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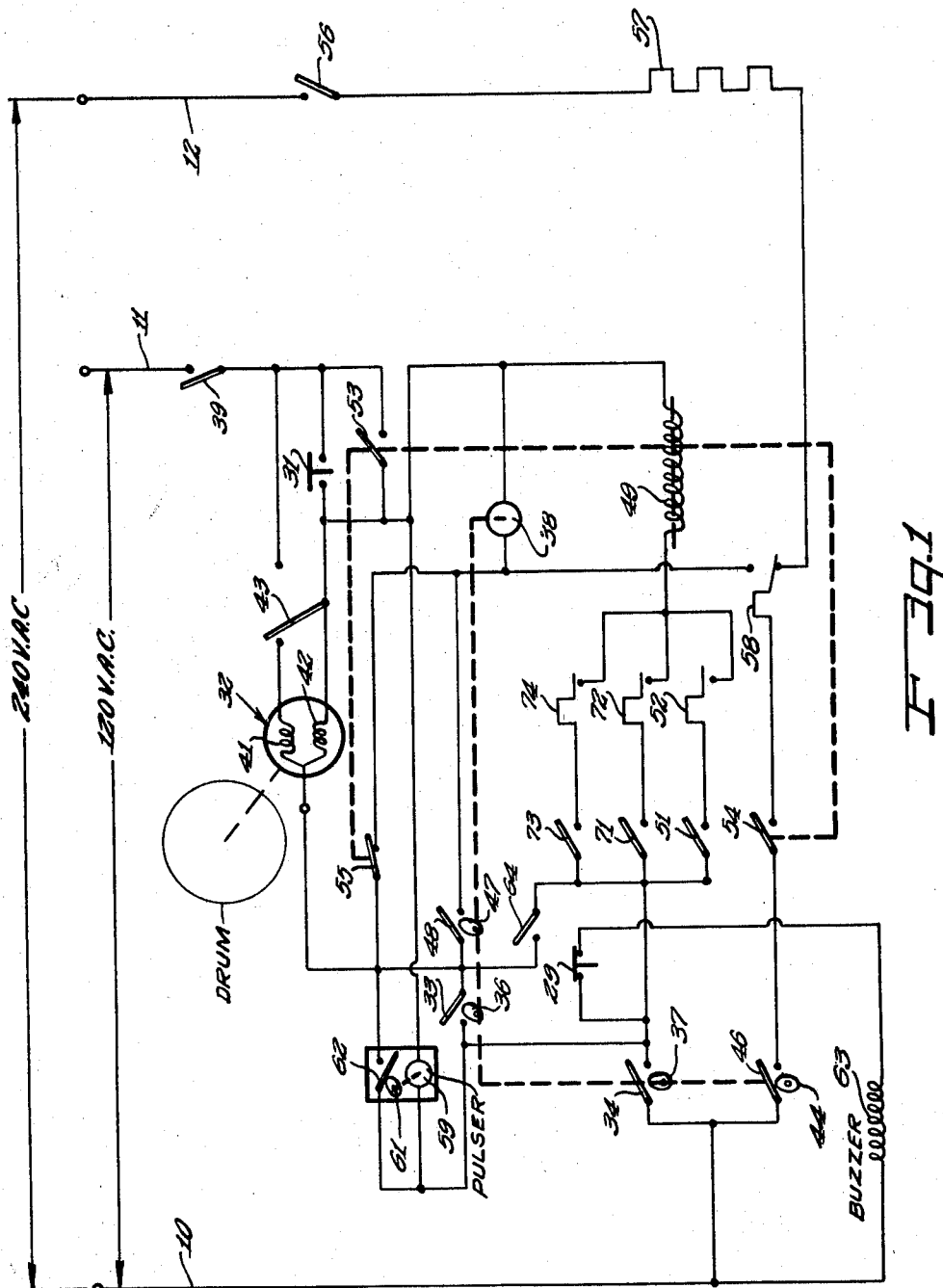
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3,391,467

