

April 14, 1959

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2,881,633

COMBINATION WASHER-DRYER DRIVE MECHANISM

Filed July 19, 1956

3 Sheets-Sheet 1

FIG. 1

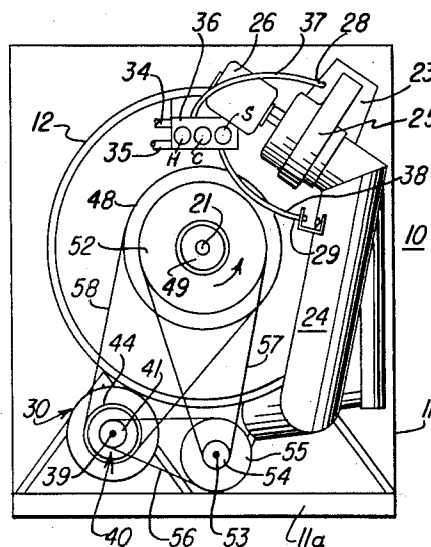
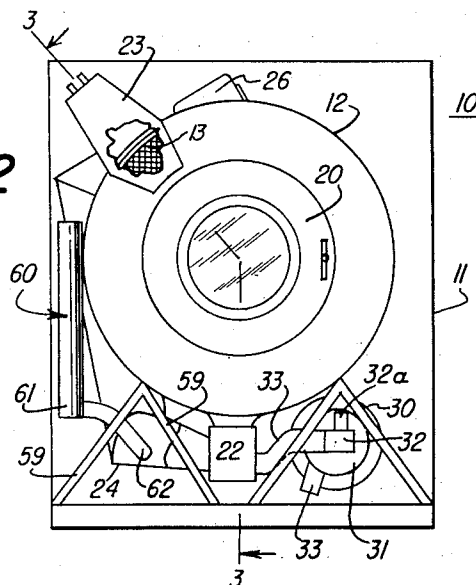


FIG. 2



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3 Sheets-Sheet 2

FIG. 3

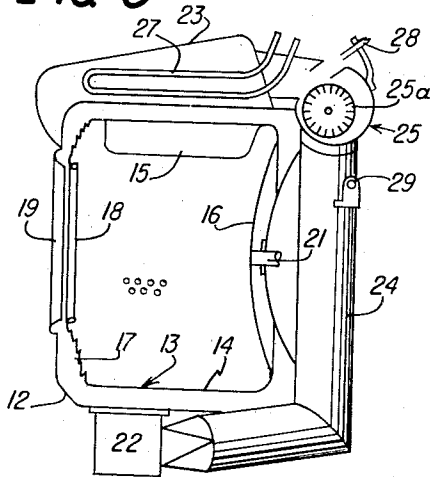


FIG. 4

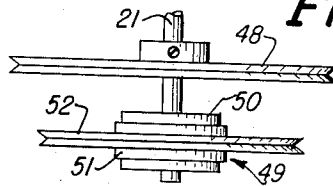
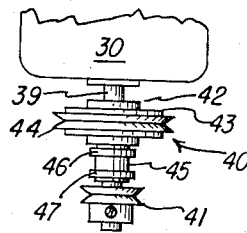


FIG. 5



WASH CONTROLLER

S1									
S2									
S3									
S4									
S5									
S6									
S7									
S8-1									
S8-2									
S9-1									
S9-2									
S10									
	OFF	FILL & WASH	DRAIN #1	SPIN #1	SPIN #2	SPIN #3	RINSE #1	RINSE #2	DRAIN #2

FIG. 7

DRY CONTROLLER

S11									
S12									
S13									
S14-1									
S14-2									
S15									
S16									
S17									
	OFF	TIME							
			FIN.	OFF					

FIG. 8

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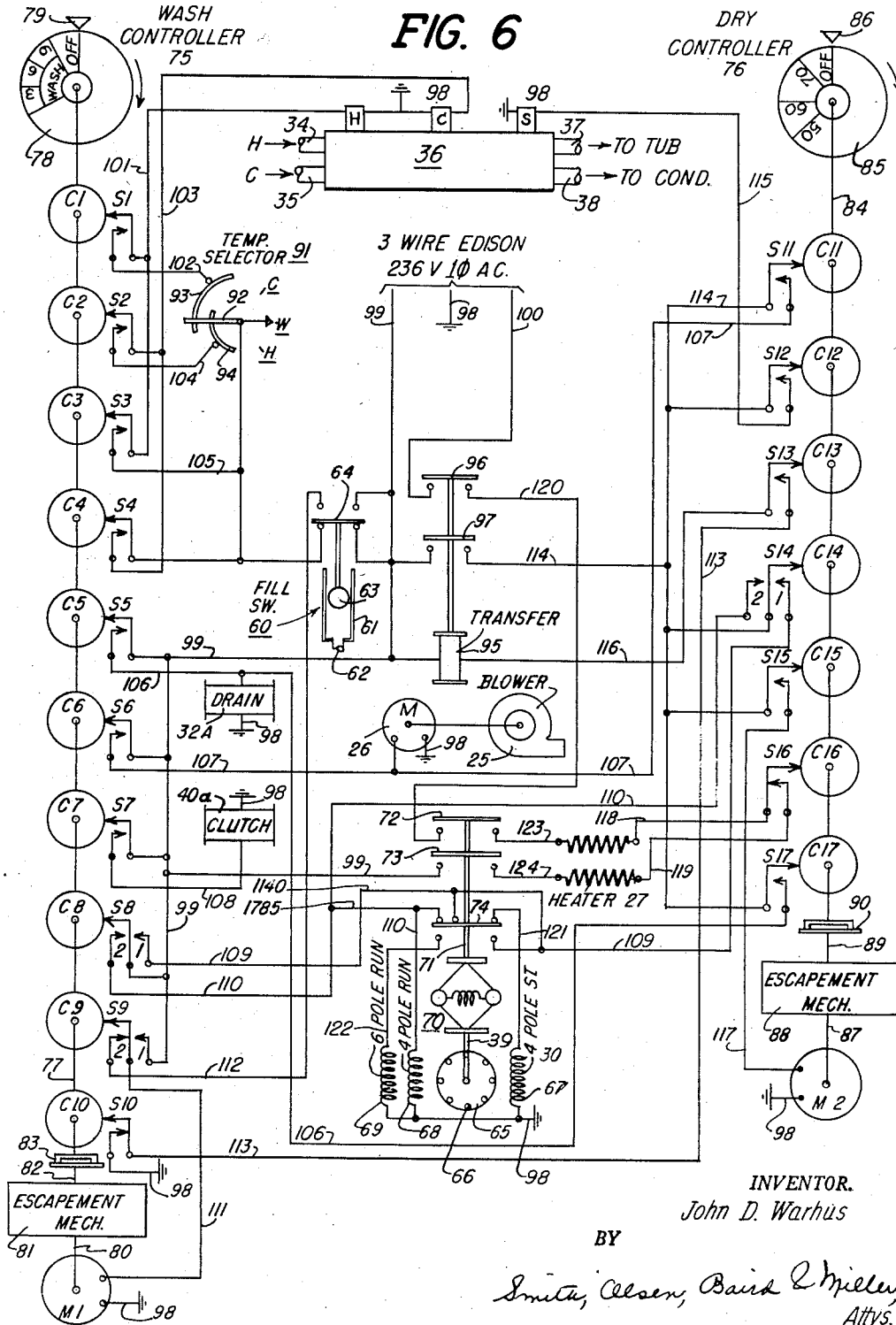
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COMBINATION WASHER-DRYER DRIVE MECHANISM

Filed July 19, 1956

3 Sheets-Sheet 3



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COMBINATION WASHER-DRYER DRIVE MECHANISM

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13 Claims. (Cl. 74-472)

The present invention relates to a combination washer-dryer machine of the home laundry type, wherein clothes are washed and then dried in the same basket or container, without handling therebetween by the housewife.

