

Nov. 22, 1966

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3,286,364

DRYER WITH ANTI-WRINKLE CONTROL

Filed June 15, 1964

2 Sheets-Sheet 1

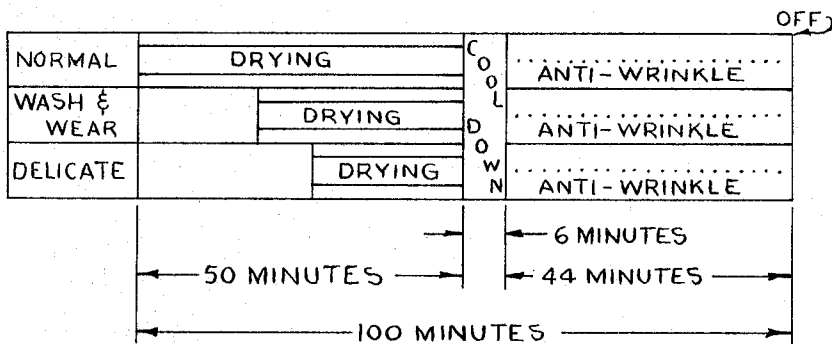


FIG. 3.

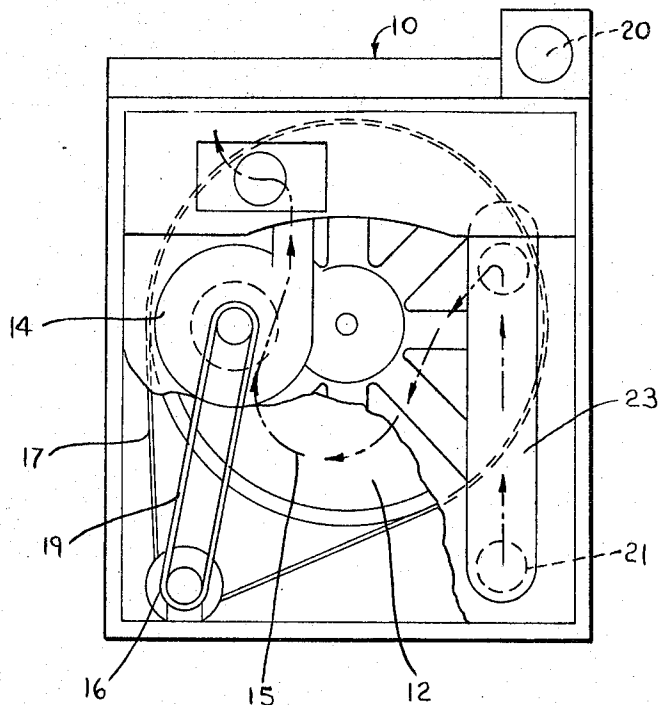


FIG. 1.