DRYER WITH ANTI-WRINKLE CYCLE

Filed Sept. 26, 1965

2 Sheets-Sheet 1



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Fig. 2

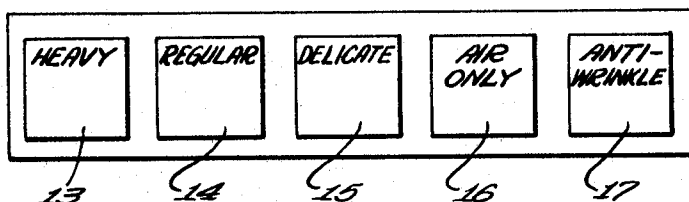


Fig. 3

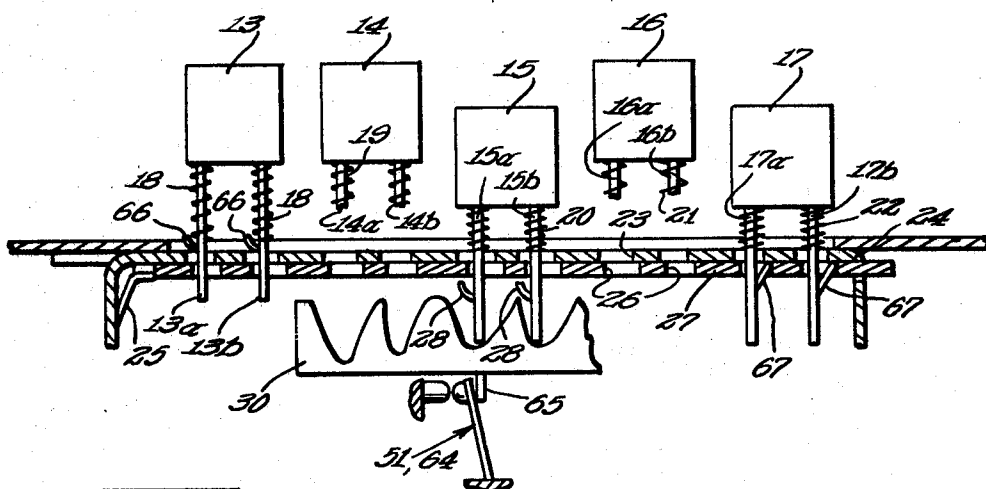


Fig. 4

TIMER SCHEDULE				
SWITCH CLOSED	DRY	COOL DOWN	ANTI-WRINKLE	OFF
34	[Hatched Area]			
33				
48	[Hatched Area]		[Hatched Area]	
46				

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DRYER WITH ANTI-WRINKLE CYCLE

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ABSTRACT OF THE DISCLOSURE

A clothes dryer having a plurality of manual selector switches in control circuits to effect control of various drying periods, any one of which may be followed by an anti-wrinkle period of intermittent rotation of the dryer drum to preclude formation of wrinkles in fabrics after they have been dried.

The present invention relates to an improved dryer assembly for drying fabrics.

In other applications assigned to the same assignee as the present application, there have been described methods and apparatus for incorporating an anti-wrinkle cycle into the operation of a dryer. The anti-wrinkle cycle is necessitated by the fact that the fabrics are frequently left in the dryer drum for substantial periods after the drying operation has been concluded. Experience has shown that leaving the fabrics in the drum for such periods promotes the setting of deep set wrinkles in the fabrics. To overcome this effect, it has been suggested that the fabrics in the drum be intermittently rearranged and tumbled automatically at the conclusion of the drying cycle. This intermittent tumbling usually takes place for about 5 to 10 seconds every 4 to 5 minutes. The rearrangement of the fabrics in this manner has been found to substantially minimize the tendency of deep set wrinkles to be produced in the fabrics.

The present invention relates to a control means for a dryer assembly which incorporates an anti-wrinkle feature into a machine which provides a plurality of optional operating programs for the operator. Such programs employ varying drying intervals, and may consist, for example, of a heavy duty cycle employing a maximum amount of drying time, a regular drying cycle for regular fabrics, and a "delicate" cycle for the more heat sensitive fabrics. In addition, it is common to provide another cycle where air only is introduced into the drum.

The present invention provides a means whereby the operator may at his option add an anti-wrinkle cycle to the pre-selected program, and further provides means for canceling out a previous selection of the anti-wrinkle cycle whenever a new program is selected. In this way, the selection of the anti-wrinkle cycle must be a conscious act on the part of the operator and there is no carry-over of the anti-wrinkle program into a new operating cycle.