It is a general object of the invention to provide in a machine of the character noted, an improved drive arrangement, wherein the different speeds of rotation of the clothes-receiving basket that are required in the different washing and drying operations are obtained in a simple and efficient manner.

Another object of the invention is to provide in a clothes washing machine of the type including a perforated clothes-receiving basket mounted for rotation about a substantially horizontal axis, an improved drive arrangement including an electric drive motor of the split-phase induction type having two normal running speeds respectively corresponding to two pole arrangements of the winding thereof.

Another object of the invention is to provide in a clothes washing machine of the type noted, an improved drive arrangement including two different clothes-tumbling speeds and at least one water-extracting speed, whereby the clothes-receiving basket may be accelerated from the lower clothes-tumbling speed to the higher clothes-tumbling speed and then to the water-extracting speed at spaced time intervals, so as to obtain proper distribution of the clothes in the basket following a clothes-washing operation and preceding a water-extracting operation.

Another object of the invention is to provide in a clothes washing machine of the type noted, an improved four-speed drive arrangement for the clothes-receiving basket.

A further object of the invention is to provide in a clothes drying machine of the type including a perforated clothes-receiving basket mounted for rotation about a substantially horizontal axis, an improved drive arrangement including an electric drive motor of the split-phase induction type having two normal running speeds respectively corresponding to two pole arrangements of the winding thereof.

A further object of the invention is to provide in a clothes drying machine of the type noted, an improved drive arrangement including two different clothes-tumbling speeds, whereby the clothes-receiving basket may be accelerated from the lower clothes-tumbling speed to the higher clothes-tumbling speed near the conclusion of the drying action so as to obtain increased fanning and cooling of the clothes following the fundamental drying operation.

A still further object of the invention is to provide in a clothes drying machine of the type noted, an improved two-speed drive arrangement for the clothes-receiving basket.

Further features of the invention pertain to the particular arrangement of the elements of the washer-dryer machine and of the drive arrangement therefor, whereby

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the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a rear elevational view of a washer-dryer machine, with the rear wall of the housing removed, embodying the present invention;

Fig. 2 is a front elevational view, partly broken away, of the machine, with the front wall of the housing removed;

Fig. 3 is a fragmentary vertical sectional view of the machine, taken in the direction of the arrows along the offset line 3-3 in Fig. 2;

Fig. 4 is an enlarged fragmentary plan view of a portion of the drive arrangement incorporated in the machine;

Fig. 5 is an enlarged fragmentary plan view of another portion of the drive arrangement incorporated in the machine;

Fig. 6 is a diagrammatic illustration of the control circuit incorporated in the machine;

Fig. 7 is a fragmentary portion of the time-sequence diagram of the washing cycle of the machine; and

Fig. 8 is a fragmentary portion of the time-sequence diagram of the drying cycle of the machine.

Referring now to Figs. 1 to 3, inclusive, of the drawings, the clothes washer-dryer machine 10 there illustrated and embodying the features of the present invention comprises a substantially box-like housing 11 enclosing a substantially cylindrical casing or tub 12 in which there is arranged a substantially cylindrical clothes-receiving basket or container 13 that is mounted for rotation about a substantially horizontal axis. More particularly, the basket 13 comprises a substantially tubular perforated side wall 14 carrying a number of angularly spaced-apart clothes-tumbling vanes 15, a forwardly dished rear wall 16, and a foraminous front wall 17 having a front opening 18 formed therein. The front opening 18 formed in the front wall 17 of the basket 13 cooperates with an aligned front opening 19 formed in the front wall of the tube 12; which front openings are closed by a front door 20 carried by the front wall of the casing 12 and movable between open and closed positions with respect to the front openings mentioned.

The basket 13 is supported for rotation within the tub 12 upon the front end of a basket shaft 21 projecting through an opening provided in the rear wall of the tub 12 and mounted for rotation about a substantially horizontal axis by bearing structure, not shown. The lower central portion of the tub 12 communicates with structure 22 defining a sump therebelow; and the upper portion of the tub 12 communicating with structure 23 defining a hood thereabove; which structures 22 and 23 are interconnected by an upstanding tube 24 and a blower 25. As best shown in Figs. 1 and 3, the lower end of the tube 24 communicates with the lower structure 22 and the upper end of the tube 24 communicates with the intake port of the casing of the blower 25, while the discharge port of the casing of the blower 25 communicates with the upper structure 23; thereby to define a passageway for the circulation of air through the tub 12 via the elements 22, 24, 25 and 23 and consequently through the basket 13, as explained more fully hereinafter. The blower 25 further comprises a rotor 25a housed in the casing thereof and driven by an electric drive motor 26, as best illustrated in Fig. 1. Further, an electric heating unit 27 is arranged in the hood 23; a water supply nozzle 28 is carried by the casing of the blower 25 and arranged

to project a stream of water through an opening therein into the hood 23 and into contact with the heating unit 27 arranged therein and thus into the tub 12; and a spray nozzle 29 is carried by the tube 24 and arranged to project a stream of water through an opening provided in the tube 24 and thus into contact with the interior surface of the tube 24 and thence into the sump 22.

An electric drive motor 30 is suitably mounted upon the lower portion of the tub 12 adjacent to the sump structure 22, and on the right-hand side thereof as viewed in Fig. 2; and on the front end of the drive motor 30 there is mounted a drain pump 31, the drain pump 31 being provided with an intake port governed by a drain valve 32 and a discharge port 33 communicating with drain plumbing, not shown. The drain valve 32 communicates directly with the intake port of the drain pump 31 and further communicates via a tube 33 with the lower portion of the sump structure 22. The drain valve 32 is of the solenoid-operated type including an operating solenoid 32a, the drain valve 32 being normally biased into its closed position and operated into its open position incident to energization of the solenoid 32a.

As best illustrated in Fig. 1, the machine 10 further comprises a hot water supply conduit 34, a cold water supply conduit 35, valve mechanism 36 of the solenoid operated type including a hot solenoid H, a cold solenoid C and a spray solenoid S, and conduits extending to the spray nozzles 28 and 29 and respectively indicated at 37 and 38 and communicating with the valve mechanism 36. In the arrangement the valve mechanism 36 is biased into its closed position; when the hot solenoid H is energized, the hot water supply conduit 34 is connected to the conduit 37 extending to the supply nozzle 28; when the cold solenoid C is energized, the cold water supply conduit 35 is connected to the conduit 37 extending to the supply nozzle 28; and when the spray solenoid S is energized, the cold water supply conduit 35 is connected to the conduit 38 extending to the spray nozzle 29.

As best illustrated in Figs. 1 and 5, the drive motor 30 is provided with an operating shaft 39 projecting from the rear end thereof and carrying both a drive clutch 40 and a fixed pulley 41, the fixed pulley 41 being rigidly secured to the extreme rear end thereof. The power clutch 40 is of the electromagnetic type, including two relatively rotatable elements 42 and 43, as well as an operating solenoid 40a, not shown, but indicated in Fig. 6. The element 42 is rigidly secured to the operating shaft 39; and the element 43 carries a surrounding pulley 44; whereby the pulley 44 is clutched to the operating shaft 39 only when the operating solenoid 40a of the power clutch 40 is energized. Further, the operating shaft 39 carries insulating structure 45 providing two slip rings 46 and 47 through which the operating solenoid 40a may be energized.

