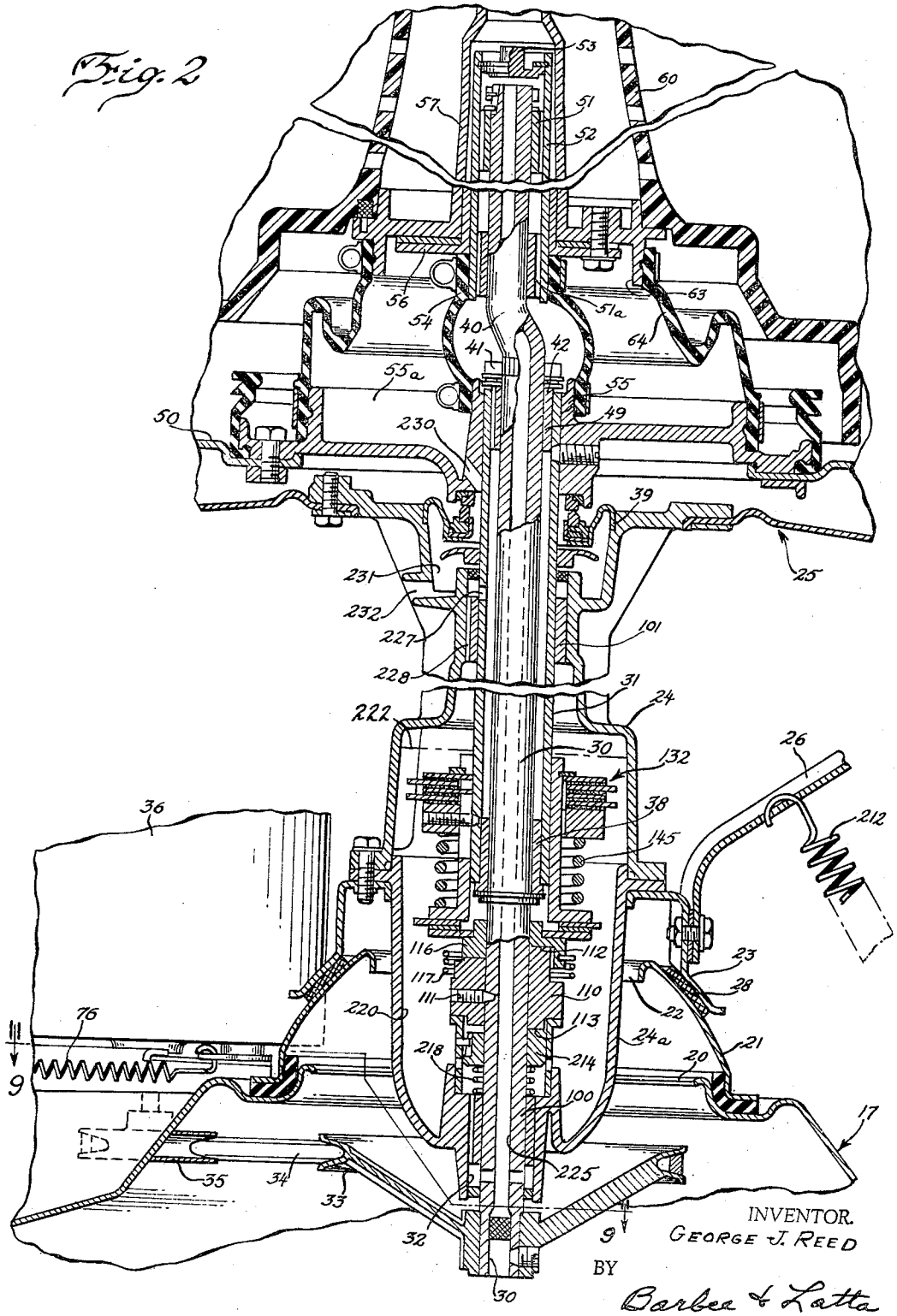
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CLUTCH AND BRAKE COMBINATION FOR AN AUTOMATIC CLOTHES WASHER