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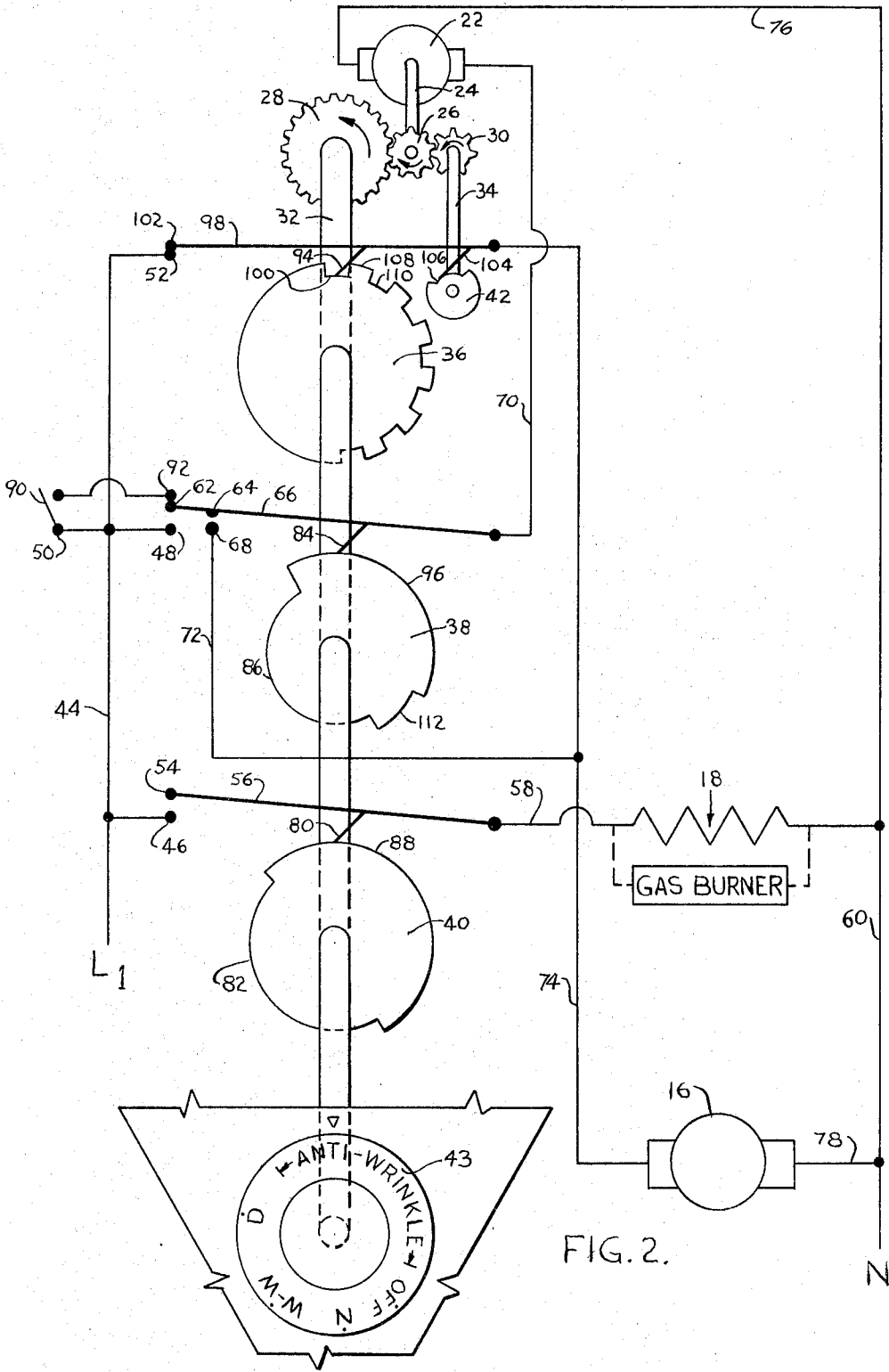


FIG. 2.

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**DRYER WITH ANTI-WRINKLE CONTROL****Harold E. Morrison, Benton Harbor, and Otto F. Krauss, St. Joseph, Mich., assignors to Whirlpool Corporation, Benton Harbor, Mich., a corporation of Delaware**

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7 Claims. (Cl. 34-45)

This invention relates in general to sequential controllers and in particular to such a controller for controlling a laundry dryer through a timed fabric treatment cycle.

Conventional laundry dryers are normally controlled through a timed sequence of operations by a timer or sequential controller. Conventional drying cycles usually consist of a timed drying period followed by a timed cool-down period. Dryer operation usually ceases after the cool-down period and the clothes come to rest at the bottom of the tumbling drum. It has been found that if the clothes are not immediately removed from the dryer, wrinkles may set in the fabric which in the case of many washables is very undesirable. It has further been found that if the tumbling drum is intermittently rotated after the cool-down period the wrinkling effect is less noticeable, and in some cases may be almost entirely obviated. The effect of intermittent tumbling is particularly noticeable in the case of synthetic fabrics and those fabrics composed partially of synthetics. Tests have shown the above-mentioned advantages of intermittent drum rotation and in addition, it has been found that static electricity build-up is alleviated in comparison to prolonged, continuous drum rotation.

It is therefore, an important object of this invention to provide apparatus for controlling intermittent operation of a dryer after a drying period thereby to inhibit fabric wrinkling.