As best illustrated in Figs. 1 and 4, the rear end of the basket shaft 21 carries both a fixed pulley 48 rigidly secured thereto and an overrunning clutch 49. The overrunning clutch 49 is of the mechanical type including two relatively rotatable elements 50 and 51. The element 50 is rigidly secured to the basket shaft 21; and the element 51 carries a surrounding pulley 52; whereby the pulley 52 is clutched to the basket shaft 21 only when the element 51 is urged to rotate in the counterclockwise direction (as viewed in Fig. 1) faster than the element 50. Restating the matter: when the element 50 is rotated faster in the counterclockwise direction (as viewed in Fig. 1), than the element 51, the drive connection therebetween, is disengaged in order to permit the basket shaft 21 to rotate faster than the pulley 52.

Further, as shown in Fig. 1, an idler shaft 53 is arranged below the tub 12 and mounted thereon for rotation; which idler shaft 53 carries two fixed pulleys 54 and 55 rigidly secured thereto. In the arrangement: the pulleys 41 and 55 are of the V-type and are belted to-

gether by an associated V-belt 56; the pulleys 54 and 52 are of the V-type and are belted together by an associated V-belt 57; and the pulleys 44 and 48 are of the V-type and are belted together by an associated V-belt 58. Accordingly, a first drive connection is provided between the operating shaft 39 of the motor 30 and the basket shaft 21, which connection includes the power clutch 40, the pulley 44, the belt 58 and the pulley 48; and a second drive connection is provided between the operating shaft 39 of the motor 30 and the basket shaft 21, which connection includes the pulley 41, the belt 56, the pulley 55, the idler shaft 53, the pulley 54, the belt 57, the pulley 52 and the overrunning clutch 49.

Considering now the mode of operation of the drive arrangement: when the motor 30 is operated, the drive shaft 39 thereof is rotated in the counterclockwise direction, as viewed in Fig. 1, thereby effecting corresponding rotation of the idler shaft 53 and the pulley 52. At this time, when the power clutch 40 is disengaged, the rotating pulley 52 urges the element 51 into driving engagement with the element 50 in the overrunning clutch 49, whereby the basket shaft 21 is rotated at a relatively low speed since there is a speed reduction both between the pulleys 41 and 55 and between the pulleys 54 and 52; and the rotating pulley 48 effects rotation of the pulley 44 in the power clutch 40 with respect to the operating shaft 39; whereby there is no interference between the two drives. On the other hand, when the power clutch 40 is engaged, the pulley 44 is rotated through the power clutch 40 effecting rotation of the pulley 48 and the consequent rotation of the basket shaft 21 at a relatively high speed, since there is only one speed reduction between the pulleys 44 and 48; whereby the element 50 overruns the element 51 in the overrunning clutch 49; whereby there is no interference between the two drives.

As previously explained, the elements 30, 53, 24, 25, 26 and 36 are mounted upon the tub 12; and in turn the tub 12 is mounted upon the base 11a of the housing 11 by a resilient shock-absorbing mounting arrangement including four upwardly inclined struts 59, as indicated in Fig. 2, two of the struts 59 being arranged on each side of the vertical center line of the tub 12, thereby to accommodate some vibration and movement of the tub 12 with respect to the housing 11 in the operation of the machine 10 and to absorb the vibratory energy involved therein. Further, a fill switch 60 is mounted upon the tub 12, as indicated in Fig. 2, the fill switch 60 including a casing 61 that is connected by a tube 62 to the lower portion of the tube 24 that, in turn, communicates with the trap structure 22.

Referring now to Fig. 6: the fill switch 60 is of the float type including a float device 63 arranged in the casing 61 and controlling a contact bridging member 64 provided with front and rear pairs of contacts; and the drive motor 30 is of the split-phase, 4-pole-6-pole, induction type including a rotor 65 carried by the operating shaft 39 and provided with a squirrel-cage winding 66, as well as a stator, not shown, carrying a 4-pole start winding 67, a 4-pole run winding 68 and a 6-pole run winding 69. Also the operating shaft 39 carries speed responsive mechanism 70 that governs an operating stem 71 carrying three contact bridging members 72, 73 and 74. The contact bridging members 72 and 73 govern respectively associated front contact pairs; while the contact bridging member 74 governs a set of three back contacts and a pair of front contacts.

Further, the machine 10 comprises a wash controller 75 and a dry controller 76. The wash controller 75 comprises a rotatably mounted operating shaft 77 carrying ten insulating control cams C1 to C10, inclusive, respectively governing ten sets of switch springs S1 to S10, inclusive, the outer end of the operating shaft 77 carrying a manual control dial 78 cooperating with an associated index marker 79. Also the wash controller 75 comprises a timer motor M1 of the synchronous type provided with

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an operating shaft 80 connected to escapement mechanism 81; the escapement mechanism 81 including a driven shaft 82. The inner end of the operating shaft 77 and the outer end of the driven shaft 82 are interconnected by a friction clutch 83 that accommodates rotation of the operating shaft 77 independently of the driven shaft 82. In the arrangement, when the timer motor M1 is energized, the escapement mechanism 81 is controlled so that the driven shaft 82 is rotated step by step in the clockwise direction effecting corresponding rotation of the operating shaft 77 through the friction clutch 83, as explained more fully hereinafter. The dry controller 76 comprises a rotatably mounted operating shaft 84 carrying seven insulating control cams C11 to C17, inclusive, respectively governing seven sets of switch springs S11 to S17, inclusive, the outer end of the operating shaft 84 carrying a manual control dial 85 cooperating with an associated index marker 86. Also the dry controller 76 comprises a timer motor M2 of the synchronous type provided with an operating shaft 87 connected to escapement mechanism 88 including a driven shaft 89. The inner end of the operating shaft 84 and the outer end of the driven shaft 89 are interconnected by a friction clutch 90 that accommodates rotation of the operating shaft 84 independently of the driven shaft 89. In the arrangement, when the timer motor M2 is energized, the escapement mechanism 88 is controlled so that the driven shaft 89 is rotated step by step in the clockwise direction effecting corresponding rotation of the operating shaft 84 through the friction clutch 90, as explained more fully hereinafter.

Further, the machine 10 comprises a temperature selector 91 including a rotatably mounted wiper 92 having cold and warm and hot positions and cooperating with two contact segments 93 and 94. Also the control circuit comprises a transfer relay 95 including an operating stem carrying two contact bridging members 96 and 97 that govern two respectively associated front contact pairs. Finally, the control circuit comprises a three-wire Edison source of 236-volts, single-phase, A.-C., provided with a grounded neutral conductor 98 and two outside ungrounded conductors 99 and 100.