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Fig. 2



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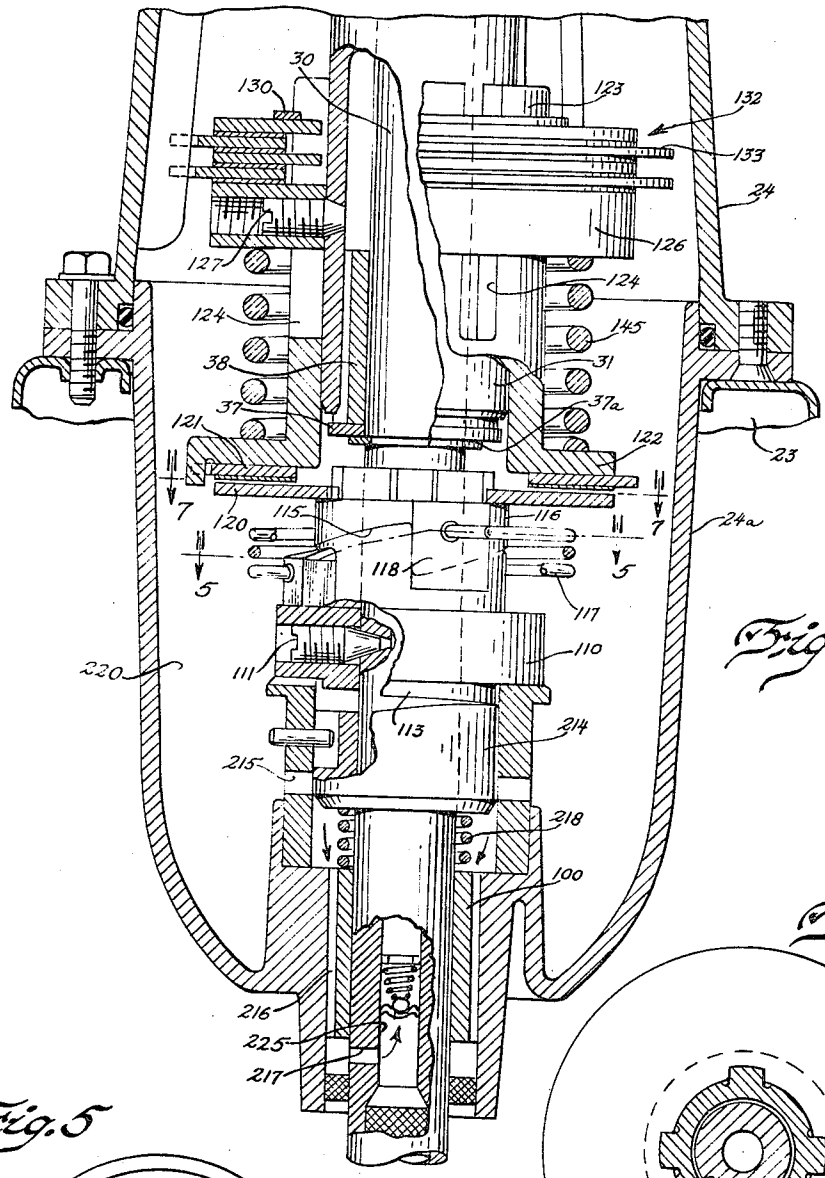


Fig. 3

Fig. 7

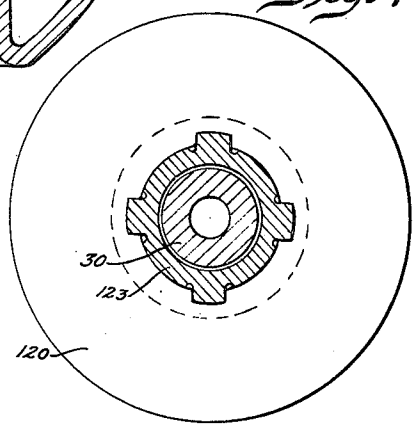
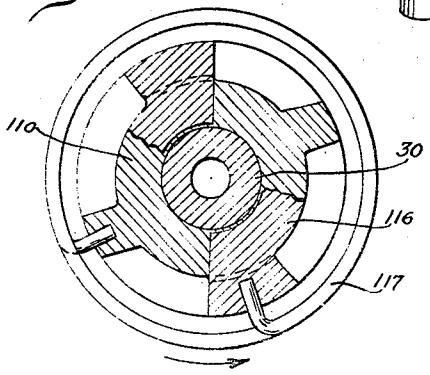


