March 11, 1958 R. L. ARCHBOLD 2,826,083

DRIVE MECHANISM FOR SPIN-DRIER TYPE WASHING MACHINE

Filed Feb. 15, 1956 3 Sheets-Sheet 1

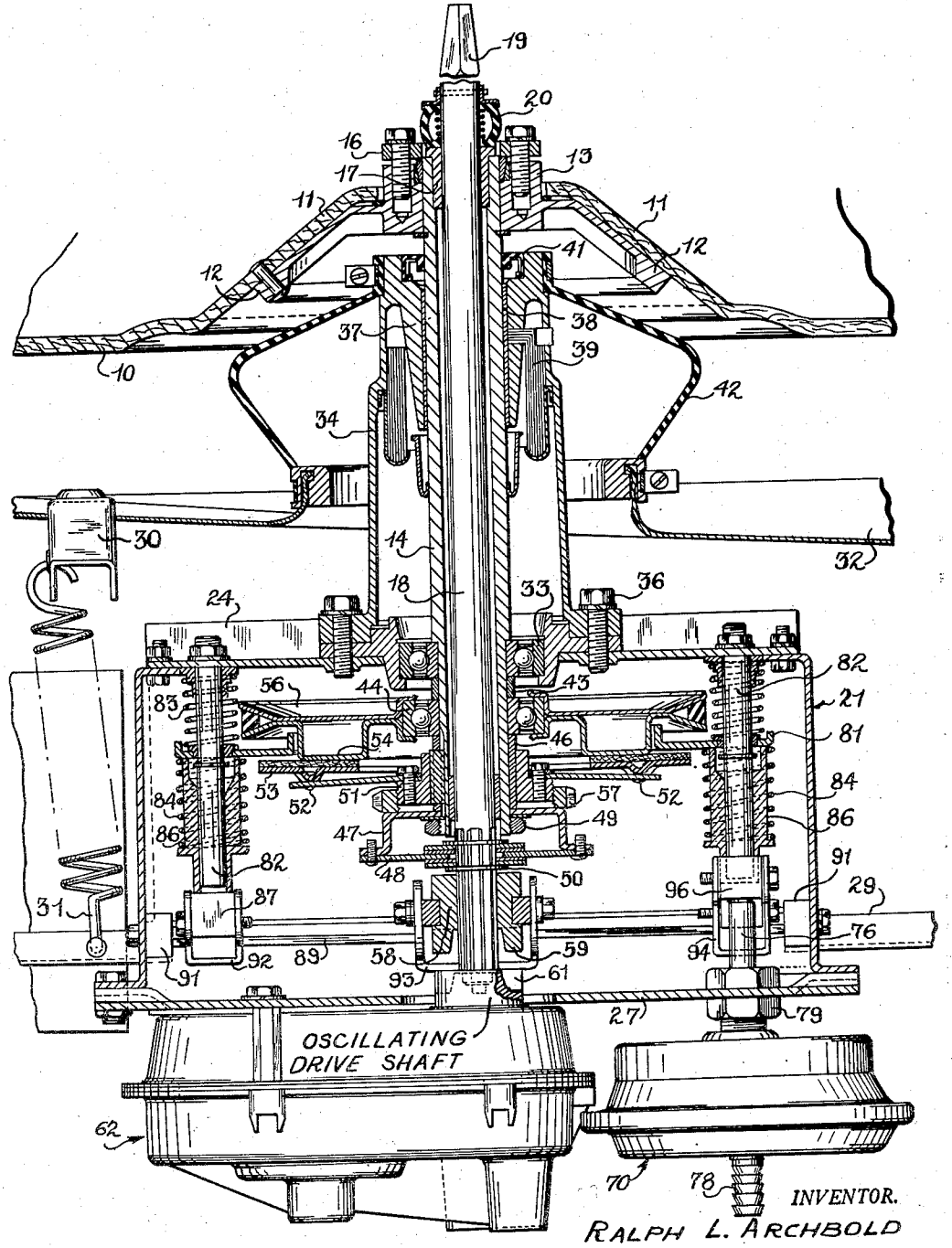


Fig. 1

INVENTOR.
RALPH L. ARCHBOLD
BY
W. G. Sullivan
ATTORNEY

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Filed Feb. 15, 1956 3 Sheets-Sheet 2