In the circuit arrangement, the set of switch springs S1 comprises two individual switch springs respectively connected to two conductors 101 and 102; the set of switch springs S2 comprises two individual switch springs respectively connected to two conductors 103 and 104; the set of switch springs S3 comprises two individual switch springs respectively connected to the conductor 101 and to a conductor 105; the set of switch springs S4 comprises two individual switch springs respectively connected to the conductors 105 and 103; the set of switch springs S5 comprises two individual switch springs respectively connected to the line conductor 99 and to a conductor 106; the set of switch springs S6 comprises two individual switch springs respectively connected to the line conductor 99 and to a conductor 107; the set of switch springs S7 comprises two individual switch springs respectively connected to the line conductor 99 and to a conductor 108; the set of switch springs S8 comprises three individual switch springs respectively connected to the line conductor 99 and to two conductors 109 and 110; the set of switch springs S9 comprises three individual switch springs respectively connected to the line conductor 99 and to two conductors 111 and 112; and the set of switch springs S10 comprises two individual switch springs respectively connected to the neutral conductor 98 and to a conductor 113. The set of switch springs S11 comprises two individual switch springs respectively connected to a conductor 114 and to the conductor 107; the set of switch springs S12 comprises two individual switch springs respectively connected to the conductor 114 and to a conductor 115; the set of switch springs S13 comprises two individual switch springs respectively connected to a conductor 116 and to the conductor 113; the set of switch

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springs S14 comprises three individual switch springs respectively connected to the conductors 110, 114 and 109; the set of switch springs S15 comprises two individual switch springs respectively connected to the conductor 114 and to a conductor 117; the set of switch springs S16 comprises two individual switch springs respectively connected to two conductors 118 and 119; and the set of switch springs S17 comprises two individual switch springs respectively connected to the conductors 114 and 106.

In the valve mechanism 36: the hot solenoid H is bridged across the conductor 101 and the neutral conductor 98; the cold solenoid C is bridged across the neutral conductor 98 and the conductor 103; and the spray solenoid S is bridged across the neutral conductor 98 and the conductor 115. In the temperature selector 91: the wiper 92 is connected to the conductor 105; and the contact segments 93 and 94 are respectively connected to the conductors 102 and 104. When the wiper 92 occupies its hot position, it engages only the contact segment 93; when the wiper 92 occupies its warm position, it engages both of the contact segments 93 and 94; and when the wiper 92 occupies its cold position, it engages only the contact segment 94. The blower motor 26 is bridged across the neutral conductor 98 and the conductor 107; the drain solenoid 32a is bridged across the neutral conductor 98 and the conductor 106; the clutch solenoid 40a is bridged across the neutral conductor 98 and the conductor 108; the timer motor M1 is bridged across the conductor 111 and the neutral conductor 98; and the timer motor M2 is bridged across the conductor 117 and the neutral conductor 98. The winding of the transfer relay 95 is bridged across the line conductor 99 and the conductor 116; the front contacts associated with the contact bridging member 96 respectively terminate the line conductor 100 and the conductor 120; and the front contacts associated with the contact bridging member 97 respectively terminate the line conductor 99 and the conductor 114. In the fill switch 60: the front contacts associated with the contact bridging member 64 respectively terminate the conductor 112 and the line conductor 99; and the back contacts associated with the contact bridging member 64 respectively terminate the conductor 105 and the line conductor 99. In the drive motor 30: the 4-pole start winding 67 is bridged across the neutral conductor 98 and a conductor 121; the 4-pole run winding 68 is bridged across the neutral conductor 98 and the conductor 110; and the 6-pole run winding 69 is bridged across the neutral conductor 98 and a conductor 122. The contacts associated with the bridging member 72 respectively terminate the conductor 120 and a conductor 123; while the contacts associated with the bridging member 73 respectively terminate the line conductor 99 and a conductor 124. The heater 27 is arranged in two sections, one of the sections being bridged across the conductors 123 and 118, and the other of the sections being bridged across the conductors 124 and 119. The three back contacts associated with the bridging member 74 are respectively connected to the conductors 110, 109 and 121, while the two front contacts associated with the bridging member 74 are respectively connected to the conductors 122 and 109.

When the wash controller 75 occupies its off position, the sets of switch springs S1, S2, S3, S4, S5, S6, S7 and S8 occupy their open positions, while the contacts "2" of the set of switch springs S9 occupy their closed position, and the set of switch springs S10 occupies its closed position. When the dry controller 76 occupies its off position, the sets of switch springs S11, S12, S13, S14, S15 and S17 occupy their open positions, and the set of switch springs S16 occupies its closed position.

When the drive motor 30 is operated as a 4-pole motor, it has a normal full load running speed of about 1725 r.p.m.; and when the drive motor 30 is operated as a 6-pole motor, it has a normal full load running speed of about 1140 r.p.m. When the drive motor 30 is operated as a 6-pole motor, the basket 13 is respectively ro-

tated at 42 r.p.m. and at 330 r.p.m., when the power clutch 40 occupies its respective declutched and clutched positions. When the drive motor 30 is operated as a 4-pole motor, the basket 13 is respectively rotated at 63.5 r.p.m. and at 500 r.p.m., when the power clutch 40 occupies its respective declutched and clutched positions. Accordingly, it will be understood that the basket 13 may be selectively rotated at the speeds: 42 r.p.m., 63.5 r.p.m., 330 r.p.m. and 500 r.p.m. by selective operation of the drive motor 30 as a 6-pole motor and as a 4-pole motor and by effecting selective declutching and clutching of the power clutch 40. In the preferred construction of the basket 13, the radius thereof is about one foot; whereby the speeds mentioned above respectively correspond to linear or circumferential speeds of the basket 13 as follows: 265 ft./min., 400 ft./min., 2080 ft./min. and 3140 ft./min. Of course the speeds of 42 r.p.m. and 63.5 r.p.m. of the basket 13 constitute clothes-tumbling speeds thereof; whereas the speeds of 330 r.p.m. and 500 r.p.m. of the basket 13 constitute water-extracting speeds thereof.

Considering the general operation of the machine 10, it is pointed out that it may be operated entirely as a clothes-washing machine, when only the wash controller 75 is set out of its off position, or it may be operated entirely as a clothes drying machine, when only the dry controller 76 is set out of its off position. The machine 10 operates first as a clothes washing machine and then as a clothes drying machine, when both of the controllers 75 and 76 are set out of their off positions. In the operation of the machine 10: the clothes to be washed or dried or washed and dried are placed in the basket 13 and the door 20 is moved into its closed position. In the event the clothes are to be washed, a suitable quantity of detergent is also placed in the tub 12, in any suitable manner, and thereafter one or both of the controllers 75 and 76 and the temperature selector 91 are selectively set in accordance with the desired control.

Now assuming that a load of clothes arranged in the basket 13 are to be washed in warm water and then dried: the temperature selector 91 is operated into its warm position; the wash controller 75 is operated into its fill and wash position in accordance with the desired time interval of the washing operation; and the dry controller 76 is operated into its time position in accordance with the desired time interval of the drying operation. When the wash controller 75 is operated out of its off position, the control cam C10 operates the set of switch springs S10 into its open position to open a point in the chain circuit for operating the transfer relay 95, so as to prevent operation of the transfer relay 95 while the wash controller 75 occupies other than its off position, as illustrated in the chart of Fig. 7. When the dry controller 76 is operated out of its off position, the control cam C13 operates the set of switch springs S13 into its closed position to prepare a point in the previously mentioned chain circuit for operating the transfer relay 95, so as to effect operation thereof when the wash controller 75 is returned back into its off position, as explained below.