Fig. 5



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CLUTCH AND BRAKE COMBINATION FOR AN AUTOMATIC CLOTHES WASHER

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Fig. 4

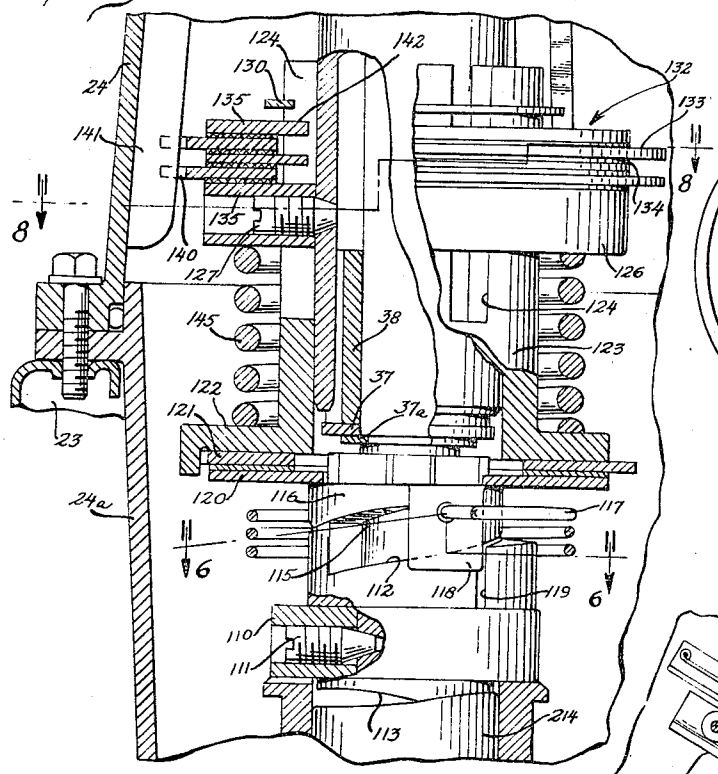


Fig. 6

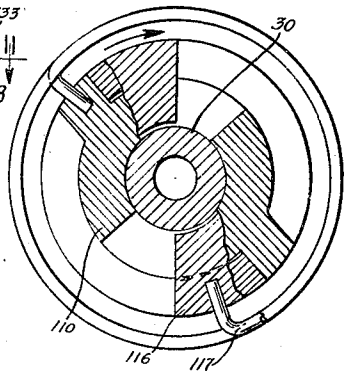


Fig. 9

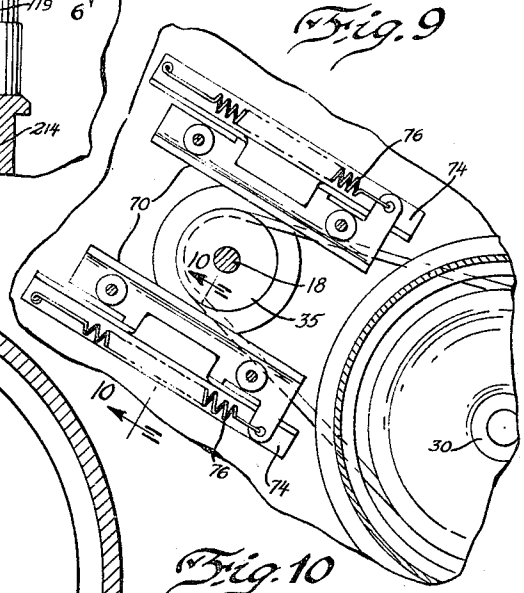
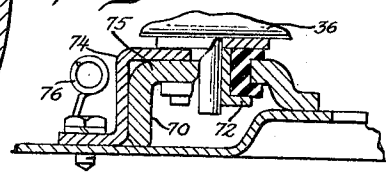


Fig. 10



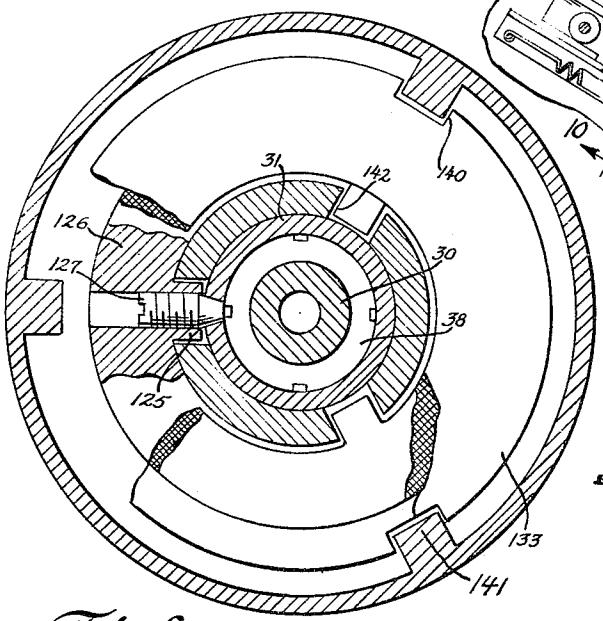


Fig. 8

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United States Patent Office 3,490,569
Patented Jan. 20, 1970

