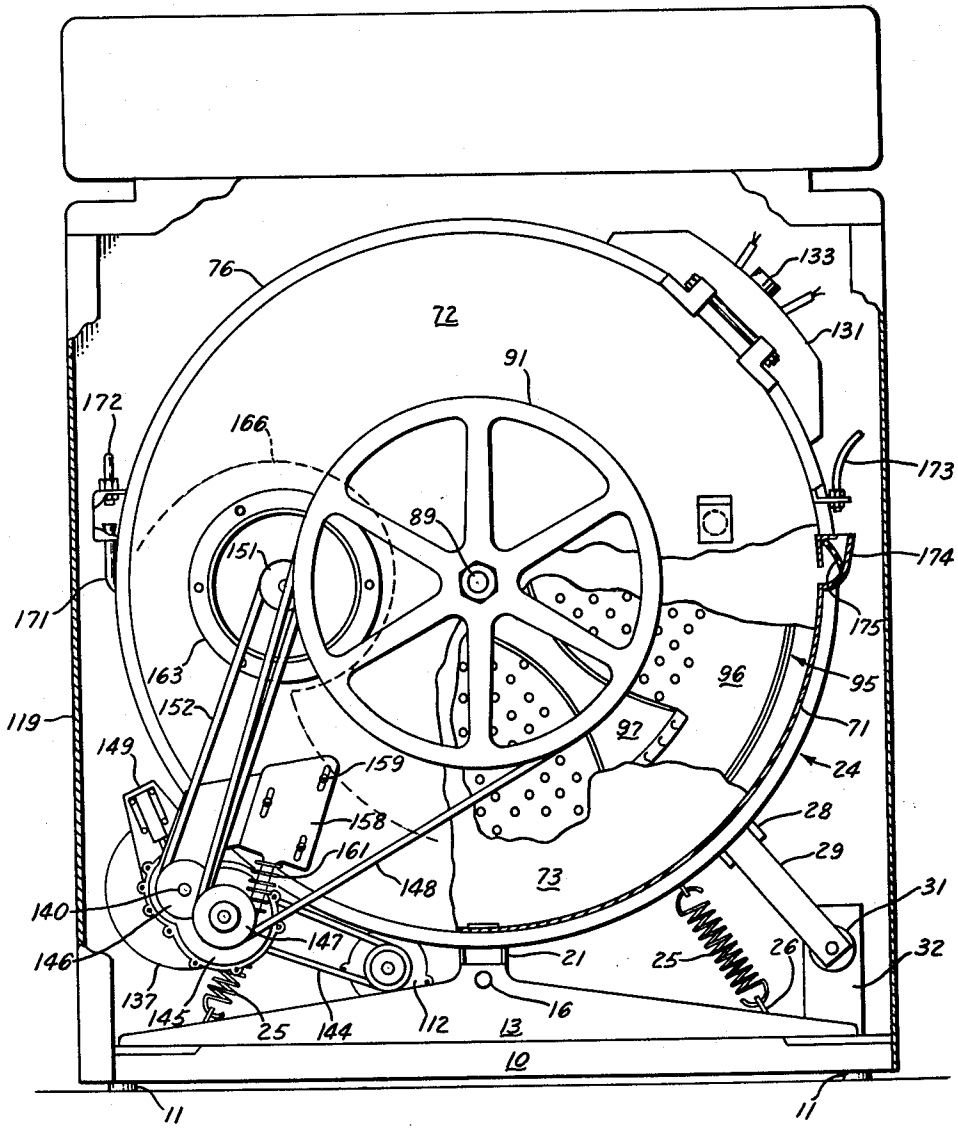
March 9, 1965 C. W. BURKLAND 3,172,278

FABRIC TREATING MACHINE WITH DRIVE MEANS TO EFFECT A TUMBLE DISTRIBUTION AND EXTRACTION OPERATION

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Fig. 1



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Fig. 3

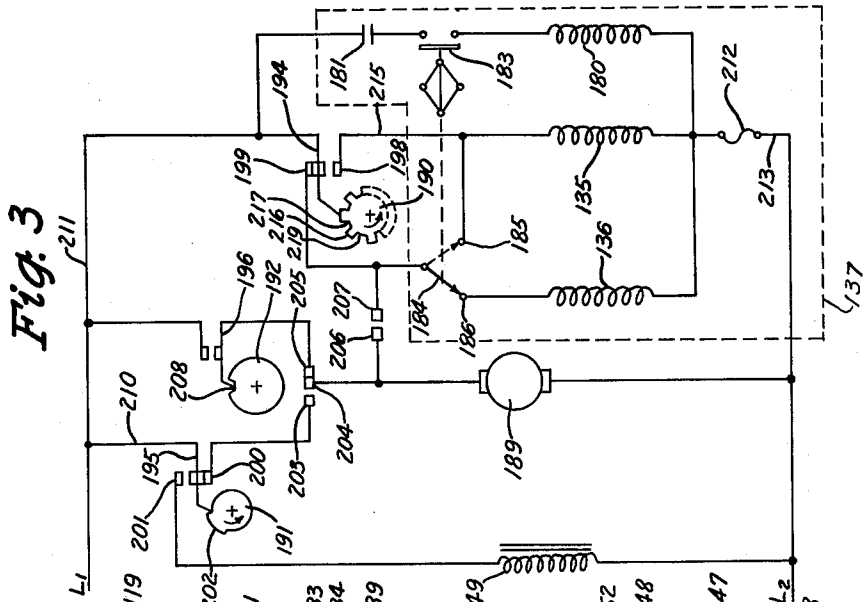
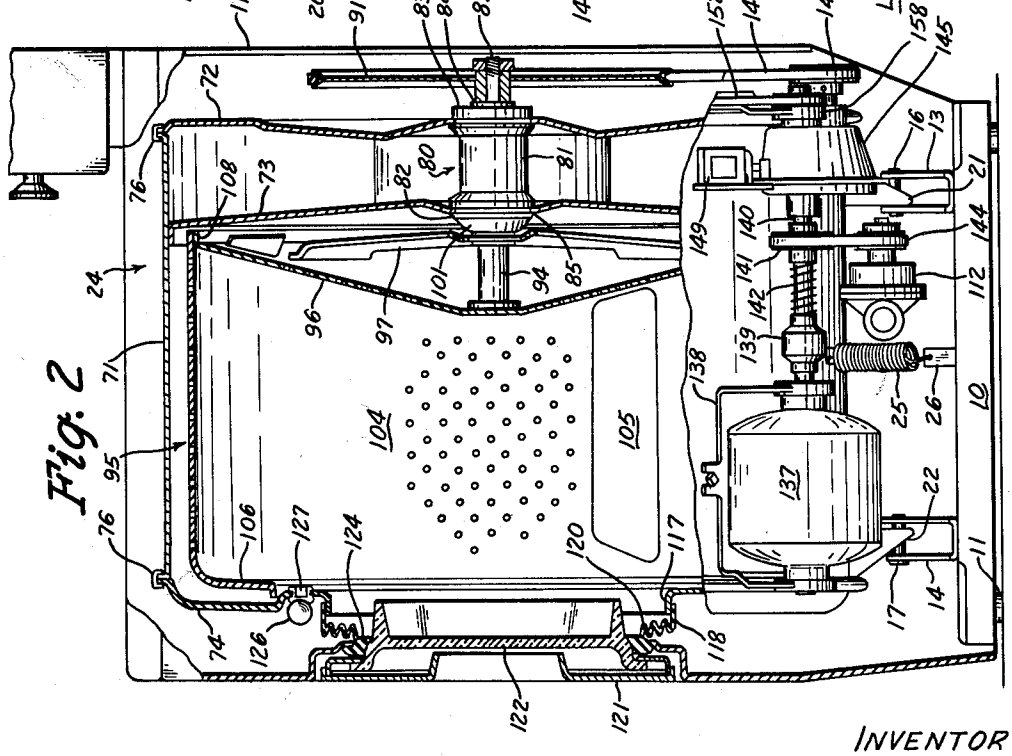


Fig. 2



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FABRIC TREATING MACHINE WITH DRIVE MEANS TO EFFECT A TUMBLE, DISTRIBUTION AND EXTRACTION OPERATION

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7 Claims. (Cl. 68—12)

This invention relates to washing machines and more specifically to a drive system for operating a substantially horizontal axis washing machine at a plurality of speeds including tumble, distribution, and extraction speeds.

It is well-known in the art to provide a non-vertical axis washer or combination washer-drier with the above mentioned three speeds of operation for achieving the most satisfactory laundry results. It has also been shown that a somewhat critical distribution speed is essential for arranging the materials in a substantially even loading about the inner periphery of the receptacle to insure a vibration-free, high speed extraction operation.

The actual distribution speed is dependent upon variables including receptacle size and load conditions. The variability with load conditions imposes impossible requirements on many drive systems and of necessity results in the use of a single, substantially constant compromise distribution speed.

It is therefore an object of this invention to provide a drive system for a non-vertical axis washing machine in which a varying distribution speed is obtained by pulsing or cycling a two-speed motor between two conditions of energization.

It is another object of this invention to provide a non-vertical axis washing machine having a multispeed drive system in which a slowly increasing distribution speed is obtained by alternately energizing and de-energizing two sets of run windings of a two-speed drive motor.

It is a further object of this invention to provide a multispeed drive system for a non-vertical axis washing machine in which the clothes receptacle is rotated at substantially constant tumble and extraction speeds by a conventional two-speed electric motor and two-speed transmission means and in which a slowly increasing distribution speed operation is obtained by pulsing or cycling between the four-pole and six-pole windings of the two-speed electric motor at predetermined time intervals.

The present invention achieves the above objectives by a system which includes a conventional two-speed drive motor, alternately energized for each of its two predetermined speeds for predetermined time intervals of relatively short duration, to attain a slowly accelerating distribution speed. This slowly accelerating distribution speed insures that an optimum distribution speed for a wide range of sizes and types of loads is realized.