Also when the wash controller 75 is operated into its fill and wash position, the control cams C1, C2, C6 and C8 operate the respective sets of switch springs S1, S2, S6 and S8, as indicated by the chart of Fig. 7. Also when the dry controller 76 is operated into its time position, the control cams C11, C12, C13, C14, C15 and C17 operate the respective sets of switch springs S11, S12, S13, S14, S15 and S17, as indicated by the chart of Fig. 8. More particularly, the sets of switch springs S1 and S2 are closed, thereby to complete parallel circuits for operating the hot solenoid H and the cold solenoid C, with the wiper 92 of the temperature selector 91 in its warm position. The circuits for operating the solenoids H and C also include the back contacts of the fill switch 60, whereby the valve mechanism 36 is governed to

bring about the supply of a mixture of hot water and cold water from the pipes 34 and 35 via the conduit 37 into the tub 12. The set of switch springs S6 is closed to complete a circuit for operating the blower motor 26 so as to bring about operation of the blower 25 at this time. More particularly, the warm water from the conduit 37 is delivered to the nozzle 28 and is directed onto the rotor 25 of the blower 25 so that a portion of the water falls through the tube 24 and another portion thereof is flung into the hood 23 by the rotor 25a and then falls into the tub 12, all of the water being delivered to the tub 12. When a full quantity of water is delivered into the tub 12, the fill switch 60 is operated so that the contact bridging member 64 opens its back contacts and closes its front contacts. Opening of the back contacts associated with the bridging member 64 interrupts the parallel circuits for operating the solenoids H and C; whereby the valve mechanism 36 is returned back into its closed position to cut off the supply of warm water to the tub 12. Closure of the front contacts associated with the contact bridging member 64 completes a circuit for initiating operation of the timer motor M1, as explained more fully hereinafter. Closure of the contacts "1" of the set of switch springs S8 completes parallel circuits for energizing the 4-pole start winding 67 and the 4-pole run winding 68 of the drive motor 30. These circuits include the line conductor 99, the contacts "1" of the set of switch springs S8, the conductor 109, and the middle back contact associated with the contact bridging member 74. At this time, the bridging member 74 connects the middle back contact thereof to the right-hand back contact thereof and to the left-hand back contact thereof and thus to the conductors 121 and 110, whereby the windings 67 and 68 are energized to the neutral conductor 98. Accordingly, the rotor 65 is accelerated from its rest position, and when a speed somewhat in excess of $\frac{1}{2}$ of its normal 4-pole running speed is reached, the speed-responsive mechanism 70 operates the contact bridging member 74 to open its back contacts and to close its front contacts. Opening of the back contacts of the contact bridging member 74 interrupts the circuits for energizing the windings 67 and 68 of the operating motor 30; while closure of the front contacts of the bridging member 74 completes a circuit for energizing the 6-pole run winding 69, the last-mentioned circuit including the conductor 109, the bridging member 74 engaging its front contacts, and the conductor 122. Accordingly, the rotor 65 is accelerated on into its normal 6-pole running speed of 1140 r.p.m. At this time, the basket 13 is rotated at 42 r.p.m., since the power clutch 40 occupies its declutched position, the clutched solenoid 49a being deenergized at this time.

As previously noted, when the fill switch 60 responds to a complete fill of wash water in the tub 12, the contact bridging member 64 is operated to open its back contacts and to close its front contacts, thereby interrupting the circuits for energizing the solenoids H and C and completing the circuit for operating the timer motor M1. More particularly, the contact bridging member 64 at its front contacts connects the line conductor 99 to the conductor 112, the conductor 112 being connected via the contacts "2" of the set of switch springs S9 to the conductor 111, whereby the timer motor M1 is energized to the neutral line 98. Operation of the timer motor M1 effects operation of the escapement mechanism 81, whereby the operating shaft 77 is driven step by step further in the clockwise direction through the driven shaft 82 and the friction clutch 83 so that the operating shaft 77 is driven out of its fill and wash position into its drain #1 position after a time interval corresponding to the set wash-time of the manual dial 78, as shown in the chart of Fig. 7. In the drain #1 position of the wash controller 75 the control cam C1, C2, C5, C6 and C9 operate the respectively associated sets of switch springs S1, S2, S5, S6 and S9. Specifically, the sets of switch springs

S1 and S2 are opened in order positively to insure de-energization of the solenoids H and C at this time. The set of switch springs S5 is closed to complete a circuit for energizing the drain solenoid 32a so that the drain mechanism 32 is opened connecting the sump 22 to the drain pump 31 in order that the charge of wash water in the tub 12 is pumped therefrom by the operating drain pump 31 to the exterior. The set of switch springs S6 is opened to arrest operation of the blower motor 26 and the consequent operation of the blower 25. The set of switch springs S9 is operated to open the contact "2" thereof and to close the contacts "1" thereof, thereby to interrupt the original circuit for operating the timer motor M1 and to complete an alternative circuit for operating the timer motor M1. The original circuit for operating the timer motor M1 included the front contacts associated with the contact bridging member 64 of the fill switch 60, as previously noted; whereas the alternative circuit for operating the timer motor M1 is a direct circuit to the line conductor 99. This arrangement insures operation of the timer motor M1 at this time independently of the position of the fill switch 60.

Operation of the timer motor M1 continues, whereby the wash controller 75 is driven into its spin #1 position so that the control cam C8 operates the set of switch springs S8, opening the contacts "1" thereof and closing the contacts "2" thereof, as indicated in the chart of Fig. 7. Opening of the contacts "1" of the set of switch springs S8 opens the previously traced circuit for energizing the 6-pole run winding 69 of the drive motor 30; while closing of the contacts "2" of the set of switch springs S8 completes a circuit for energizing the 4-pole run winding 68 of the drive motor 30. The last-mentioned circuit extends from the line conductor 99 via the closed contacts "2" of the set of switch springs S8, the conductor 110, and the winding 68 to the neutral conductor 98. Accordingly, the rotor 65 of the drive motor 30 is accelerated on into its 4-pole running speed of 1725 r.p.m., so that the basket 13 is rotated at a speed of 63.5 r.p.m. with the power clutch 40 in its declutched position. This increase in the speed of rotation of the basket 13 from the tumbling speed of 42 r.p.m. to the tumbling speed of 63.5 r.p.m. causes the wet clothes to be distributed about the periphery of the basket 13 and arrests the free tumbling action of all of the clothes in the basket 13. More particularly, when the basket 13 is rotating at the tumbling speed of 42 r.p.m. all of the contained clothes tumble therein; whereas when the basket 13 is rotating at the tumbling speed of 63.5 r.p.m. only the clothes disposed toward the center thereof and within a radius of about 9" are free to continue their tumbling action, and the more remotely disposed clothes are retained in contact with the periphery of the basket 13 due to the centrifugal forces involved.

Operation of the timer motor M1 is continued; whereby the wash controller 75 is then driven into its spin #2 position, as indicated by the chart in Fig. 7; whereby the control cams C7 and C8 operate the sets of switch springs S7 and S8. More particularly, the set of switch springs S8 is operated to open the contacts "2" thereof and to close the contacts "1" thereof; whereby operation of the drive motor 30 as a 4-pole motor is arrested and operation thereof as a 6-pole motor is resumed so that the rotor 65 is decelerated from 1725 r.p.m. to 1140 r.p.m. Closure of the sets of switch springs S7 completes a circuit for energizing the clutch solenoid 40a; whereby the power clutch 40 is operated into its clutched position so that the basket 13 is accelerated into its low water-extracting speed of 330 r.p.m., in order to bring about the centrifugal extraction of a substantial amount of the water contained in the clothes.

Operation of the timer motor M1 continues; whereby the wash controller 75 is next driven into its spin #3 position, as indicated in the chart of Fig. 7, so that the control cam C8 operates the set of switch springs S8

opening the "1" contacts thereof and closing the "2" contacts thereof in order that the 6-pole run winding 69 is deenergized and the 4-pole run winding 68 is energized. Accordingly, the rotor 65 is accelerated into its speed of 1725 r.p.m.; whereby the basket 13 is accelerated into its water-extracting speed of 500 r.p.m., with the power clutch 40 in its clutched position. This acceleration of the basket 13 into its high water-extracting speed of 500 r.p.m. insures the centrifugal extraction of additional water from the clothes.