3,490,569

CLUTCH AND BRAKE COMBINATION FOR AN AUTOMATIC CLOTHES WASHER

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Int. Cl. F16d 11/06, 43/00; D06f 29/00
U.S. Cl. 192—18 3 Claims

ABSTRACT OF THE DISCLOSURE

A washing machine of the automatic type wherein the clothes retaining basket is perforated and the water retaining tub is concentric with and rather closely positioned relative to the basket. A novel drive mechanism is employed with co-axially arranged agitator and spin shafts.

BACKGROUND OF INVENTION

Field of invention

The invention is in the field of automatic washing machines of the vertical axis type.

Description of the prior art

The prior art discloses an automatic washing machine in which the clothes carrying basket is perforated and the water retaining tub is concentric with and rather closely spaced to the basket. The tub is supported on braces which have their upper ends fastened to the tub and their lower ends fastened to a ring which is mounted for nutational movement on a dome which is secured to a stationary base member. Centering springs have their inner ends secured to the ring and their outer ends secured to the stationary base members. The springs collaborate in resisting the nutational movement of the ring relative to the dome such as when an unbalanced wash load is encountered. A single pulley drive from a reversible motor permits accomplishing the agitation cycle and spin cycle through co-axially arranged agitation and spin shafts.

SUMMARY OF THE INVENTION

The invention contemplates a perforated clothes carrying basket in combination with a stationary water carrying tub arranged concentric therewith. A reversible motor drives a single pulley which in turn drives an agitator shaft in either direction and a co-axially arranged spin shaft in one direction. A casting which houses both shafts also provides the support for the stationary tub relative to the base portion of the cabinet which forms the outer shell of the machine. A novel drive mechanism is arranged within the support housing for effecting rotation of the agitator shaft in one direction during the agitation period and then for rotating the spin shaft in reverse direction during the water removal period. A collar fixed to the agitator shaft serves to actuate an oil pump at one of its ends and serves to effect clutching and de-clutching at its other end. A brake mechanism holds the spin shaft stationary during the agitation period and during the period in which the basket overruns the spin shaft after de-clutching has occurred.

The principal object of the invention is to provide, in a vertical axis type washing machine, an improved supporting structure for the stationary tub and the components associated therewith and to provide an improved drive assembly for use in conjunction with the improved supporting structure.

Another object is to provide a novel lubricating system for use with a washing machine as hereinbefore described.

BRIEF DESCRIPTION OF DRAWINGS

FIGURE 1 is a vertical sectional view of the washing machine, partly broken away to show the various working parts thereof.

FIGURE 2 is a more detailed enlarged sectional view of the washing machine, partly broken away to show more clearly the working mechanism of same.

FIGURE 3 is a section, partly broken away, to show the brake and cam mechanism of the washing machine.

FIGURE 4 is a section, partly broken away, showing the collar and cam mechanism for braking the washing machine.

FIGURE 5 is a section taken substantially along line 5—5 of FIGURE 3.

FIGURE 6 is a section taken substantially along line 6—6 of FIGURE 4.

FIGURE 7 is a section taken substantially along line 7—7 of FIGURE 3.

FIGURE 8 is a section taken substantially along line 8—8 of FIGURE 4.

FIGURE 9 is a top plan view of the motor mounting taken along line 9—9 of FIGURE 2, and

FIGURE 10 is a section taken substantially along line 10—10 of FIGURE 9.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawings the numeral **10** designates in general a washing machine.

The cabinet comprises a base mounting plate **17** upon which are mounted four vertical side walls **11** and a top **12** having an access opening **13** closed by a lid member **14**. Access into the lower portion or machine compartment of the cabinet **11** is through an opening **15** formed in one of the vertical side walls of the housing—the same being closed by a closure plate **16**.