Further objects of the invention will become evident as the description proceeds and from an examination of the accompanying drawings which illustrate a preferred embodiment of the invention and in which similar numerals refer to similar parts throughout the several views.

In the drawings:

FIGURE 1 is a rear elevational view of a combination washer-drier unit shown partially in section embodying the drive system of the present invention;

FIGURE 2 is a side-elevational view partially in section of the combination washer-drier unit of FIGURE 1 and more specifically showing the motor and two-speed transmission; and,

FIGURE 3 is an electrical schematic circuit showing electrical connections to the drive system and controls related thereto.

Referring now to the accompanying drawings in detail, it will be seen that the combination washer-drier unit embodying the present invention and shown in these drawings includes a substantially flat surfaced base frame **10** mounted on legs **11**. Mounted upon base frame **10** are the channel members **13** and **14** which are welded or securely affixed in some suitable manner to the base frame **10** to form the two major supports for the washer-drier unit illustrated in the accompanying figures.

As seen in FIGURES 1 and 2, channel members **13** and **14** are substantially triangular in elevational configuration with the apex of these members receiving pivot pins **16** and **17**. These pivot pins **16** and **17** support tub brackets **21** and **22** to provide a two-point support for the tub or casing which is generally indicated by the arrow **24**. Tub **24** which is fastened to brackets **21** and **22** may thus oscillate back and forth on pins **16** and **17** in an arcuate movement in response to various forces generated within that tub.

Tub **24** is maintained in an upright position on pins **16** and **17** by two centering springs **25** connected between tub **24** and base **10** through the spring connector brackets **26** fastened to the latter member. FIGURE 1 shows the tub **24** as being provided with a damper bracket **28** which forms the support for the damper leaf spring **29** carrying the damper pad **31** in a ball and socket joint at the end of damper spring **29**. Base frame **10** is provided with an upstanding damper plate **32** which is frictionally engaged by the damper pad **31** for retarding oscillatory movement of tub **24** by absorbing and dissipating the energy causing tub **24** to oscillate on the supporting pins **16** and **17**.

Tub or casing **24** includes a generally cylindrical side wall **71**, a pair of spaced rear walls **72** and **73** and a front wall **74**. The front and outer rear walls **74** and **72**, respectively, are connected to cylindrical side wall **71** by means of the encompassing flanged hoop-like members **76** while the partition wall **73** positioned between walls **72** and **74** is welded to side wall **71**. It will be seen from an inspection of FIGURE 2 that the spaced rear walls **72** and **73** support the tub bearing assembly generally indicated by the reference numeral **80**.

The tub bearing assembly **80** includes a spacer hub **81** which is located between and which abuts the rear walls **72** and **73**, and a tubular clamp member **82** located concentrically within hub **81**. Clamp member **12** is formed with a shoulder **85** at one end thereof and has a threaded portion **84** at the other end thereof for receiving spanner clamp nut **83** which, when tightened on member **82**, produces a rigid support with respect to tub **24** for two bearings (not shown) one of which is located adjacent each of walls **72** and **73** for support of receptacle drive shaft **89**.

The rear end of the receptacle drive shaft **89** is rigidly connected to the large drive pulley **91** whereas its front end is threaded into hub **94** of the drum or clothes receptacle **95**. Drum **95** includes a perforate rear wall **96** which is rigidly affixed to and cooperates with the spider-like member **97** to form a double cone support connected to the hub **94** and providing a rigid support for the clothes basket **95** on drum drive shaft **89**. A sealing member **101** is biased against the rear surface of this revolvable hub structure **94** to prevent water from the tub **24** from entering tub bearing assembly **80**.

As apparent from FIGURE 2, the clothes drum **95** also includes a perforate cylindrical side wall **104** carrying clothes elevating vanes **105**. Side wall **104** merges into the short front wall **106** and joins the flanged rear wall **96** in an overlapping relationship to form a protruding flange **108** which, while not touching wall **73**, cooperates with that wall **73** to form an effective air barrier to prevent heated air entering tub **24** through cylindrical side

wall 71 during the drying operations from being short circuited around the rear peripheral edge of drum 95.

Tub 24 is connected at its lower portion with a drain pump 112 which communicates with an external drain for removing fluids from tub 24.

Tub 24 also includes a circular loading opening 117 which is encircled by the bellows seal 118 having its opposite end fastened to a similar opening formed in the cabinet 119 enclosing this combination unit. Sealing member 118 includes a number of convolutions 120 permitting movement of tub 24 relative to cabinet 119. A rectangular door 121 hinged on cabinet 119 carries a transparent glass door 122 having a cylindrical portion extending rearwardly through the bellows seal 118 which is provided with a flexible annular sealing lip 124 engageable with the periphery of the glass door 122. This seals the unit while enabling the operator of the machine to observe operations taking place within tub 24 during the washing and drying processes. The lamp 126 fastened to the exterior of tub 24 shines through a transparent member 127 carried in tub 24 for illuminating the interior of the machine during the loading operations of the machine.