Operation of the timer motor M1 continues; whereby the wash controller 75 is driven into its rinse #1 position, as indicated by the chart of Fig. 7, so that the control cams C3, C4, C6 and C8 operate the respective sets of switch springs S3, S4, S6 and S8. More particularly, the sets of switch springs S3 and S4 are closed so as to complete direct parallel circuits for energizing the solenoids H and C, independently of the temperature selector 91, the circuits however including the back contacts of the contact bridging member 64 of the fill switch 60. Accordingly, warm water is supplied to the tub 12 from the pipes 34 and 35 with the valve mechanism 36 in its open position. The set of switch springs S6 is closed to effect operation of the blower motor 26 and the consequent operation of the blower 25. The set of switch springs S8 is operated to open the contacts "2" thereof and to close the contacts "1" thereof; whereby the 4-pole operation of the drive motor 30 is arrested and 6-pole operation thereof is resumed. More particularly, the rotor 65 is decelerated from 1725 r.p.m. to 1140 r.p.m. so that the basket 13 is decelerated from 500 r.p.m. to 330 r.p.m., with the power clutch 40 in its clutched position. Accordingly, at this time warm water is supplied to the tub 12 while the basket 13 is rotated at 330 r.p.m. and while the drain mechanism 32 occupies its open position, since the drain solenoid 32a is also energized. More particularly, the warm water that is supplied into the hood 23 falls into the tub 12 and onto the rotating basket 13 so that the clothes contained therein are subjected to a centrifugal spinning rinse, the water falling through the perforated basket 13 into the sump 22 and being pumped to the exterior by the drain pump 31 with the drain mechanism 32 in its open position.

Operation of the timer motor M1 continues, whereby the wash controller 75 is driven into its rinse #2 position, as illustrated in the chart of Fig. 7, so that the control cams C5, C7 and C9 operate the sets of switch springs S5, S7 and S9. More particularly, the set of switch springs S5 is opened to interrupt the circuit for energizing the drain solenoid 32a in order that the drain mechanism 32 is operated back into its closed position, so that the water subsequently delivered into the tub 12 is retained therein. The set of switch springs S7 is opened, so that the clutch solenoid 40a is deenergized in order that the power clutch 40 is returned back into its declutched position. At this time the drive motor 30 is operating as a 6-pole motor, the rotor 65 being rotated at 1140 r.p.m. in order that the basket 13 is rotated at 42 r.p.m., with the power clutch 40 in its declutched position. The set of switch springs S9 is operated to open the "1" contacts thereof and to close the "2" contacts thereof. Opening of the "1" contacts of the set of switch springs S9 interrupts the previously traced direct circuit for operating the timer motor M1; whereas closure of the contacts "2" of the set of switch springs S9 prepares the previously traced circuit for operating the timer motor M1 via the conductor 112. Thus operation of the timer motor M1 is arrested at this time; however the supply of warm water to the tub 12 is continued; and when a full charge of warm rinse water is supplied to the tub 12 the fill switch 60 is operated, as previously explained. More particularly, the contact bridging member 64 opens the back contacts thereof interrupting the parallel circuits for energizing the solenoids H and C in order that the valve mechanism 36 is returned back into its closed posi-

tion to cut off the supply of warm water to the tub 12. Also the contact bridging member 64 closes its front contacts connecting the conductor 112 to the line conductor 99 so as to complete the previously traced alternative circuit for operating the timer motor M1 in order that further operation of the wash controller 75 is resumed; whereby the wash controller 75 is subsequently driven into its drain #2 position, as indicated in the chart of Fig. 7.

At this time, the control cams C3, C4, C5, C6 and C9 operate the respective sets of switch springs S3, S4, S5, S6 and S9. More particularly, the sets of switch springs S3 and S4 are opened in order to interrupt further points in the previously traced circuits for energizing the solenoids H and C. The set of switch springs S5 is closed in order to energize the drain solenoid 32a so that the drain mechanism 32 is operated into its open position in order that the charge of rinse water contained in the tub 12 is pumped therefrom by the drain pump 31 to the exterior. The set of switch springs S6 is opened to arrest operation of the blower motor 26 and the subsequent operation of the blower 25. The set of switch springs S9 is operated to open the contacts "2" thereof and to close the contacts "1" thereof. Opening of the contacts "2" of the set of switch springs S9 interrupts a further point in the previously traced alternative circuit for operating the timer motor M1; whereas closure of the contacts "1" of the set of switch springs S9 completes the previously traced direct circuit for operating the timer motor M1.

Further operation of the timer motor M1 is resumed; whereby the cycle of the wash controller 75 continues through a number of actions thereof, not shown; whereby the wash controller 75 is ultimately operated back into its off position. In the omitted actions of the wash controller 75, the clothes in the basket 13 are subjected to at least one additional rinsing action involving steps substantially identical to rinse #1 and rinse #2, previously described. Thereafter the rinse water is drained from the tub 12 in a step identical to drain #2 and the water retained by the clothes is centrifugally extracted therefrom in a final water-extraction action including steps similar to spin #1, spin #2 and spin #3. In this arrangement, the final spinning step corresponding to spin #3 is preferably of a rather prolonged time interval, perhaps of a time duration of 4 or 5 minutes in order to bring about the centrifugal extraction of a great proportion of water carried by the clothes in the basket 13.

When the wash controller 75 is ultimately returned into its off position as previously explained, the sets of switch springs S1 to S8, inclusive, are operated into their open positions; the set of switch springs S9 is operated to open the contacts "1" thereof and to close the contacts "2" thereof—and the set of switch springs S10 is operated into its closed position. Operation of the set of switch springs S9 to open its contacts "1" and to close its contacts "2" insures that further operation of the timer motor M1 is arrested when the manual dial 78 occupies its off position. Operation of the set of switch springs S10 into its closed position connects the neutral conductor 98 to the transfer conductor 113; whereby operation of the dry controller 76 is initiated at this time, it having been previously assumed that the dry controller 76 has been operated out of its off position.

More particularly, a circuit is completed for energizing the winding of the transfer relay 95 that includes the transfer conductor 113, the closed set of switch springs S13, the conductor 116 and the line conductor 99, whereby the transfer relay 95 is operated so that the contact bridging members 96 and 97 close the associated pairs of front contacts. At this time the sets of switch springs S11, S12, S13, S15, S16 and S17 occupy their closed position, while the set of switch springs S14 is operated to close the contacts "1" thereof and to open the contacts "2" thereof. The closed set of switch springs S11 completes an alternative circuit for operating the