As shown best in FIGURES 1 and 2 of the drawings, located centrally in base plate **17** is an opening **20**, and also secured to plate **17** directly over opening **20** is a dome member **21** having a central opening **22** in axial alignment with opening **20**. Supported for movement on dome **21** is an annulus ring **23**, which in turn is rigidly secured to a vertically extended tubular shaped housing **24**, the same being adapted to support and carry at its upper end a tub member **25**. To prevent the outer, or circumferential portion of the tub **25** from sagging or distorting, there are provided diagonal brace members **26** (only one of which is shown) adapted to secure the peripheral portion **27** of the tub **25** to annulus ring **23** to cooperatively form with the housing **24** a more rigid support for tub **25**, particularly when the tub tends to nutate on the surface of dome **21**. To resist excessive movement of ring **23**, frictional pads **28** are inserted between the annulus ring **23** and the surface of dome **21**.

As will best be seen in FIGURE 1, housing **24** has a portion **24***a* thereof adapted to extend downwardly through openings **20**, **22**, into dome **21** and housing **24** has extending axially therethrough a pair of co-axial shafts **30**, **31** hereinafter identified respectively as the agitator shaft and the spin shaft. Shaft **30** extends outwardly through an opening **32** formed in the lower end of housing portion **24***a*. Secured to the end of agitator shaft **30** is a pulley **33** driven by belt **34**, the belt passing over a pulley **35** operatively driven by a two-directional electric motor **36**. It will be noted that the spin shaft **31** extends co-axially with shaft **30**, and is supported thereby as follows. A collar **37** rests on snap ring **37***a* which is

secured to shaft 30, said collar being adapted to receive, and have resting thereon, a combination sleeve and thrust bearing member 38, to which, and upon which, one end of sleeve shaft 31 is journaled and supported. Shafts 30 and 31 extend co-axially through an upper opening 39 formed in housing 24 and extend into tub 25. Shaft 30 extends beyond the terminated end of shaft 31 and has formed thereon a crank arm 40. To interlock shafts 30, 31, in assembly, a nut 41 is pressed on shaft 30 and a roller bearing 42 is interposed between nut 41 and end of shaft 31. The upper terminated end of shaft 31 is journaled to shaft 30 by means of a sleeve bearing 49.

Secured adjacent the upper end of shaft 31, for rotation therewith, is a perforated clothes receiving basket 50, enclosed within tub 25. Both the tub 25 and basket 50 are provided with access openings, aligned with opening 13, through which clothes may be received into the basket 50, or removed therefrom.

Crankarm 40 extends vertically and upwardly into basket 50. Mounted and positioned upon crankarm 40 are a pair of spaced apart bearing members 51 and 51*a* upon which are journaled a sleeve 52, the same extending co-axially with crankarm 40. Sleeve 52 extends a short distance beyond the terminal end of crankarm 40 and is closed by a plug 53. The lower end of sleeve 52 is open and is connected and secured by a rubber sleeve or boot member 54 to a neck section 55 formed integrally with basket 50.

Secured by a weld, or the like, to sleeve 52, is a collar 56 to which is secured, and rests upon, an agitator supporting member 57, FIGURE 1, said supporting member being formed with a rest 58 upon which seats an agitator 60. The upper end of agitator 60 is secured by a cap 61 threaded upon a stud 62 that extends from the upper end of the agitator supporting member 57. A downwardly extending neck 63 is formed integrally with member 57 and has attached thereto one end of a rubber sleeve 64, the opposite end of same being secured to an upwardly extending neck member 65 formed integrally with basket 50.

As shown best in FIGURES 9 and 10 of the drawings, a two-directional motor 36 is provided, the same being secured to and rests upon a pair of spaced apart parallel slide members 70. The slide members 70 straddle an opening 71 formed in the base plate 10 through which a motor shaft 18 projects for securement therebelow of the pulley 35. Motor 36 is provided with studs 72 which project through rubber grommets 73 for securement to a respective slide member 70. To guide slides 70, so that they will move in a radial direction from the axis of the agitator shaft 30, a pair of tracks 74 are provided, said tracks 74 being in parallel relationship and having vertical walls between which the slides 70 are guided—the same being secured to base 17. Each of tracks 70 are formed with an inwardly turned flange 75 which in turn engages the top of slides 74, and the flanges 75 are in spaced parallel relationship with base 17 to receive therebetween and guide the movement of the slides.

To torsion belt 34, in efficient driving relationship with pulleys 33, 35, there are provided tension springs 76—one end of each spring 76 being attached to a respective slide 70 and the other to a respective track member 74, on base 17.