Tub 24 also includes a heater housing 131 which may be formed separately or as a part of the casing side wall and which supports a heating element (not shown) capable of radiating heat energy into tub or casing 24 through an opening located in the cylindrical tub wall 71 and covered by the heater housing 131. Heater housing 131 also mounts the thermostat 133 which is connected in series with the heater.

The power to rotate the drum 95 through the large pulley 91 is applied by the two-speed motor 137 mounted on bracket 138 carried on a lower portion of tub 24. The two-speed motor 137 is operable at a speed of approximately 1725 revolutions per minute when its four-pole run winding 135 is energized and operable at a speed of approximately 1150 revolutions per minute when its six-pole run winding 136 is energized. The output shaft of motor 137 is connected to a flexible universal coupling 139 which is connected in turn to the transmission input shaft 140 constituting an extension of the motor shaft.

A split pulley 141 having a pair of axially separable sheaves splined to each other is rigidly connected to shaft 140 through one of its sheaves. The other sheave is constantly biased towards the shaft-connected sheave by means of the compression spring 142 which encircles the shaft extension 140. This arrangement automatically regulates the tension in the small belt 144 which drives the drain pump 112 whenever motor 137 is energized.

Shaft extension 140 also drives the two-spaced transmission unit 145 and the pulley 146 affixed to the end of that portion of shaft 140 extending completely through transmission 145. Transmission 145 is provided with an output pulley 147 which is drivingly connected to the large drum drive pulley 91 through belt 148.

Since motor 137 is operable at two predetermined speeds and transmission 145 is operable for two output speeds for each input speed, the drive system of the present embodiment may drive the clothes receptacle at four substantially constant speeds. With solenoid 149 de-energized, transmission 145 is in the condition of maximum speed reduction for driving receptacle 95 at speeds of 75 revolutions per minute and 50 revolutions per minute corresponding to operation of motor 137 at speeds of 1725 revolutions per minute and 1150 revolutions per minute respectively. Upon energization of solenoid 149, transmission 145 is operable for driving clothes receptacle 95 at extraction speeds of approximately 300 revolutions per minute and at approximately 450 revolutions per minute when motor 137 is operating at speeds of 1150 revolutions per minute and 1725 revolutions per minute respectively.

The pulley 146 affixed to the end of shaft 140 is connected to the fan pulley 151 through belt 152 for driving pulley 151 at a speed approximately equal to that of motor 137.

A combination transmission support and belt tensioning device is provided by the slotted bracket 158 which is connected to the rear wall 72 through the adjustable screws 159. Bracket 158 journals shaft 140 allowing transmission unit 145 to pivot freely around the bearing receiving that latter shaft. By use of the adjustable screws 159, the transmission unit 145 and its mounting bracket 158 may be moved away from the fan pulley 151 and the slack taken out of belt 152. The slack is automatically taken out of the tumbler drive belt 148 by means of the compression spring 161 mounted between bracket 158 and the transmission unit 145 and tending to pivot the transmission 145 downwardly and in a clockwise direction around shaft 140. The tension in the drain pump belt 144 is automatically maintained during these adjustments by means of the spring biased split pulley 141.

Though not shown in this embodiment, a conventional unbalance control system may be provided for controlling operation of the machine during the extraction operation to eliminate the possibility of walking of the machine or damage thereto resulting from forces that may be generated during the extraction operation.

A combination blower condenser unit capable of moving air through tub 24, scrubbing lint, and condensing out moisture from hot vapors produced within casing 24 during the drying operations, is positioned in the compartment formed by and between portions of the spaced walls 72 and 73.

The compartment for the blower condenser unit is produced by cooperation of walls 72 and 73 with an imperforate scroll-shaped side wall 166 shown by dotted lines in FIGURE 1 which bridges the space between walls 72 and 73 to enclose the vapor condenser and blower unit. Water is directed towards the impeller (not shown) and the action of the rotating impeller upon the stream of water produces a cool mist spray and fog for condensing out hot moisture vapors entering the blower condenser unit during the drying operation of this combination machine.

The impeller (not shown) positioned behind plate 163 is driven by blower pulley 151. Plate 163 is bolted to the rear wall 72 of tub 24 and provides convenient access to the blower housing.

The water for the vapor condensing operation is supplied through the external conduit 172 and is directed into the condenser unit by conduit 171. Water for the washing operation is supplied through the conduit 173 which empties into cup 174 provided with a flapper check valve 175 and draining into tub 24 between walls 73 and 74. Flapper valve 175 not only prevents suds from escaping from tub 24 during the washing operation but also prevents steamy vapors from escaping from the washing and drying chamber of tub 24 and condensing on the cooler interior surfaces of cabinet 119.

As previously indicated, it is well-known within the laundry appliance industry to provide a plurality of speeds of operation in non-vertical axis washing machines and washer-drier combination units. These speeds or velocities include a tumble speed for accomplishing the washing action, a distribution speed for arranging the fabrics in a substantially even pattern around the inner periphery of the washing receptacle, and at least one relatively high speed for accomplishing fluid extraction.