blower motor 26, this circuit including the conductors 107 and 114, the contact bridging member 97 and the line conductor 99. Accordingly, the blower 25 is operated to effect the circulation of air through the tub 12 and the rotating basket 13, as explained more fully hereinafter. The closed set of switch springs S12 completes a circuit for energizing the spray solenoid S so that the valve mechanism 36 is operated to bring about the supply of cold water from the pipe 35 to the conduit 38 and thence via the spray nozzle 29 into the tube 24 for a purpose more fully explained hereinafter. The closed set of switch springs S15 completes a circuit for operating the timer motor M2, whereby the operating shaft 84 is driven step by step in the clockwise direction as time proceeds through the escapement mechanism 88 and the friction clutch 90 in order that the dry controller 76 is operated through the set time interval and ultimately back into its off position, as explained more fully hereinafter. The closed contacts "1" of the set of switch springs S14 connects the conductor 114 to the conductor 109; whereby the drive motor 30 is first started as a 4-pole motor and subsequently operated as a 6-pole motor in the manner previously explained; whereby the rotor 65 is rotated at a speed of 1140 r.p.m. effecting rotation of the basket 13 at 42 r.p.m. with the power clutch 40 in its declutched position. The closed set of switch springs S16 bridges together the conductors 118 and 119 whereby the two sections of the heater 27 are energized in series relation, the circuit including the conductors 123 and 124, the contact bridging members 72 and 73, the line conductor 99, the conductor 120, the contact bridging member 96 and the line conductor 100. Accordingly, the two sections of the heater 27 are connected in series relation across the line conductors 99 and 100 of the Edison source effecting full heating thereof. The closed set of switch springs S17 completes a circuit for energizing the drain valve solenoid 32a, whereby the drain valve 32 is operated into its open position to connect the sump 22 to the drain pump 31, so that water and condensate and lint accumulating in the sump 22 is pumped to the exterior.

At this time the basket 13 is rotated at 42 r.p.m., as previously noted so that the clothes tumble therein; and the blower 24 circulates air therefrom into the hood 23 into contact with the heater 27 so that the air is heated and delivered into the tub 12 into contact with the rotating basket 13 and therethrough into the sump 22 and thence into the tube 24. Accordingly, moisture in the clothes tumbling in the basket 13 is evaporated therefrom and moisture-laden air is delivered into the tube 24 where it is contacted by the cool water projected thereinto from the spray nozzle 29. The moisture-laden air is thus cooled effecting the condensation of the moisture therein, whereby the condensate and the spray water and lint are washed down the tube 24 into the sump 22 and thus pumped to the exterior by the drain pump 31, with the drain mechanism 32 in its open position. The air is then withdrawn from the upper portion of the tube 24 and again delivered to the blower 25 so that it may be recirculated over the heater 27 to effect reheating thereof in a cycle. Hence, the moisture is removed from the clothes tumbling in the basket 13 by the current of hot air circulated therethrough; and the moisture is condensed from the circulated current of air in the tube 24 by the spray of cool water projected thereinto from the spray nozzle 29; whereby a totally enclosed air circulating system is provided so as to prevent the escape of moisture, heat and lint to the exterior of the machine 10.

The operation of the machine 10 continues, as explained above, whereby the dry controller 76 is operated from its time position into its finish position just preceding its off position as indicated in the chart of Fig. 8. When the dry controller 76 is operated into its finish position, the control cams C14 and C16 operate the sets

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of switch springs S14 and S16. More particularly, the set of switch springs S16 is operated into its open position to interrupt the connection between the conductors 118 and 119 so as to effect deenergization of the heater 27. The set of switch springs S14 is operated to open the "1" contacts and to close the "2" contacts thereof. Opening of the "1" contacts of the set of switch springs S14 interrupts the previously traced circuit for operating the drive motor 30 as a 6-pole motor, while closure of the "2" contacts of the set of switch springs S14 completes an alternative circuit for operating the drive motor 30 as a 4-pole motor. More particularly, the conductor 114 is connected to the conductor 110 at the contacts "2" of the set of switch springs S14 thereby energizing the 4-pole run winding 68 of the drive motor 30. Accordingly, the rotor 65 is accelerated from its speed of 1140 r.p.m. to its speed of 1725 r.p.m., whereby rotation of the basket 13 is accelerated from 42 r.p.m. to 63.5 r.p.m. With the heater 27 deenergized, the increased tumbling speed of rotation of the basket 13 effects cooling of the clothes during the finishing step.

Operation of the timer motor M2 is continued, whereby the dry controller 76 is operated into its off position, as indicated in the chart of Fig. 8; whereby the control cams C11 and C17, inclusive, operate the set of switch springs S11 to S17, inclusive. The set of switch springs S11 is opened to interrupt the circuit for operating the blower motor 26 so as to arrest further operation of the blower 25; and the set of switch springs S12 is opened to interrupt the circuit for energizing the solenoid S, whereby the valve mechanism 36 is returned back into its closed position to interrupt the supply of cool water to the spray nozzle 29. The set of switch springs S13 is opened to interrupt the circuit for retaining operated the transfer relay 95. Upon restoring the transfer relay 95 actuates the contact bridging members 96 and 97 back into their open positions. The set of switch springs S14 is operated to open the contacts "2" thereof so as to interrupt the circuit for energizing the 4-pole run winding 68 of the drive motor 30 in order to arrest operation of the drive motor 30 at this time. The set of switch springs S15 is opened to arrest operation of the timer motor M2, while the manual dial 85 occupies its off position cooperating with the index marker 86. The set of switch springs S16 is reclosed so as to reconnect the conductors 118 and 119 in order to reprepare the circuit for energizing the heater 27. The set of switch springs S17 is opened to deenergize the drain valve solenoid 32a, so that the drain valve mechanism 32 is returned into its closed position. At this point it is noted that when the transfer relay 95 restores, the contact bridging member 96 interrupts a further point in the circuit for energizing the heater 27 and the contact bridging member 97 disconnects the line conductor 99 from the conductor 114 so as to prevent further operation of the drive motor 30. Also it is noted that when operation of the drive motor 30 is arrested, the speed responsive device 70 brings about opening of the contact bridging members 72 and 73 so as to interrupt further points in the circuit for energizing the heater 27. Also when operation of the drive motor 30 is arrested, the speed responsive device 70 restores the contact bridging member 74 so as to open the front contacts associated therewith and to close the rear contacts associated therewith.

At this time, the cycle of operation of the machine 10 has been completed and the clothes may be removed from the basket 13 after opening of the door 20. In the cycle described, the clothes were first washed under the control of the wash controller 75 and were then dried under the control of the dry controller 76.

In the foregoing description of the operation of the machine 10 in the washing cycle it was assumed that the clothes were to be washed in warm water, whereby

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the temperature selector 91 was preset into its warm position. However, in the event the clothes are to be washed in hot water or cold water the temperature selector 91 is correspondingly set into its hot position or its cold position, whereby in the corresponding fill and wash position of the wash controller 75 the tub 12 is filled with a corresponding charge of hot water or cold water.

Also in this connection, it is pointed out that a washing cycle may be effected in the machine 10, without an accompanying drying cycle, by setting the wash controller 75, while leaving the dry controller 76 in its off position; and similarly, a drying cycle may be effected in the machine 10, without an accompanying washing cycle, by setting the dry controller 76, while leaving the wash controller 75 in its off position.

In view of the foregoing, it is apparent that there has been provided a combination washer-dryer machine that incorporates an improved drive arrangement so that the different speeds of rotation of the clothes-receiving basket provided therein may be readily obtained as required in the different washing and drying operations thereof. Specifically in the improved drive arrangement, two different tumbling speeds and two different water-extracting speeds are obtained in a simple and ready manner by the selective control of the two-speed mechanical clutch arrangement and by the selective control of the two-speed electric drive motor of the 4-pole-6-pole, split-phase induction type.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising a drive motor provided with an operating shaft, a first drive connection including a power clutch from said operating shaft to said basket shaft, an idler shaft, a second direct drive connection from said operating shaft to said idler shaft, a third drive connection including an overrunning clutch from said idler shaft to said basket shaft, means for operating said motor, and means for engaging and for disengaging said power clutch, engagement of said power clutch effecting relatively high speed rotation of said basket shaft from said operating shaft via said first drive connection and with said overrunning clutch accommodating overrunning between said basket shaft and said third drive connection, disengagement of said power clutch effecting relatively low speed rotation of said basket shaft from said operating shaft via said second drive connection and said idler shaft and said third drive connection in tandem relation and with said power clutch accommodating overrunning between said first drive connection and said operating shaft.