Agitator shaft 30 is journaled in bearing 100 secured within the lower end of housing 24*a*, FIGURE 1, and in bearings 38, 49, within the co-axial shaft 31, which in turn is journaled in bearing 101 adjacent the upper end of housing 24.

As shown best in FIGURES 3 and 4, shaft 30 is provided with a collar 110 secured in rotation therewith by a screw 111. Formed on the upper and lower ends of collar 110 are, respectively, cam members 112, 113, the lower cam 113 being adapted to actuate an oil pump piston 214 and the upper cam 112 being provided to alter the drive from agitation to spin and back to agitation. Oil pump piston 214 is reciprocally mounted on shaft 30 between cam 113 and a spring 218. Openings 215 are provided to allow oil to be fed from reservoir 220 in housing 24 to passageways 216, in the direction of the arrows, to port 217 and thence to bore 225 in shaft 30, FIGURE 2. A check valve 213 prevents reverse flow of the lubricating oil on the suction stroke of the pump. Cam 112 is in operative engagement with a cam surface 115 formed on sleeve member 116 that is in free sliding relationship on shaft 30. Sleeve 116 is rotated by its cam engagement with cam 112 during agitation, i.e., the cams interlock, as shown best in FIGURE 3. As this occurs, sleeve member 116 is at its lowest drop position on the shaft. On the spin cycle, sleeve member 116 is rotated by spring 117 upwardly on shaft 30 to cause contact of clutch plate 120 with friction pad 121. Friction on the rotating clutch plate 120 then drives sleeve 116 to its highest position, and the two members, cam 112 and sleeve 116, are locked in rotation by abutment 118 on cam 112 striking shoulder 119 on sleeve 116. The upper end of sleeve 116 is splined for interlocking with the clutch plate 120. Clutch plate 120 is carried by sleeve member 116 in its vertical movement. Also, clutch 120 is movable into and out of engagement with a friction pad 121 carried on a flanged end 122 of sleeve 123. Sleeve 123 is mounted upon spin shaft 31 to permit axial movement relative thereto, and also to be locked in driving relation therewith. Sleeve 123 has axially extended slots 124 to receive projections 125 of a collar 126, said collar being secured by a screw 127 to shaft 31 for rotation therewith and also to lock the sleeve 123 in rotation with shaft 31. Sleeve 123, by its slots 124, is permitted axial sliding movement on shaft 31.

As shown best in FIGURES 3 and 4 of the drawings, there is shown a brake mechanism which will stop the spinning basket 50 automatically just as soon as the motor is cut off and the drive begins to coast, and it will also hold basket 50 stationary during agitation. Spaced vertically above and from collar 126 is a ring member 130 attached to sleeve 123 and between the ring 130 and sleeve 123 is brake 132. Brake 132 comprises a plurality of friction plates 133, 134, and friction pads 135, all assembled for axial movement on sleeve 123. Plates 133 are larger in diameter than plates 134. Plates 133 are formed with axially extended slots 140 to receive a respective rib 141 formed integrally on housing 24. Plates 134 are alternated with plates 133 and are each formed with inwardly extending tongues 142, FIGURES 3 and 8, received in slots 124 of sleeve 123. Friction pads 135 are provided between each plate 133, 134, and between the lower plate and collar 126. Between collar 126 and flange 122 of sleeve 123 is a compression spring 145 which normally tends to move sleeve 123 in a downward direction to cause ring 130 to move down upon and compress the brake elements into frictional interlocking relation with each other and to the non-movable collar 126. Collar 126 rotates, but does not move vertically, i.e., axially to the movement of sleeve 123. When the brake has been applied, as described, shaft 31 becomes interlocked with housing 24, and as long as the brake is applied, basket 50 will be held against rotation.

Numeral 200 designates a conduit to bring water from a source, not shown, to a conductor 201, which is in alignment with tub opening 13. A water gauge 202 is provided which receives water through a sump 203, said sump being located below the bottom of drum 25 and has an opening 207 thereinto. Numeral 211 designates a pump connected to sump 203 by pipe 210, to remove water from tub 25 following the various wash and rinse cycles. Secured to the top of water gauge 202 is a control member 206, adapted to trip motor 36 when water rises to a predetermined height in water gauge pipe 202 compressing the air above it. Pump 211 is mounted above motor 36 and is driven thereby.

A baffle 205 is provided to prevent water turbulence spilling the air out of chamber 202.