As previously shown, motor 137 and transmission 145 cooperate in the present embodiment to provide the tumbling velocity, a relatively low fluid extraction velocity, an intermediate extraction velocity, and a relatively high extraction velocity.

A range of receptacle velocities between the tumble velocity and the low extraction velocity, for distributing the fabrics in a substantially even pattern around the inner periphery of the washing receptacle, is obtained by

pulsing or cycling energization of the two-speed motor between its two running conditions under control of a timing device. Referring to FIGURE 3, an electrical schematic diagram shows the components and circuitry of one embodiment for achieving the desired cycling. The position of the switches and timer contacts in FIGURE 3 is shown in their position at a point in the cycle of operations near the end of a tumble operation and immediately prior to a distribution operation.

Provided across power lines L_1 and L_2 is conventional 110 volt 60 cycle alternating current for operating the electrical devices. Included in the electrical circuit of FIGURE 3 is the start winding 180 of conventional two-speed motor 137 in series connection with start capacitor 181. Start winding 180 is effectively connected across power lines L_1 and L_2 in a parallel relationship to four-pole run winding 135 and six-pole run winding 136. In series with start winding 180 is centrifugal switch 183 for interruptting current to start winding 180 at a predetermined motor speed. Centrifugal switch 183 is linked with switch 184 for operating switch 184 from contact 185 to contact 186 upon opening of centrifugal switch 183. Switch 184 is made to contact 185 during periods of energization of start winding 180 for insuring energization of four-pole run winding 135 during the starting operation.

Controls for pulsing or cycling energization of motor 137 between run windings 135 and 136 are shown schematically in FIGURE 3. An auxiliary timing means, such as timing motor 189, is provided for advancing cams 190, 191, and 192 to operate switches 194, 195, and 196 respectively. Cam members 190, 191, and 192 are provided with rises or lifts for operating the switches at predetermined time intervals.

Switch member 194 effects selective energization of run windings 135 and 136. Switch 194 is actuated to a first position by rises on cam 190 for completing a circuit to six-pole run winding 136 through contact 199 and is biased to a second position at locations of recesses in cam 190 for completing a circuit to four-pole run winding 135 through contact 198. Switch member 195 is biased to a first position for completing a circuit to contact member 200 and is actuated by a rise 202 on cam 191 to a second position for completing a circuit to solenoid 149 through contact 201. Switch member 196 is a single-pole, single-throw switch, actuatable by cam member 192, for completing a circuit to timing motor 189 at predetermined positions in the cycle of operations to reset the pulsing system.

A conventional primary timing mechanism (not shown) having cam operated switches, for example, is provided for controlling sequential operation of the combination washer-drier through a predetermined series of operations. The switches of the timer mechanism include contacts 203, 204, and 205 for controlling operation of the pulsing system. Contacts 203, 204 are closed during fluid extraction portions of the cycle of operations for energizing auxiliary timing motor 189. Motor 189 then drives cams 190, 191, and 192 for cycling energization of motor 137 between run winding 135 and run winding 136 to effect a slowly accelerating distribution velocity at the beginning of or immediately prior to each fluid extraction operation. Timer contacts 204, 205 are closed during tumble operations for energizing timing motor 189 in series with reset switch 196 to return the pulsing system to its off or start position. Also included are contacts 206, 207 which are optionally actuatable to a closed position at selected times in the cycle of operations, either manually or by the timer mechanism, for completing a circuit to timing motor 189. When so actuated, timing motor 189 advances cam member 190 from rise 216 to recess 217 for allowing switch 194 to operate to the biased poistion to complete a circuit through contact 198 and energize run winding 135 for high speed spin operation.

This circuit including the auxiliary timing motor, cams and switches, comprises a motor pulsing system operable for effecting a slowly accelerating distribution speed by rapidly cycling energization of the two-speed motor between the two run windings. This distribution speed operation follows tumble operations and precedes extraction operations and is initiated at these predetermined positions in the cycle of operations by the timer mechanism as explained hereinabove.

To review, the position of the pulsing system switches and timer contacts near the end of the tumble operation and immediately prior to the pulsing operation are as follows: switch 194 is actuated to close a circuit to contact 199; switch 195 is biased to complete a circuit to contact 200; switch 196 is biased to the open position; timer contacts 204, 205 are closed; and contacts 206, 207 are open. Also switch 184 is closed to contact 186. The motor is thus operating at its slow speed and the receptacle is rotating at a tumble velocity.

At a predetermined position in the cycle of operations, such as at the completion of the tumble operation, timer contact 204 is closed to contact 203 for initiating the pulsing operation and thus the distribution operation. Upon closing of timer contacts 203, 204, auxiliary timing motor 189 is energized by a circuit between power lines L_1 and L_2 including line 210, switch 195 made to contact 200, and timer contacts 203, 204. Upon energization of timing motor 189, cams 190, 191, and 192 are driven at a slow timing speed of 6 revolutions per minute, for example, for actuating switches 194, 195, and 196 to control the pulsing operation.