2. The variable speed transmission set forth in claim 1, wherein each of said drive connections constitutes a speed-reducing drive connection, and wherein the speed reduction from said operating shaft to said basket shaft via said first drive connection is substantially less than the speed reduction from said operating shaft to said basket shaft via said second drive connection and said idler shaft and said third drive connection in tandem relation.

3. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising a drive motor provided with an operating shaft, a first drive connection from said operating shaft to said basket shaft and including a first pulley carried by said operating shaft and a power clutch arranged between said operating shaft and said first pulley and a second pulley affixed to said basket

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shaft, an idler shaft, a second direct drive connection from said operating shaft to said idler shaft and including third and fourth pulleys respectively affixed to said operating shaft and to said idler shaft, a third drive connection from said idler shaft to said basket shaft and including a fifth pulley affixed to said idler shaft and a sixth pulley carried by said basket shaft and an overrunning clutch arranged between said basket shaft and said sixth pulley, means for operating said motor, and means for engaging and for disengaging said power clutch, engagement of said power clutch effecting relatively high speed rotation of said basket shaft from said operating shaft via said first drive connection and with said overrunning clutch accommodating overrunning of said basket shaft with respect to said sixth pulley, disengagement of said power clutch effecting relatively low speed rotation of said basket shaft from said operating shaft via said second drive connection and said idler shaft and said third drive connection in tandem relation and with said power clutch accommodating overrunning of said operating shaft with respect to said first pulley.

4. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising an electric drive motor provided with an operating shaft, said motor being of the two-speed split-phase induction type including a start winding and two corresponding run windings, said motor being operated at its relatively high speed when a first of its run windings is energized and being operated at its relatively low speed when a second of its run windings is energized, switching apparatus having first and second positions respectively selecting said first run winding and said second run winding to be energized, means for operating said switching apparatus between its first and second positions, a device responsive to the speed of said motor and having corresponding start and run positions, means governed by said device for energizing both said start winding and a predetermined one of said run windings in the start position thereof and for energizing only the selected one of said run windings in the run position thereof, a first drive connection including a power clutch from said operating shaft to said basket shaft, an idler shaft, a second direct drive connection from said operating shaft to said idler shaft, a third drive connection including an overrunning clutch from said idler shaft to said basket shaft, and means for engaging and for disengaging said power clutch, engagement of said power clutch effecting relatively high speed rotation of said basket shaft from said operating shaft via said first drive connection and with said overrunning clutch accommodating overrunning between said basket shaft and said third drive connection, disengagement of said power clutch effecting relatively low speed rotation of said basket shaft from said operating shaft via said second drive connection and said idler shaft and said third drive connection in tandem relation and with said power clutch accommodating overrunning between said first drive connection and said operating shaft; whereby said basket shaft is rotated at respective first and second relatively high speeds when said first and second run windings of said motor are respectively energized with said power clutch engaged and wherein said first high speed is greater than said second high speed, and whereby said basket shaft is rotated at respective first and second relatively low speeds when said first and second run windings of said motor are respectively energized with said power clutch disengaged and wherein said first low speed is greater than said second low speed.

5. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising an electric motor of the two-speed split-phase induction type including a start winding and two corresponding run windings, said motor being operated at its relatively high speed when a first of its run windings is energized and being operated

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at its relatively low speed when a second of its run windings is energized, switching apparatus having first and second positions respectively selecting said first run winding and said second run winding to be energized, means for operating said switching apparatus between its first and second positions, a device responsive to the speed of said motor and having corresponding start and run positions, means governed by said device for energizing both said start winding and a predetermined one of said run windings in the start position thereof and for energizing only the selected one of said run windings in the run position thereof, speed-reduction mechanism for operatively connecting said motor to said basket shaft so that operation of said motor at its high speed effects a relatively high tumbling speed of rotation of said basket shaft and operation of said motor at its low speed effects a relatively low tumbling speed of rotation of said basket shaft, and additional means for rotating said basket shaft from said motor at a water-extracting speed that is substantially higher than either of said tumbling speeds.

6. The variable speed transmission set forth in claim 5, wherein said first run winding has N poles and said second run winding has M poles, where N and M are even numbers and $M > N$.

7. The variable speed transmission set forth in claim 6, where $N=4$ and $M=6$.

8. The variable speed transmission set forth in claim 5, wherein said relatively high tumbling speed of rotation of said basket shaft is about 60 r.p.m. and said relatively low tumbling speed of rotation of said basket shaft is about 40 r.p.m.

9. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising an electric motor of the two-speed split-phase induction type including a start winding and two corresponding run windings, said motor being operated at its relatively high speed when a first of its run windings is energized and being operated at its relatively low speed when a second of its run windings is energized, switching apparatus having first and second positions respectively selecting said first run winding and said second run winding to be energized, means for operating said switching apparatus between its first and second positions, a device responsive to the speed of said motor and having corresponding start and run positions, means governed by said device for energizing both said start winding and a predetermined one of said run windings in the start position thereof and for energizing only the selected one of said run windings in the run position thereof, speed-reduction mechanism for operatively connecting said motor to said basket shaft so that operation of said motor at its relatively high speed effects a relatively high water-extracting speed of rotation of said basket shaft and operation of said motor at its relatively low speed effects a relatively low water-extracting speed of rotation of said basket shaft, and additional means for rotating said basket shaft from said motor at a tumbling speed that is substantially lower than either of said water-extracting speeds.

10. The variable speed transmission set forth in claim 9, wherein said first run winding has N poles and said second run winding has M poles, where N and M are even numbers and $M > N$.

11. The variable speed transmission set forth in claim 10, where $N=4$ and $M=6$.

12. The variable speed transmission set forth in claim 9, wherein said relatively high water-extracting speed of rotation of said basket shaft is about 500 r.p.m. and said relatively low water-extracting speed of rotation of said basket shaft is about 300 r.p.m.

13. A variable speed transmission for the substantially horizontally disposed and rotatably mounted basket shaft of a clothes processing machine, comprising an electric motor of the two-speed split-phase induction type including a start winding and two corresponding run wind-

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ings, said motor being operated at its relatively high speed when a first of its run windings is energized and being operated at its relatively low speed when a second of its run windings is energized, switching apparatus having first and second positions respectively selecting said first run winding and said second run winding to be energized, means for operating said switching apparatus between its first and second positions, a device responsive to the speed of said motor and having corresponding start and run positions, means governed by said device for energizing both said start winding and a predetermined one of said run windings in the start position thereof and for energizing only the selected one of said run windings in the run position thereof, speed-reduction mechanism operatively connecting said motor to said basket, said mechanism being of the two-speed type including two corresponding speed settings, said mechanism effecting a relatively great speed reduction in its low speed setting and effecting a relatively small speed reduction in its

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high speed setting, and means for operating said mechanism between its low and high speed settings, whereby when said mechanism is in its low speed setting operation of said motor at its respective low and high speeds effects respective low and high tumbling speeds of rotation of said basket shaft, and whereby when said mechanism is in its high speed setting operation of said motor at its respective low and high speeds effects respective low and high water-extracting speeds of rotation of said basket shaft.

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