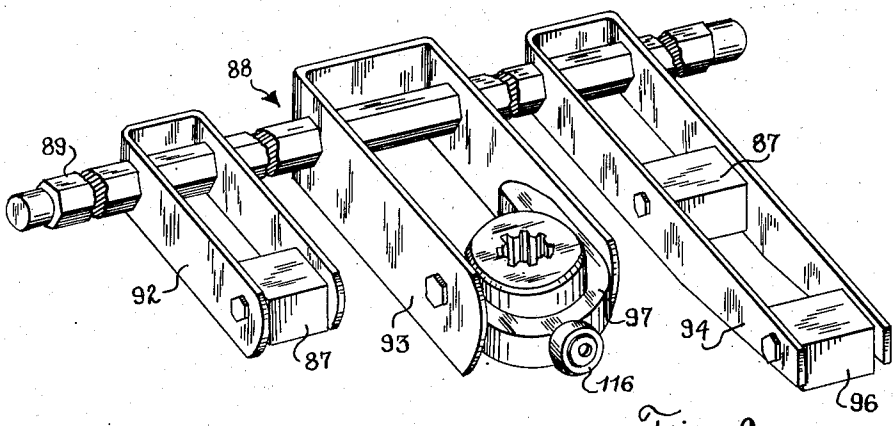


Fig. 2

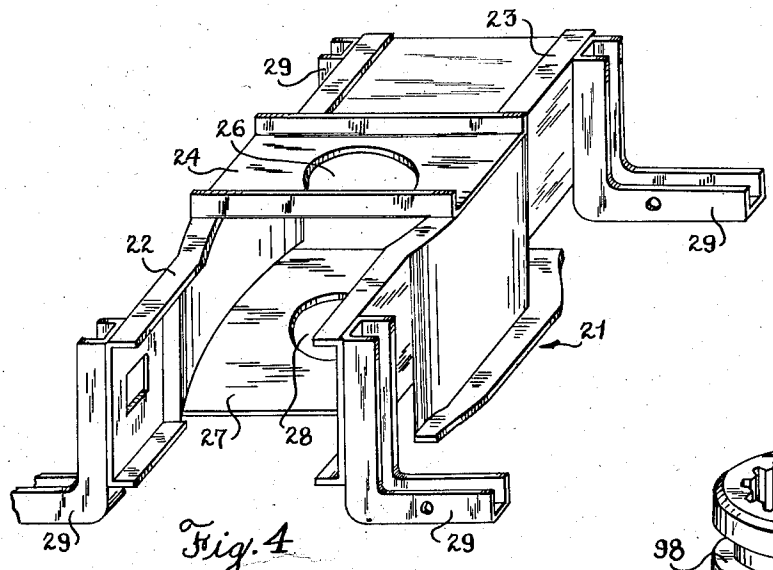


Fig. 4

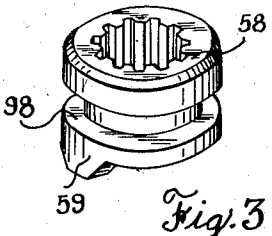


Fig. 3

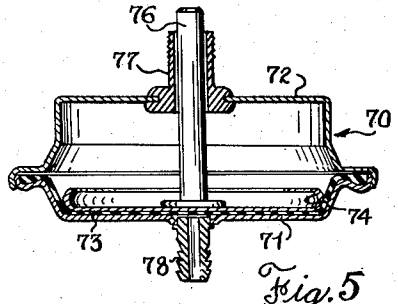


Fig. 5

INVENTOR.
RALPH L. ARCHBOLD
BY
W. G. Sullivan
ATTORNEY

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DRIVE MECHANISM FOR SPIN-DRIER TYPE WASHING MACHINE

Filed Feb. 15, 1956 3 Sheets-Sheet 3

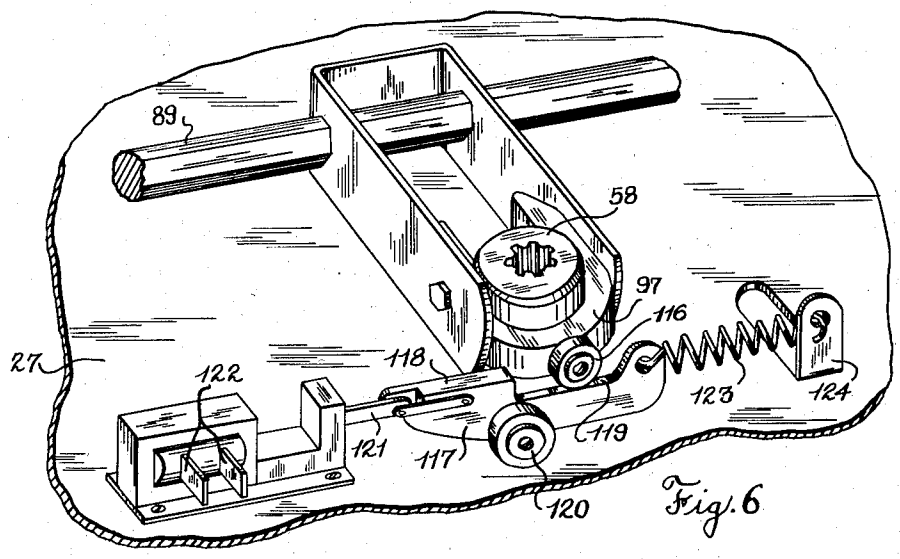


Fig. 6

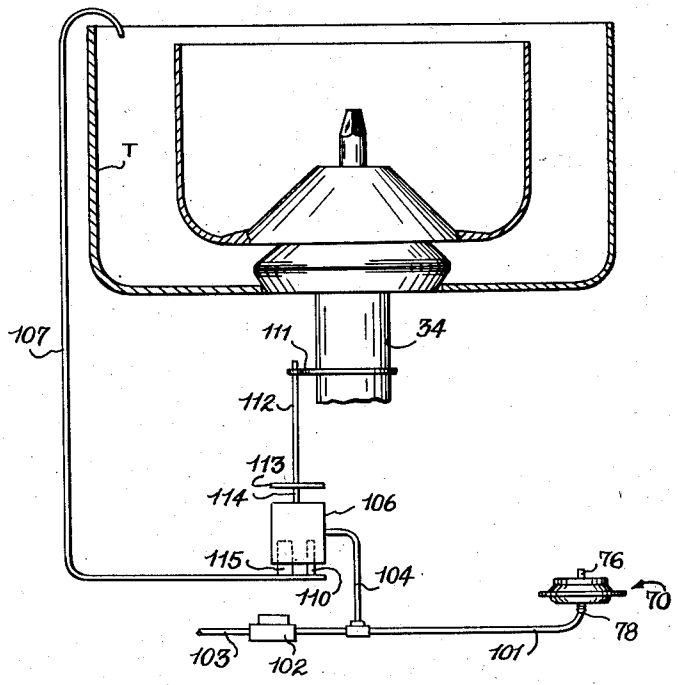


Fig. 7

INVENTOR.
RALPH L. ARCHBOLD
BY
W. G. Sullivan
ATTORNEY

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2,826,083

DRIVE MECHANISM FOR SPIN-DRIER TYPE WASHING MACHINE

Ralph L. Archbold, Euclid, Ohio, assignor to White Sewing Machine Corporation, Lakewood, Ohio, a corporation of Delaware

Application February 15, 1956, Serial No. 565,583

4 Claims. (Cl. 74—70)

This invention relates to spin-dryer type washing machines having an oscillatable agitator and more particularly to improved drive mechanism for washing machines of this type.