As cam 190 advances, switch 194 is cycled between its first actuated position made to contact 199 and its second biased position made to contact 198. In this embodiment, rises on cam 190 maintain switch 194 actuated to contact 199 for periods of approximately three-tenths of one second and recesses allow switch 194 to make to contact 198 for periods approximately two-tenths of one second. Cam 190 proceeds to cycle switch 194 between its first position and its second position for a period of approximately 7½ seconds during which time the motor is alternately energized for acceleration to or operation at each of its two predetermined speeds. Energization of motor 137 for acceleration towards its predetermined speed of 1150 revolutions per minute is accomplished by a circuit from L_1, through line 211, switch 194 made to contact 199, switch 184 made to contact 186, to one side of six-pole run winding 136. The other side of run winding 136 is connected to power line L_2 through thermoprotector 212 and line 213. Motor 137 is energized through its four-pole run winding 135 for acceleration towards 1725 revolutions per minute by a circuit from power line L_1, through line 211, switch 194 made to contact 198, and through line 215 to one side of four-pole run winding 135. The other side of run winding 135 is connected to power line L_2 through thermoprotector 212 and line 213.

In the present embodiment, the energization of motor 137 for operation at the first and second speeds for periods of two-tenths of one second and three-tenths of one second, respectively, permits the motor to first accelerate an increment to a momentary higher speed and to decelerate a smaller increment therefrom to a lower momentary speed for effecting a net increase. Both acceleration and deceleration rates are dependent upon various factors including the loading within receptacle 95 and voltage to the motor. However, with the instant structure and within a reasonable range of loading thereof, the two-tenths of one second and three-tenths of one second time increments of alternating energization are sufficient and proper for achieving the desired slow acceleration of receptacle 95.

This time controlled pulsing of motor 137 will provide a period of slow acceleration from the motor operating speed of 1150 revolutions per minute toward the operating

speed of 1725 revolutions per minute. These speeds correspond to clothes receptacle speeds of approximately 50 revolutions per minute and 75 revolutions per minute when solenoid 149 is maintained in the de-energized condition.

Upon completion of approximately 7½ seconds of pulsing between four-pole energization and six-pole energization, recess 219 of cam 190 will allow operation of switch 194 to close to contact 198 for maintaining four-pole run winding 135 energized for a period of approximately one-half second to insure operation of motor 137 at its upper operating speed of 1725 revolutions per minute for effecting rotation of drum 95 at 75 revolutions per minute prior to energizing spin solenoid 149 for the extraction operation.

Upon completion of the one-half second operation of motor 137 on four-pole energizatin, rise 202 of cam 191 will effect operation of switch 195 to open at contact 200 and close to contact 201. At substantially the same time, rise 216 of cam 190 will close switch 194 to contact 199. Opening of switch 195 at contact 200 will de-energize auxiliary timing motor 189 for terminating the pulsing operation. Closing of switch 194 to contact 199 will de-energize run winding 135 and energize run winding 136 for allowing motor 137 to decelerate from 1725 revolutions per minute to the lower speed of 1150 revolutions per minute. Closing of switch 195 to contact 201 will complete a circuit to spin solenoid 149 for shifting transmission 145 to a high output speed condition and effecting an increase in receptacle speed from 75 revolutions per minute to 300 revolutions per minute for the extraction operation. Spin solenoid 149 is energized by a circuit between power lines L_1 and L_2 which includes line 210, and switch 195 made to contact 201.

The high extraction speed of 450 revolutions per minute drum speed may be obtained by closing contacts 206, 207 for re-energizing advance motor 189 to advance cam 190 so that recess 217 permits switch 194 to open at contact 199 and close to contact 198. Opening of switch 194 at contact 199 will de-energize timing motor 189 and run winding 136. Switch 194 remains in its biased position as a result of recess 217 for completing a circuit through contact 198 to energize run winding 135 for motor operation at 1725 revolutions per minute.

The pulsing system is reset to the "off" or "start" position during the first tumble operation occurring after each distribution operation during which the pulsing system was operative. Cam 192 maintains switch 196 closed during all positions of the pulsing system except at that position of recess 208 which corresponds to the "off" position. Upon initiation of a tumble operation, timer contact 204 closes to 205 and completes a circuit for energizing timing motor 189. The pulsing system including auxiliary cams 190, 191 and 192 is thereby advanced to the position at which recess 208 permits switch 196 to open and de-energize timing motor 189. In this "off" or "start" position, switch 194 is made to contact 199, switch 195 is made to contact 200, and switch 196 is open.