An object of the present invention is to provide an improved control circuit for incorporating an anti-wrinkle cycle into a dryer having a choice of different fabric drying programs.

Another object of the invention is to provide a fabric dryer with an optional anti-wrinkle cycle, the arrangement being such that the anti-wrinkle cycle must be consciously selected by the operator in conjunction with one of the other programs.

Another object of the invention is to provide an improved control circuit for incorporating an anti-wrinkle cycle into the operation of a dryer, whereby selection of a different program automatically cancels any anti-wrinkle cycle selection which had been made previously in connection with a different program.

Other objects and features of the present invention will

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become apparent to those skilled in the art from the following description of the attached sheets of drawings in which:

FIGURE 1 is an electrical schematic diagram of a dryer control system in accordance with the present invention;

FIGURE 2 is a plan view of the control panel of the dryer;

FIGURE 3 is a view partly in elevation and partly in cross section of a portion of the control panel; and

FIGURE 4 is a chart showing the condition of the timer operated switches at various times in the operation of the dryer.

As shown in the drawings:

The control circuit of FIGURE 1 is energized from a pair of lines 10 and 11 which supply an ordinary 120 volt alternating current to the majority of the system, and a line 12 which provides a potential of 240 volt alternating current between itself and line 10 primarily for energizing the heater circuit.

Referring first to FIGURE 2, it will be seen that the illustrated embodiment of the invention incorporates five selector switches, numbered 13 thru 17, inclusive, the selector switch 13 providing an extended drying interval for heavier fabrics, switch 14 providing a regular drying cycle, switch 15 providing a relatively short cycle for delicate fabrics, switch 16 providing for the introduction of air only into the dryer drum, and switch 17 providing for the inclusion of an anti-wrinkle cycle at the termination of the other selected program. In explaining the operation of the device, it will be assumed that both the delicate cycle and the anti-wrinkle cycle are desired so that push buttons 15 and 17 have been depressed. As best seen in FIGURE 3, each of the push buttons 13 thru 17 inclusive has a pair of legs 13A and 13B thru 17A and 17B, inclusive extending therefrom, the push buttons being biased upwardly by means of springs 18 thru 22 inclusive. The legs on the push buttons are arranged to extend through slots 26 formed within a stationary plate 24 and also through slots 26 formed in a slider bar 27. Pressing the push button 15 causes the legs 15A and 15B to extend through the slots in the plate 24 and slider bar 27 whereupon catches 28 struck out from the legs 15A and 15B are received behind the slider bar 27 and keep the push button 15 depressed against the bias provided by the springs 20. When the push button 15 is depressed still lower, the legs 15A and 15B move selected cam bars 30 causing a switch 29 (FIGURE 1) to close and immediately thereafter causing a second switch 31 to close. The closing of the switch 31 completes the energizing circuit to a drive motor 32, which drives the drum illustrated in FIGURE 1, the circuit being completed through switches 33 and 34 operated by cams 36 and 37 respectively from a conventional timer motor 38. A switch 39 is located adjacent the access door to the dryer drum and is closed when the access door is closed.

The drive motor 32 includes a start winding 41 and a running winding 42 together with a centrifugally operated switch 43 which removes the starting winding 41 from the circuit as the drive motor comes up to speed. As soon as the switch 43 moves to running position, the push button 15 may be released from its over travel position to the position where the catches 28 engage the bottom of the slider bar 27. This causes switch 31 to open, and immediately thereafter switch 29 will be closed. The timer motor 38 is energized through switches 43 and 39 on one side and through switches 55, 33 and 34 on the other.

The timer 38 has another cam 44 which operates a switch arm 46 and another cam 47 which operates a switch 48. As shown in the chart of FIGURE 4, at the commencement of the drying cycle, switches 33, 34, and 46 are closed. Consequently a relay coil 49 will be energized through switch 34, switch 51 (operated by the

push button 15) and a thermostat 52. Energization of the relay coil 49 causes its associated switches 53 and 54 to close, and a third switch 55 to open. The closing of switch 54 together with closing of a centrifugal switch 56 due to rotation of the drive motor shaft thereby energizes the heater element 57. The opening of the switch 55 deenergizes the timer motor 38.