Three circumferentially equally spaced centering springs **212** are provided, the same being secured to and extending from braces **26** to base member **17** for centering basket **50** relative to tub **25** when undue nutation is caused because of unbalanced wash loads.

The manner in which the washing machine operates is as follows:

The washer is completely automatic—it fills with water, washes, spins to remove wash water, fills with rinse water, rinses, spins damp dry and shuts off automatically. When the user wishes to wash, clothes are loaded into basket **50** through opening **13** in tub **25** and the control knob on the front of the washer, not shown, is turned so that the indicia on same shows "wash," which in turn allows water, hot, cold, or mixed, according to the fabric being washed, to enter tub **25** and basket **50** through conduit **200**, then across an air gap to conductor **201** which in turn delivers the water to basket **50** and through the openings therein to tub **25**. As the tub **25** begins to fill, water passes into sump **203** and on into pipe **202**. As the air in pipe **202** is compressed by the filling water, it will, when a predetermined height of water fill is acquired in the tub, actuate control **206**, which switch actuates an electric circuit, not shown—which turns off the water and at the same time actuates motor **36**.

Motor **36** is two directional and will rotate the armature thereof either clockwise or counter-clockwise. During the wash cycle motor **36** is wired to rotate the armature **18** thereof in a counter-clockwise direction. Armature **18** has a pulley **35** mounted thereon and rotatable along therewith, which in turn has a belt run **34** to a second pulley **33** mounted at the bottom end of drive shaft **30**. As shaft **30** rotates, the shaft in turn rotates collar **110** and cam **112**, mounted thereon, in a counter-clockwise direction, FIGURE 3, which movement in turn locks sleeve member **116** in its low position. As this function is being performed, sleeve member **116** rotates idly as clutch plate **120** is dropped out of engagement with its friction pad **121**. In turn sleeve **123** will have moved to its lowest position by spring **145** to effect a brake engagement and an interlock with the co-axial shaft **31** to prevent its rotation. This movement causes basket **50** mounted on shaft **31**, to be held stationary. As agitator shaft **30** rotates, it moves crankarm **40** secured thereto, which is offset or distorted, in an orbital path about the interior of basket **50** and carries in the same path agitator **60** which is secured to crankarm **40**. As agitator **60** moves in its orbital path it is held against rotation about the axis of crankarm **40** by means of rubber sleeves **54**, **64**. As the sleeves **54**, **64**, are attached to the basket **50**, which is held stationary, the sleeves prevent the assembly on the crankarm **40** from rotating thereon and allow merely movement with crankarm **40** for movement in an orbital path. As described, during the wash cycle, agitator shaft **30** rotates crankarm **40** with agitator **60**, held against rotary movement thereon, in counter-clockwise direction and in an orbital path within basket **50**, until the wash cycle has been completed.

The wash cycle starts after approximately half the amount of wash water has entered the wash tub and with full amount of cleaning agent.

The pump **211** is mounted above and is directly connected to the motor **36** and operates any time the motor is energized. When the pump is rotating in agitation direction it serves no useful purpose. But, when the pump is rotating in spin direction, it discharges the dirty wash water from tub **25** through opening **207**, sump **203**, hose **210**, pump **211** and thence into a suitable laundry tub drain or floor drain as desired. When the spin position of the cycle starts, the motor is energized in spin direction and turns the pump **211** as well as spinning basket **50**. The drag of the water causes the clutch to slip and holds down spin speed until the water is pumped out of tub **25**. When the water is pumped out of the tub, the basket will accelerate to full speed.

The control dial is then turned to the rinse agitation cycle which in turn allows water to again enter tub **25** as in the wash cycle, and motor **36** is again energized. For this cycle motor **36** rotates in a clockwise direction and again rotates shaft **30** and in turn collar **110** and cam **112** effects a lifting action of sleeve **116**, FIGURE 3.

As spring **117** turns it moves from the position shown in FIGURE 3 to the position shown in FIGURE 4, where abutments **118** engage shoulders **119** to interlock the drive in reverse. The lifting of sleeve **116** is of sufficient height to not only engage the clutch members **120**, **121**, to drive sleeve **123**, but also to lift sleeve **116** against the tension of spring **145** interposed between the brake mechanism and flange **122** of sleeve **123** and lift ring **130** to release brake **132**.