Automatically controlled spin-dryer type washing machines with which I am familiar usually have the clutch and brake mechanism actuated by solenoids or hydraulic means. Hydraulic actuating means have the advantage of being relatively noiseless compared to solenoids but must have a pre-determined minimum water pressure available. Jaw clutches are desirable for connecting an agitator with the drive mechanism but require substantial travel for engagement and disengagement relative to a friction type clutch. Also in the event of water pressure failure when using hydraulic actuating means it is necessary to provide means preventing concurrent spinning of the clothes basket or container and operation of the agitator to avoid damage to the clothes.

According to the invention, I provide a spin-dryer type washing machine having an oscillatable agitator connectable to the power source by a jaw clutch and a friction type clutch is adapted to connect the basket to the power source for spinning. The clutches are actuated by hydraulic pressure which may be as low as seven pounds per square inch. Sufficient travel is provided during normal operation to insure that the agitator clutch is disengaged before the basket clutch is engaged, and in the event of hydraulic pressure failure means are provided preventing engagement of the agitator clutch if the spin clutch is engaged.

It is a primary object of the invention to provide in a spin-dryer type washing machine having an oscillatable agitator improved means for actuating the drive mechanism.

Another object of the invention is to provide in a washing machine of the above type hydraulic means for actuating the drive mechanism which will function properly at relatively low pressure.

Another object of the invention is to provide in a washing machine of the above type having fluid pressure means for actuating the drive means inter-lock means preventing operation of the agitator while the clothes container is spinning in the event of fluid pressure failure.

Other objects of the invention and the invention itself will become increasingly apparent from a consideration of the following description and drawings wherein:

Figure 1 is a fragmentary sectional view of a washing machine embodying the invention;

Figure 2 is a perspective view of clutch actuating mechanism illustrated in Figure 1;

Figure 3 is a perspective view of a jaw clutch element adapted to be actuated by the mechanism shown in Figure 2;

Figure 4 is a perspective view of a supporting frame I preferably employ;

Figure 5 is a sectional view of the fluid pressure motor illustrated in Figure 1;

Figure 6 is a perspective view of clutch inter-lock means I may employ, and

Figure 7 is a view, largely schematic, of a hydraulic system I preferably use.

Referring now to the drawings, and particularly Figure 1, I have shown the bottom portion of a generally cup shaped clothes container or basket **10** adapted to have clothes and water agitated therein during a washing period and to be rotated at high speed to discharge water from the upper portion of the basket during an extracting period. The basket may be counter-balanced in any suitable manner during the extracting period to compensate for an out of balance clothes load as by discharging extracted water into peripheral pockets integral with the basket but the means employed for balancing the basket during spinning or for minimizing the transmission of vibration to a supporting surface for the washing machine constitutes no essential part of the present invention.

The bottom portion or base of basket **10** has a frusto-conical shaped re-entrant portion **11** which is sealingly secured to the flange **12** of an element having a hub **13** which is locked to a tubular drive shaft **14** in any suitable manner. In the present instance, a circular groove is provided between hub **13** and shaft **14** which receives wedge rings pressed into locking engagement by a ring **16** bolted to hub **13**. A bronze or the like bearing **17**, preferably self lubricating, has a radial flange seating on the upper end of shaft **14** and the bearing inner wall engages a solid shaft **18** co-axial with tubular shaft **14** and rotatable relative thereto. The upper end of the solid or inner shaft **18** is formed with a plurality of tapered flat sides, as indicated at **19**, to project into and drivingly engage the socket of a conventional agitator. A suitable liquid seal **20** engages bearing **17** and shaft **18**. The drive mechanism to be described is adapted to impart an oscillating motion to inner shaft **18** while the basket is prevented from rotating and to spin or rotate the basket with the drive mechanism clutch and brake means being actuated by fluid pressure.