When the temperature of the exhaust air from the dryer drum reaches a predetermined value, the thermostat 52 will be opened, thereby deenergizing the relay coil 49. The heater circuit is thereupon opened up because the switch 54 returns to its normally open position. At the same time, the timer motor 38 is reenergized by reclosing of the normally closed switch contact 55 through switches 33 and 34 which are still closed. Consequently, the timer motor 38 is energized whenever the heater 57 is deenergized.

When the temperature of the air leaving the dryer drum drops, the thermostat 52 will again be closed, thereby reenergizing the heater 57 and deenergizing the timer motor 38. As the drying proceeds, the periods in which the heater is deenergized will become longer and longer. The cycling of the heater 57 continues until the timer motor 38 has accumulated sufficient time to indicate that the fabrics within the drum have been completely dried. Then, the timer motor operating through cam 44, opens switch 46 to terminate operation of the heater element 57 and end the drying cycle. Just before the termination of the drying cycle, the timer motor 38 operating through cam 47 closes switch 48. After the heater 57 has been deenergized, the drive motor 32 continues to operate through a cool down cycle. During this cycle, the timer motor 38 is continuously energized through the closed switch 48, switch 33 and switch 34. After a cool down period of predetermined duration, the timer motor 38 operating through cam 36 opens the switch 33, causing the drive motor 32 and the timer motor 38 to be deenergized.

Protection against over-heating of the air in the dryer drum is provided by an overload thermostat 58 in series with the heater element 57.

Intermittent energization of the drive motor 32 during the anti-wrinkle cycle is provided by a pulser motor generally indicated at numeral 59. The pulser motor 59 operates a cam 61 which controls a switch arm 62. At the end of the cool down cycle, the pulser motor 59 is energized through the timer motor operated switch 34 and the relay operated switch 53. The pulser motor 59 rotates the cam 61 such that every 4 or 5 minutes, the switch 62 is closed thereby providing a complete circuit to the drive motor 32. The switch 62 remains closed for 5 to 10 seconds, just long enough to rearrange the fabrics within the dryer drum. The closing of the pulser switch 62 also provides a complete circuit to the timer motor 38 through the closed switch 48.

If the door to the dryer drum is opened sometime during the anti-wrinkle cycle, the door actuated switch 39 is opened thereby deenergizing relay coil 49 and opening the switch 53. This action completely terminates the operation of the dryer, since the reclosing of the door operated switch 39 does not reenergize the pulser motor 59 because of the opening of the switch 53.

If the access door is not opened sometime during the anti-wrinkle cycle, the timer motor 38 will eventually accumulate enough running time to open the switch 34 whereby completely terminating dryer operation. The opening of switch 34 energizes a buzzer 63 through switch 29, switch 62, running winding 42 and the centrifugal switch 43. The buzzer 63 will operate for only a few seconds, the amount of time it takes for drive motor 32 to slow down sufficiently so that the switch arm 43 moves back to the start position.

Returning to FIGURE 3, it will be seen that depressing the push button 15 closes both switches 51 and 64, by means of the projection 65 on the cam bar 30. When the cool down period has been completed, and the anti-

wrinkle push button 17 has not been pushed, the opening of the timer operated switch 33 does not terminate the operation of the drive motor 32 since an alternate electrical path to the motor is provided through the switch 64 and the switch 34. Similarly, closed switches 64 and 48 provide a circuit to the timer motor 38. Consequently, the timer motor 38 is energized continually, and shortly accumulates the amount of time necessary to open the switch 34 and completely deenergize the dryer.