The incline on cam surface **115** is such that driving torque is required to hold cams **112** and **115** in their highest position against the force of spring **145** and maintain a released brake. At the conclusion of the spin cycle, or if the motor is deenergized by opening the lid **14** causing switch **14***a* to interrupt the motor current, spring **145** forces sleeve **123** downwardly, thus setting the brake.

Sleeve **123**, through its collar attachment **126** to spin shaft **31**, effects a drive from co-axial agitator shaft **30** to shaft **31**. Inasmuch as basket **50** is rotating, simultaneously shaft **30** is rotating agitator **60**, except the rotation is in a reverse direction and will do no work. In this spin cycle the outer and inner shaft rotate simultaneously which in turn causes the basket, crankarm and agitator to rotate simultaneously in a clockwise direction.

Also during this cycle, water again passes into sump **203** from which it is pumped by means of pump **211** to a hose member and hence to a drain.

As shaft **30** is rotated oil pump piston **214** is reciprocated by cam **113**, mounted between collar **110** and piston **214**. The piston pumps oil (whenever shaft **30** is rotated) from a reservoir **220** in housing member **24***a* through opening **215**, then through bearing slots **216** and then through opening **217** into the bore **225** of the agitator shaft. The pressure occasioned by the pump piston forces the oil up through bore **225** to the upper end of the shaft **30** where it spills over and runs down through the slots in bearings **51** and **51***a*. The oil then passes through the interior of boot **54** into bearing **42** and then through the slots in bearing **49** down along the exterior surface of shaft **30**. The oil then travels through the slots in bearing **38** and back to reservoir **220**. Some of the oil would travel through opening **227** and then through the slots **228** in bearing **101** and back to the reservoir **220**. A check valve **221** is positioned in the bore **225**. The approximate oil level in the housing **24** is indicated at **222** in FIGURE 2. In event a rupture should occur in the boot **54**, any oil leakage would travel into the interior of member **55***a* thence through opening **230** down along the outer surface of spin shaft **31** into chamber **231** and thence out through opening **232**. Thus, the leaking oil would not mix with wash water and ruin the clothes. Should boot **64** rupture water would spill through opening **230** and out through opening **232** onto the floor. The leak would not be concealed so as to cause water eventually to be forced into the drive unit and foul up the drive mechanism. No single failure would allow water to enter the drive unit—only two failures in series could so result.

The centering springs **212**, which extend from braces **26** to base plate **17** recenter basket **50** and tub **25** when undue nutation occurs because of an unbalanced clothes load.

The suspension on this type of automatic washer is such that the system, being free to pivot on the nodal point will seek to rotate about its center of gravity rather than the axis of rotation. Thus, the machine is self-balancing at high speed. The unbalanced load will move toward the axis of rotation and the most eccentric part of the tub will be away from the unbalance. The amount of eccentricity is proportioned to the amount of unbalance.

When the amount of unbalance becomes excessive, striking of the tub against the cabinet would occur except the amount of torque has been limited by the clutch so that the energy absorbed by friction pads **28** would equal input energy through the clutch. Thus, the machine could not accelerate to high speed until some water was expelled from the unbalanced load.

As described, on the wash cycle, drive shaft **30** rotates crankarm **40** with agitator **60**, held against rotary movement thereon, in a counter-clockwise direction and in an orbital path within basket **50**, until the wash cycle has been completed.

I claim:

1. A drive assembly for a washing machine comprising: a hollow support housing; an agitator shaft extending through the housing; a hollow spin shaft coaxially mounted relative to the agitator shaft and having its lower end supported on the agitator shaft; a first collar secured to the agitator shaft; a first sleeve slidably and rotatably mounted on the agitator shaft; resilient means connected to the first collar and first sleeve for establishing a yieldable driving connection therebetween; a second collar secured to the spin shaft; a second sleeve mounted on the spin shaft for axial movement relative thereto; a clutch

interposed between the first and second sleeves and a cam means interposed between the first collar and the first sleeve for causing engagement of the clutch and thereby establishing a driving connection between the agitator shaft and spin shaft.

2. A drive assembly as set forth in claim **1** wherein brake means are mounted on the second sleeve for restraining rotation of the spin shaft.

3. A drive assembly as set forth in claim **2** wherein the second sleeve has a radially outwardly flange to which one portion of the clutch is secured.

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MARK NEWMAN, Primary Examiner

A. D. HERRMANN, Assistant Examiner

U.S. Cl. X.R.

68—23.6; 192—41, 54