The basket, including the clothes and water load, and the operating mechanism, including the drive mechanism and an electric motor, are preferably spring mounted through a supporting frame best illustrated in Figure 4 and generally indicated at **21**. The frame **21** comprises generally channel form side panels **22** and **23**, a channel form top plate **24** having a central opening **26**, and a bottom plate **27** having an opening **28** axially aligned with top plate opening **26**. Secured to each side panel of the frame are a pair of arms, each arm **29** being of L shape and of U form in cross section. The horizontal portion of each arm is resiliently supported by being secured to the lower end of an associated spring **31** and the upper ends of the springs may be secured to the relatively rigid or re-inforced base **32** of a tub encasing the basket in spaced relation or to cross members **30**. The tub and its base **32** are supported by rigid corner members (not shown) which rest on the supporting surface for the washing machine. The tub may form the upper part of the machine cabinet or the tub and the mechanism beneath the tub may be encased by an ornamental covering. The outer ends of arms **29** may engage snubbing means on the corner members to limit tilting of the spring supported parts. A more detailed description of the means for supporting frame **21** may be had by reference to my co-pending application Serial No. 346,145, filed April 1, 1953 and entitled Spring Mounted Washing Machine of the Water Balance Type, now Patent No. 2,745,273.

A housing for a bearing **33** disposed in opening **26** of frame top plate **24** and an elongate tubular member **34** superposed on the top plate are secured thereto in any suitable manner as by bolts **36**. Member **34** has a re-

entrant hub 37 within which is disposed a sleeve bearing 38 for the tubular or outer shaft 14, the bearing preferably being lubricated by wick means 39. To prevent water in the machine tub from penetrating bearing 38 a liquid seal 41 is provided and the tub base 32 is sealed with member 34 by a bellows type rubber ring 42.

Tubular shaft 14 is of reduced external diameter in its lower portion forming a shoulder which seats on the upper face of the inner race of ball bearing 33, the lower face of this race rests on a collar 43 which engages the inner race of a second ball bearing 44. A sleeve 46 abuts the lower face of the inner race of bearing 44 and at its lower end the sleeve engages an inverted cup shaped element 47 detachably secured to a ring form plate 48. A nut 49 threaded to tubular shaft 14 holds the above described parts in assembled relation whereby it will be apparent that any axial load or thrust on shaft 14 will be transmitted to ball bearing 33 and resultantly to the top plate 24 of frame 21. Plate 48 which engages element 47 is sealed relative to solid or inner shaft 18 in any desired manner such as by snap rings 50 which engage grooves in the shaft and abut sealing collars on each side of the plate.

A hub 51 is keyed to sleeve 46 and shaft 14 but has limited axial adjustment movement relative thereto. Hub 51 is provided with radially extending spring fingers 52 adapted to rotate with and resiliently support a ring form clutch element 53 having friction material on its upper face. The spring fingers continuously urge the clutch element into engagement with a U section ring form lower face 54 of a pulley 56 which is secured to the outer race of bearing 44. A nut 57 threaded to hub 51 and abutting element 47 is adapted to be rotated by a spanner wrench or the like to adjust the spring fingers axially and resultantly the effective frictional engagement between the clutch element 53 and pulley 56.

The lower end of the solid or inner shaft 18 is splined to engage the jaw clutch element 58 illustrated in Figure 3. Element 58 has depending tapered teeth 59 adapted to be received in sockets 61 formed in a co-operating clutch element extending from a gear case generally indicated at 62. The gear case is of conventional design whereby rotary movement is translated to oscillating movement of a shaft having sockets 61. In a conventional manner the pulley 56 is continuously rotated and the shaft operating the clutch element having sockets 61 is continuously oscillated during operation of the washing machine through belt drives extending from an electric motor (not shown).