The array of push buttons is arranged such that depressing any one of the push buttons 13 through 16 from its raised position to the position in which it is engaged with the slider bar 27 releases the push button 17. Referring to FIGURE 3, push buttons 15 and 17 are shown in their engaged positions. Now if push button 13 is pressed down against the bias of the springs 18, the catches 66 on the legs 13A and 13B cam the movable slider bar 27 to the left against the bias provided by a spring 25 thus releasing the catches 28 from engagement with the slider bar 27 and permitting the springs 20 to return the push button 15 to its original elevated position. Movement of the slider bar 27 to the left will also disengage catches 67 formed on the legs 17A and 17B so that push button 17 is released to its elevated position. Thus, depressing any of the push buttons 13 to 16 will release the push button 17 which controls the anti-wrinkle cycle, so that the push button 17 must be repressed whenever there is a change in the selected cycle. It should also be noted that pressing push button 17 will in no way alter the disposition of the other push buttons 13 to 16 inclusive because the catches 67 on the legs 17A and 17B extend to the right and consequently do not cause any horizontal movement of the slider bar 27.

While the invention has been described in connection with a combined delicate fabric drying cycle and an anti-wrinkle cycle it should be understood that the other cycles can be used in conjunction with the anti-wrinkle cycle as well. For example, depressing push button 13 actuates a switch 71 and its associated thermostat 72, the two being in parallel with switch 51 and thermostat 52. Similarly, depressing push button 14 causes a switch 73 to close, and injects another thermostat 74 into the control circuit.

From the foregoing, it will be understood that the control circuit of the present invention provides a convenient means for incorporating an anti-wrinkle cycle in a dryer having a variety of drying cycle programs. It should also be evident that various modifications can be made to the described embodiments without departing from the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a fabric drying apparatus including a rotatable drum for receiving fabrics to be dried and drive means for rotating said drum,

a plurality of control circuits for operating said drive means continuously through drying cycles of varying duration,

a plurality of manually operable selector switches, one in each of said control circuits, for selectively introducing one of said control circuits into the energizing circuitry for said drive means,

pulser means for intermittently energizing said drive means for relatively short periods at relatively long intervals,

manually operable switch means for introducing said pulser means into the energizing circuit of said drive means, and

means interconnecting said last named switch means with said plurality of manually operable selector switches to permit joint closing of said last named switch means with one of said plurality of selector switches, and release of the jointly closed switch means upon closing of another of said plurality of selector switches.

2. The fabric drying apparatus of claim 1 which includes a door operated switch in series with said pulser means to terminate operation of said pulser means upon opening of the access door to said drum.

3. The fabric drying apparatus of claim 1 which also includes a timer means which operates continuously in the interim between the termination of one of said drying cycles and operation of said pulser means.

4. In a fabric drying apparatus including a rotatable drum for receiving fabrics to be dried and drive means for rotating said drum,

heater means arranged to deliver heated air to said drum,

a plurality of control circuits for operating said drive means continuously through drying cycles of varying duration,

a plurality of manually operable selector switches, one in each of said control circuits, for selectively introducing one of said control circuits into the energizing circuitry for said drive means,

pulser means for intermittently energizing said drive means for relatively short periods at relatively long intervals,

manually operable switch means for introducing said pulser means into the energizing circuit of said drive means,

means interconnecting said last named switch means with said plurality of manually operable selector switches to permit joint closing of said last named switch means with one of said plurality of selector switches, and release of the jointly closed switch means upon closing of another of said plurality of selector switches,

thermostatic means operable to sense the temperature of the air leaving said drum and controlling operation of said heater means,

timer means energized when said heater means is de-energized,

and switch means actuated by said timer means after the elapse of a predetermined amount of time in which said heater means is deenergized to energize said

drive means and provide a cool down cycle for the fabrics in said drum.

5. In a fabric drying apparatus comprising a rotatable drum for receiving fabrics to be dried and drive means for rotating said drum,

a plurality of control circuits for providing a plurality of operating cycles, each of said operating cycles having a drying period wherein said drive means is continuously operated,

a series of manually operable selector switches operably connected with said plurality of control circuits for providing optional selection of any one of said plurality of operating cycles,

pulser means for intermittently energizing said drive means for short periods of time at the conclusion of said drying period,

manually operable switch means connected to said pulser means having a first position for rendering said pulser means effective and a second position for rendering said pulser means ineffective, and means interconnecting said series of selector switches and said switch means for automatically moving said switch means to said second position whenever a change in operating cycle is effected by the manual selection of one of said series of selector switches.

6. The drying apparatus of claim 5 which includes a door operated switch which disables said pulser means upon opening of the access door to said drum.

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