In summary, operation of this invention for providing the desired speeds of operation including a slowly accelerating distribution speed is best understood by considering operation of the motor through a full sequence of operations. Upon initial energization of the machine for the first tumble portion of the cycle, switch 194 is in the position closed to contact 199 or is immediately actuated to that position by the automatic reset system explained hereinabove, centrifugal switch 183 is closed, and switch 184 is made to contact 185 for energizing start winding 180 and four-pole run winding 135 in a parallel relationship. With run winding 135 and start winding 180 energized, motor 137 will be accelerated at a rate depending upon variables including voltage across lines L_1 and L_2 and size of the load carried by receptacle 95. At a given speed of operation, centrifugal switch 183 will open to de-energize run winding 180 and to operate switch 184 to close to contact 186 for de-energizing four-pole run winding 135 and energizing six-pole run winding 136. Receptacle 95 is then driven for a predetermined period of time at a tumble speed of approximately 50 revolutions per minute with motor 137 energized through six-pole run winding 136 and operating at a speed of approximately 1150 revolutions per minute.

At completion of the tumble operation and prior to the desired beginning of the fluid extraction operation, timer contact 204 is opened from contact 205 and closed to contact 203 for energizing auxiliary timing motor 189 by a circuit which includes switch 195 made to contact 200. Upon energization of auxiliary timing motor 189, cam 190 is advanced at a slow timing speed. Rises or lifts on cam 190 provide a timed switching program for operating switch member 194 between contacts 198 and 199 to maintain each of the run windings energized for predetermined periods of time necessary to cause motor 137 to have a net acceleration from its lower operating speed of 1150 revolutions per minute to its higher operating speed of 1725 revolutions per minute. These motor speeds correspond to container speeds of 50 revolutions per minute and 75 revolutions per minute respectively with solenoid 149 de-energized. At completion of approximately 8 seconds of auxiliary timing motor operation, switch 194 is actuated to close to contact 199 for energizing motor 137 for operation at 1150 revolutions per minute and switch 195 is operated to close to contact 201 for interrupting energization of auxiliary timing motor 189 and for energizing spin solenoid 149. Upon energization of solenoid 149, transmission 145 is actuated into position for driving receptacle 95 at a fluid extraction speed of approximately 300 revolutions per minute.

After a predetermined period of spin at 300 revolutions per minute, in this specific embodiment contact 206 is closed to 207 for re-energizing auxiliary motor 189 to advance cam 190 to a position at which recess 217 allows switch 194 to operate for closing to contact 198, thus de-energizing auxiliary timing motor 189 and six-pole run winding 136 and energizing four-pole run winding 135 to drive receptacle 95 at the high spin speed of approximately 450 revolutions per minute. The fluid extraction operation may include a series of distribution operations and extraction operations for best fluid extraction results. The fluid extraction operation may, of course, be followed by an additional tumbling operation as in the combination washer-drier, with heat on for drying the fabrics.

It is thus seen that the present invention provides a washing machine or combination washer-drier in which a slowly accelerating distribution speed is obtained by alternately energizing and de-energizing the two run windings of a two-speed motor. This slowly accelerating distribution speed insures an optimum distribution speed for a wide range of sizes and conditions of clothes loads.

In the drawings and specification, there has been set forth a preferred embodiment of the invention and, although specific terms are employed, these are used in a generic and descriptive sense only and not for purposes of limitation. Changes in form and proportion of parts, as well as the substitution of equivalents, are contemplated as circumstances may suggest or render expedient without departing from the spirit or scope of this invention as further defined in the following claims.

I claim:

1. In a fabric treating machine having receptacle means rotatable about a non-vertical axis and operable through a sequence of operations including tumble, distribution, and extraction operations, the combination comprising: drive means including an electric drive motor operable at a first speed and a second higher speed; said drive means being operable for rotating said receptacle means at a plurality of velocities including a tumble velocity and a relatively slow extraction velocity; means for energizing said motor for operation at said first speed for effecting rotation of said receptacle at said tumble velocity; and

motor pulsing means operative during said distribution operation for energizing said motor alternately for acceleration toward said second speed and for deceleration toward said first speed at predetermined time intervals to effect slow acceleration of said receptacle from said tumble velocity to said relatively slow extraction velocity.

2. In a fabric treating machine having receptacle means rotatable about a non-vertical axis and operable through a sequence of operations including tumble, distribution, and extraction operations, the combination comprising: drive means including an electric drive motor operable at a first speed and a second higher speed; said drive means being operable for rotating said receptacle means at a plurality of velocities including a tumble velocity and a relatively slow extraction velocity; and circuit means including motor pulsing means operative during said distribution operation for cyclically energizing said motor for said second speed and said first speed to alternately effect an increment of speed change toward said second speed and to effect a smaller increment of speed change therefrom toward said first speed whereby said receptacle means is slowly accelerated from said tumble velocity to said relatively slow extraction velocity for distributing material contained therein.

3. In a washing machine having receptacle means rotatable about a non-vertical axis and operable through a sequence of operations including tumble, distribution and extractor operations, the combination comprising: an electric drive motor operable at a first speed and at a second higher speed; transmission means driven by said motor operable for rotating said receptacle means at a plurality of velocities including a tumble velocity and a relatively low extraction velocity; and circuit means including pulsing means operative during said distribution operation, said pulsing means having switch means and timing means cooperable therewith for rapidly cycling energization of said motor to alternately effect an increment of acceleration toward said second speed and an increment of deceleration toward said first speed at predetermined intervals of time, said increments of acceleration and deceleration having a relationship of net acceleration to effect slow acceleration of said receptacle means from said tumble velocity to said relatively slow extraction velocity, said circuit means further having means for de-energizing said timing means and initiating said extraction operation upon completion of said distribution operation.