The fluid pressure motor or hydraulic means for actuating the jaw clutch for agitating or washing and the friction clutch for spinning the basket or extracting water from the clothes will now be described. A fluid pressure motor generally indicated at 70 in Figure 1 and shown in section in Figure 5 comprises a casing or housing formed of a lower cup shaped part 71 with an outwardly extending peripheral flange and an upper part 72 of inverted cup form having a peripheral flange crimped over the flange of the lower part. A rubber or the like flexible diaphragm 73 has its outer edge clamped between the flanges of the housing parts and a preferably metal cup form disc 74 is bonded to the upper surface of the diaphragm. The disc has a central stem 76 which projects upwardly through a bushing 77 fixed to housing upper part 72. A nipple 78 fixed to housing lower part 71 is adapted to be secured to a hose or conduit to transmit fluid pressure to the underside of the diaphragm. The motor 70 is secured to the lower plate 27 of frame 21 as by nuts 79 and in a well known manner when fluid pressure, preferably water pressure available in homes, is exerted on the underside of diaphragm 73 stem 76 will be forced upwardly with a force corresponding to the available pressure distributed on the effective area of the diaphragm.

A ring form brake plate 81 is vertically or axially slidable on rods 82 rigidly secured to and depending from

the top plate 24 of frame 21. Helical springs 83 abutting top plate 24 and the brake plate continuously urge the brake plate downwardly against the resistance of sleeves 86 slidable on rods 82. To avoid chattering I preferably provide springs 84 which abut the under side of the brake plate 81 and a flange on rods 82. It will be noted that the clutch element 53 including the friction facing material extends radially to partially underlap the brake plate 81 whereby when the brake plate is moved downwardly it can force the clutch element 53 out of contact with face 54 of pulley 56 against the resistance of spring fingers 52. When the brake plate is moved upwardly to the position illustrated in Figure 1 the spring fingers 52 force the clutch element into driving engagement with pulley 56 to effect rotation of tubular shaft 14 and the basket.

I preferably provide two rods 82 at diametrically opposite points and each sleeve 86 is held in contact with a block 87 by its associated spring 83. As best illustrated in Figure 2 each block 87 is pivotally mounted in an end arm of a rock lever generally indicated at 88. The rock lever comprises a rod 89, preferably hexagonal in cross-section except at its ends which are circular in cross section to be received in bearings 91 mounted on the frame side plates 22 and 23, and three U form arms 92, 93 and 94 perforated to receive rod 89 and rockably locked therewith. Arm 94 is longer than arm 92 and at its outer end pivotally engages a block 96 adapted to engage the upper end of stem 76 of the fluid motor 70 whereby when the stem is raised the arms will be moved upwardly about rod 89 as an axis to elevate blocks 87 and resultantly lift brake plate 81 to permit engagement of clutch element 53 with pulley 56.

Upward movement of arm 94 effected by the fluid motor also elevates the central arm 93 and a U shaped yoke 97 which is pivotally mounted at the outer end of the arm. The forks of yoke 97 seat in a peripheral groove 98 formed in jaw clutch element 58 whereby as fluid under pressure is supplied to fluid pressure motor 70 teeth 59 will be disengaged from sockets 61 and resultantly stop the oscillating drive of inner shaft 18 from gear case 62. Conversely when fluid is permitted to discharge from motor 70 the pressure of springs 83 acting through brake plate 81, sleeves 86 and blocks 87 associated with arms 92 and 94 will rock central arm 93 downwardly to engage jaw clutch element 58 with the oscillating shaft of the gear case.

Referring now to Figure 7 the manner of supplying fluid under pressure to motor 70 and discharging fluid therefrom will now be explained. A preferably flexible conduit 101 connects nipple 78 of motor 70 with a conventional solenoid operated valve 102 which is periodically opened and closed by an automatic timer adapted to energize and de-energize the solenoid. A second conduit 103 connects the valve with a source of fluid under pressure such as the domestic water supply. A third conduit 104 communicates with conduit 101 and extends to a mechanism generally indicated at 106. Extending upwardly from mechanism 106 is a discharge line 107 which has its upper end bent in U form to discharge into the machine tub T which has a sump in its base connected to a drain. A relatively small bleeder port 110 in mechanism 106 effects continuous communication between conduit 104 and discharge line 107 whereby when valve 102 is open a major portion of the fluid pressure available in conduit 103 will be directed against diaphragm 73 of the fluid motor 70 to elevate or maintain stem 76 elevated against the pressure of springs 83. When valve 102 is closed the diaphragm and stem 76 will be lowered relatively slowly as fluid is discharged from the motor 70 through conduit 104, the bleeder port 110 and discharge line 107.