Another object of the invention is to provide a laundry dryer which automatically performs an anti-wrinkling function.

Another object of the invention is to provide apparatus for controlling a dryer through a timed fabric treatment cycle comprising a drying portion and an anti-wrinkle portion.

Other objects of the invention will become apparent to those skilled in the art upon reading the following description in conjunction with the drawings in which:

FIGURE 1 is a rear elevational view of a laundry dryer with parts removed or shown broken away for clarity.

FIGURE 2 is a circuit diagram of a laundry dryer, and illustrates diagrammatically the control apparatus of the invention.

FIGURE 3 is a chart showing fabric treatment cycles controlled by the apparatus of this invention.

Referring to FIGURE 1, a laundry dryer 10 includes a rotatable drum 12 for tumbling fabrics or the like and blower means 14 for causing air to circulate through the dryer as shown by arrows 15. A motor 16 drives drum 12 and blower 14 by means of belts 17 and 19 respectively. Air-heating means, not shown, are provided in air conduit 23 to heat air entering the dryer through inlet 21. The air heating means may be either electric or a conventional electrically controlled gas burner. The fabric treatment cycle of operation of dryer 10 is controlled by a sequential controller 20.

The fabric treatment cycle of operation may take any desired form, three of which are illustrated in FIGURE 3. The Normal treatment cycle may comprise a drying portion of 50 minutes followed by a cool-down portion of six minutes, followed by a period of intermittent operation of the tumbling drum at the end of which dryer

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operation ceases. The illustrative Wash-and-Wear and Delicate cycles are shown having reduced drying portions, however, the drying temperature may also be reduced in the case of Wash-and-Wear and Delicate cycles. The anti-wrinkle portion of the cycle or period of intermittent tumbling drum operation is shown as being 44 minutes in length for all cycles. This amount of anti-wrinkling time is based upon a timer or sequential controller having a 100-minute period of operation. Timers or sequential controllers having longer or shorter periods of operation may be used and the length of any portion of the complete treatment cycle is a matter of choice.

Referring now to FIGURE 2, there is shown diagrammatically a sequential controller and the control circuitry for the dryer of this invention. The sequential controller is capable of intermittently operating a dryer after completion of the drying and cool-down portions of a treatment cycle. A timer motor 22 drives a shaft 24 to which is fixedly attached a drive gear 26. Drive gear 26 drives gears 28 and 30 which are fixedly attached to shafts 32 and 34, respectively. Mounted on shaft 32 are a series of cams 36, 38 and 40. Cam 36 in cooperation with a cam 42 controls intermittent operation of the dryer during the anti-wrinkle portion of the treatment cycle, cam 38 controls operation of the timer motor and the dryer motor during the treatment cycle and cam 40 controls heating means 18 for the dryer. A selector knob 43 is provided to position the sequential controller for the desired cycle of operation. A treatment cycle of dryer operation is initiated by rotating selector knob 43 counterclockwise to a position where the indicia of the selected cycle is in register with suitable starting point indicia on the dryer console.

Current is supplied to the control circuitry of the sequential controller from power source L1 in line 44. Line 44 supplies current to contacts 46, 48, 50 and 52.

Assuming that the Normal treatment cycle has been selected, a contact 54 on a conducting switch arm 56 is in contact with contact 46 to supply power to heating means 18 through conducting switch arm 56 and line 58. This circuit is completed through line 60 to ground or the neutral terminal N. Contacts 62 and 64 on a conducting switch arm 66 are in engagement with contacts 48 and 68, respectively, to energize timer motor 22 through line 70, and dryer motor 16 through lines 72 and 74. These circuits are completed through lines 76 and 78 respectively to the neutral terminal N. Throughout the drying portion of the treatment cycle, a cam follower 80 on switch arm 56 rides on lower cam face 82 of cam 40, and cam follower 84 on switch arm 66 rides on lower cam face 86 of cam 38. Thus, the circuits to the timer motor, the heating means and the dryer motor are all complete during the drying portion of a normal treatment cycle. At the end of the drying portion of the treatment cycle cam follower 80 rides up to upper surface 88 of cam 40 and deenergizes the heating means, and cam follower 84 continues to ride on cam face 86 for a six minute cool-down period. At the end of this cool-down period cam follower 84 rides to the upper surface 96 of cam 38 and de-energizes the dryer motor. If, as shown in FIGURE 2, manual, anti-wrinkle selector switch 90 is open, the timer motor 22 is also de-energized at this time to terminate dryer operation at the end of the cool-down portion of the treatment cycle.