4. In a washing machine having receptacle means rotatable about a non-vertical axis and operable through a sequence of operations including tumble, distribution and extraction operations, the combination comprising: an electric drive motor having a first run winding and a second run winding individually energizable for accelerating said motor to a first speed and to a second higher speed; transmission means driven by said motor operable for rotating said receptacle means at a plurality of velocities including a tumble velocity and a relatively slow extraction velocity; and circuit means for energizing said first run winding and operating said motor at said first speed to effect rotation of said receptacle at said tumble velocity, said circuit means having pulsing means operative during at least one predetermined portion of said sequence of operations and including means for cyclically energizing said motor between said first run winding and said second run winding for relatively short predetermined intervals of time, said motor being responsive to said cyclical energization for effecting a speed change toward said second speed and a smaller speed change toward said first speed whereby said receptacle means is slowly accelerated from said tumble velocity to said low extraction velocity.

5. In a washing machine as defined by claim 4 wherein said circuit means further includes means for deenergizing said pulsing means and initiating said extraction operation after a predetermined time duration comprising said distribution operation.

6. In a washing machine operable through a cycle of operations including tumble, distribution, and extraction operations and having a receptacle rotatable about a non-vertical axis, the combination comprising: primary timing means for controlling said washing machine through said series of operations; an electric drive motor having first and second run windings individually energizable for selective operation of said motor for acceleration to and operation at a first speed and a second higher speed; transmission means driven by said motor and selectively operable for rotating said receptacle at a plurality of substantially constant velocities including a tumble velocity and at least one extraction velocity; transmission control means optionally energizable for actuating said transmission means to vary output velocity thereof; first circuit means having first switch means operable to a first position for energizing said first run winding and operable to a second position for energizing said second run winding; second circuit means including second switch means and auxiliary timing means, said second circuit means being energizable by said primary timing means for initiating said distribution operation; first cam means driven by said auxiliary timing means for effecting cyclical operation of said first switch means between said first and second positions to alternately energize said first and second run windings individually for predetermined intervals of time, said motor being responsive to said cyclical energization for alternately effecting an increase in speed of said receptacle and effecting a smaller decrease in speed of said receptacle to slowly accelerate said receptacle from said tumble velocity to a low extraction velocity during said distribution operation; and second cam means driven by said auxiliary timing means for actuating said second switch means to de-energize said auxiliary timing means and energize said transmission control means for initiating said extraction operation, said first switch means being selectively operable to said first and said second positions for effecting rotation of said container at an intermediate extraction velocity and a relatively high extraction velocity respectively.

7. In a washing machine operable through a cycle of operations including tumble, distribution, and extraction operations and having a receptacle rotatable about a non-vertical axis, the combination comprising: primary timing means for controlling said washing machine through said series of operations; an electric drive motor having first and second run windings individually energizable for selective operation of said motor for acceleration to and operation at a first speed and a second higher speed; triansmission means driven by said motor for rotating said receptacle at a plurality of substantially constant velocities including a low tumble velocity, a low extraction velocity and a plurality of higher extraction velocities; transmission control means optionally energizable for actuating said transmission means to deliver said higher extraction velocities; first circuit means having first switch means operable to a first position for energizing said first run winding and operable to a second position for energizing said second run winding, said first switch means being maintained in said first position during said tumble operation for energizing said first run winding to operate said motor at said first speed for effecting rotation of said receptacle at said tumble velocity; second circuit means including second switch means and auxiliary timing means, said second circuit means being energizable by said primary timing means at the completion of said tumble operation; first cam means driven by said auxiliary timing means for effecting rapid cyclical operation of said first switch means between said first and second positions to alternately energize and de-energize said first and second run windings for relatively short predetermined intervals of time, said motor

being responsive to said rapid cyclical energization for alternately increasing output speed an increment and decreasing output speed less than said increment to effect slow acceleration of said receptacle from said tumble velocity to said low extraction velocity during said distribution operation; second cam means driven by said auxiliary timing means for actuating said second switch means to de-energize said auxiliary timing means and energize said transmission control means for initiating said extraction operation, said first switch means being further responsive to said first cam means upon initiation of said extraction operation for energizing said first run winding to effect acceleration of said motor to said first speed for effecting rotation of said receptacle at a second intermediate extraction velocity; selectively actuatable

means for causing said motor to be accelerated to said second speed for effecting rotation of said receptacle at a third relatively high extraction velocity.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,172,278 March 9, 1965

Charles W. Burkland

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 51, for "two-spaced" read -- two-speed --; column 5, line 73, for "poistion" read -- position --.

Signed and sealed this 27th day of July 1965.

SEAL)
ttest:

ERNEST W. SWIDER
ttesting Officer

EDWARD J. BRENNER
Commissioner of Patents

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