As previously explained this downward movement of motor stem 76 disengages the upper friction or spin clutch, applies a braking action to the spin shaft 14, and engages the agitating shaft 18 with the gear case to

effect oscillating movement of the agitator. It will be noted that the distance the brake plate **81** must be lowered to engage the friction facing on clutch element **53** is small relative to the distance jaw clutch element **58** must be lowered to effectively engage its driving shaft extending from gear case **62**. I preferably have brake plate **81** travel downwardly about one-eighth inch for engagement and element **58** about three eighths inch. Under normal operating conditions the discharge of fluid from motor **70** is sufficiently slow so that the spin shaft **14** is effectively braked before the jaw clutch is engaged and there is no danger of damaging articles being washed as might occur if the agitator tended to oscillate the articles while the basket was still spinning at relatively high speed. However, under certain conditions a relatively rapid discharge of fluid from motor **70** may occur and to provide a positive time delay before jaw clutch **58** engages I may provide an interlock of the type illustrated in Figure 6. One of the conditions would be a failure of water pressure at the diaphragm for any reason such as by a break in conduit **101**. Another condition is that I may employ mechanism **106** as a safety device to quickly apply brake plate **81** to clutch element **53** if excessive vibration occurs due to an unbalanced load while the basket is spinning. In this case a second relatively large port **115** in mechanism **106** is uncovered or opened effecting additional communication between conduit **104** and discharge line **107**. This may be effected by providing a laterally extending arm **111** fixed to tubular member **34** and having a loop at its outer end encircling a tiltable rod **112** having a plate **113** at its lower end adapted to exert pressure on a pin **114** associated with mechanism **106**. When rod **112** is tilted a pre-determined amount the pressure on pin **114** opens large port **115** thereby permitting the fluid pressure in motor **70** to be quickly lowered and resultantly apply brake plate **81** to element **53** which slows rotation of basket **10**. This snubbing or braking action will continue until excessive unbalance is corrected or until the spin cycle is completed. However to avoid engaging the agitator clutch under these conditions I preferably provide an inter-lock arrangement as illustrated in Figure 6.

Referring now to Figure 6, a roller **116** is mounted on yoke **97** and is adapted to seat on an elevated surface **118** or a depressed surface **119** of a laterally movable arm **117**. Arm **117** has a pair of rollers **120** resting on frame bottom plate **127** for ease of lateral movement. One end of arm **117** is pivotally connected to the core **121** of a solenoid having terminals **122** adapted to be connected to leads extending to a switch actuated by the timer (not shown). The opposite end of arm **117** is connected to one end of a tension spring **123**, the opposite spring end being hooked to a finger **124** pressed from plate **27**. It will now be apparent that when the solenoid is energized arm **117** will be drawn to the left against the tension of spring **123** and roller **116** will seat on depressed surface **119** permitting jaw clutch element to engage its oscillating drive shaft (as illustrated). When the solenoid is de-energized spring **123** will draw arm **117** to the right causing roller **116** to seat or ride on elevated surface **118** and will prevent engagement of clutch element **58** with its drive shaft. The timer controlled solenoid switch is arranged so that the solenoid is de-energized during basket spin periods whereby engagement of the jaw clutch is prevented. However, under these conditions sufficient downward movement of end arms **92** and **94** is permitted so that brake plate **81** may engage and brake friction clutch element **53**. It will be noted that the distance along end arm **94** from rod **89** to motor stem **76** is about twice the distance along end arms **92** and **94** from rod **89** to blocks **87**. Stem **76** is adapted to travel about three-quarters of an inch and with the leverage advantage described a fluid pressure as low as seven pounds per square inch on diaphragm **73** will overcome the force

of springs **83** without requiring an unduly large diaphragm. Inasmuch as the available pressure of a domestic water supply system may drop to a relatively low point under certain conditions it is important that the mechanism be operable at low pressure.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to persons skilled in the at.

What I claim is as follows:

1. Drive mechanism for washing machines of the type having a clothes container rotatable at relatively high speed to extract water from the clothes and an oscillatable agitator for washing the clothes, said drive mechanism comprising of pair of coaxial shafts, one shaft being adapted to rotate the container and the other shaft being adapted to oscillate the agitator, a drive pulley, a friction clutch adapted to connect the drive pulley with said one shaft, oscillatable drive mechanism, a jaw clutch adapted to connect said other shaft to the oscillatable mechanism, fluid pressure means for successively actuating said clutches, said fluid pressure means comprising a fluid pressure motor adapted upon increase of fluid pressure to a pre-determined value to effect movement of one clutch to an engaged position and the other clutch to a disengaged position, spring means continuously opposing said movement and adapted upon a decrease in fluid pressure below said value to effect movement of said clutches in a reverse direction, a relatively small capacity fluid bleeder line extending from the motor, a relatively large capacity fluid feeder line for the motor, and a valve in the feeder line whereby when the valve is open fluid pressure at the motor will be rapidly increased and when the valve is closed the fluid pressure will be slowly decreased.

2. Drive mechanism for washing machines of the type having a clothes container rotatable at relatively high speed to extract water from the clothes and oscillatable means for agitating the clothes in the container, said drive mechanism comprising a friction clutch adapted to connect the container with a power source for rotating the container, a jaw clutch adapted to connect the oscillatable means with a power source, a fluid pressure motor for successively actuating the clutches, spring means opposing actuation of the clutches by the fluid pressure motor whereby upon a decrease in motor fluid pressure below a pre-determined value one of said clutches will be moved by the spring means towards a disengaged position and the other clutch towards an engaged position, the movement required to engage the said other clutch being substantially greater than the movement required to disengage the said one clutch, brake means adapted to be applied when the said one clutch is moved towards disengaged position, and means for normally decreasing motor fluid pressure relatively slowly whereby the brake means will be applied for a substantial period prior to engagement of said other clutch.

3. Drive mechanism for washing machines of the type having a clothes container rotatable at relatively high speed to extract water from the clothes and oscillatable means for agitating the clothes in the container, said drive mechanism comprising a friction clutch adapted to connect the container with the a power source for rotating the container, a jaw clutch adapted to connect the oscillatable means with a power source, a fluid pressure motor for successively actuating the clutches, spring means opposing actuation of the clutches by the fluid pressure motor whereby upon a decrease in motor fluid pressure below a pre-determined value one of said clutches will be moved by the spring means towards a disengaged position and the other clutch towards an engaged position, the movement required to engage the said other clutch being substantially greater than the movement required to disengage the said one clutch, brake means adapted to be applied when the said one

clutch is moved towards disengaged position, means for normally decreasing motor fluid pressure relatively slowly, and time delay means effective to prevent engagement of said other clutch for a pre-determined period in the event of a rapid decrease in motor fluid pressure.

4. Drive mechanism for washing machines of the type having a clothes container rotatable at relatively high speed to extract water from the clothes and oscillatable means for agitating the clothes in the container, said drive mechanism comprising a friction clutch adapted to connect the container with a power source for rotating the container, a jaw clutch adapted to connect the oscillatable means with a power source, a fluid pressure motor for successively actuating the clutches, spring means opposing actuation of the clutches by the fluid pressure motor whereby upon a decrease in motor fluid pressure below a pre-determined value one of said clutches will be moved by the spring means towards a disengaged position and

the other clutch towards an engaged position, the movement required to engage the said other clutch being substantially greater than the movement required to disengage the said one clutch, brake means adapted to be applied when the said one clutch is moved towards disengaged position, means for normally decreasing motor fluid pressure relatively slowly to gradually apply the brake means, and supplemental means for rapidly decreasing the motor fluid pressure in response to excessive vibration of the clothes container to quickly apply the brake means.

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