If, on the other hand, manual switch 90 has been closed the circuit is completed through line 44, switch 90, contacts 92, 62, switch arm 66 and the line 70 to the timer motor. With timer motor 22 energized the sequential controller continues to operate and cam 36 rotates into the position shown in FIGURE 2. In this position a cam

follower 94 on a conducting switch arm 98 has ridden into depression 100 on cam 36, and contact 102 on conducting switch arm 98 has engaged contact 52. This engagement and the riding of cam follower 94 into depression 100 are permitted only if a cam follower 104, also on switch arm 98, has ridden to lower surface 106 on cam 42. With contacts 52 and 102 in engagement the circuit is completed through dryer motor 16, and drum 12 is caused to rotate.

Cam 42 mounted on shaft 34 is driven by gear 30 which in turn is driven by gear 26 and preferably rotates at one revolution per minute. Under these conditions dryer motor 16 will be energized once each minute for a period of for example, 10 seconds which corresponds to the angular length of lower cam surface 106 on cam 42. Depression 100 on cam 36 may be dimensioned to provide a one-minute interval during which contacts 102 and 52 are free to come into engagement with each other. As timer motor 22 continues to rotate cam 36 through shaft 24, gear 26, gear 28 and shaft 32, cam follower 94 rides to surface 108 on cam 36 and precludes engagement of contacts 102 and 52 for a period of five minutes, for example. Upon continued rotation of cam 36, cam follower 94 is free to drop into depression 110 which is similar to depression 100, and once again cam 42 is allowed to control engagement of contacts 52 and 102 as described above.

It will thus be understood that throughout the remainder of the fabric treatment cycle the dryer drum will be intermittently rotated for periods of for example 10 seconds each six minutes to preclude wrinkling of the fabrics within the drum. Intermittent drum rotation also alleviates static electricity build-up in comparison to continuous drum rotation. At the end of the period of intermittent operation, cam follower 84 rides down to surface 112 on cam 38 which positions contact 62 intermediate contacts 48 and 92 breaking the circuit through switch 90 and thus de-energizing the timer motor 22. At this time the cycle of dryer operation is complete.

The cool-down period as previously described may be eliminated from the treatment cycle if desired. To eliminate the cool-down period, it is only necessary to extend cam face 82 in a clockwise direction an angular distance equal to the length of time of the cool-down period. With cam face 82 thus extended, heating means 18 remains energized until the beginning of the anti-wrinkle portion of the treatment cycle.

Having described the invention as related to the embodiment shown in the accompanying drawings, it is our intention that the invention not be limited by the details of description, but be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. In a laundry dryer having a fabric tumbling drum, air translation means for moving air through said drum, air heating means for heating air entering said drum, and drive means for driving said drum and said air translation means:

a sequential controller for controlling said dryer through a timed fabric treatment cycle of operation comprising a drying portion and an anti-wrinkle portion;

circuit means including said sequential controller, said air heating means, and said drive means;

first switch means in said circuit means, controlled by said sequential controller for continuously actuating said drive means during said drying portion of said timed fabric treatment cycle; and second switch means in said circuit means, controlled by said sequential controller for intermittently energizing said drive means during said anti-wrinkle portion of said timed fabric treatment cycle, whereby following said drying portion of said timed fabric treatment cycle

said drive means drives said drum to intermittently tumble said fabric until the completion of said timed fabric treatment cycle.

2. The laundry dryer of claim 1 wherein said circuit means includes a manually operated switch for selectively controlling operation of said second switch means.

3. In a laundry dryer having a fabric tumbling drum, air translation means for moving air through said drum, air heating means for heating air entering said drum, and drive means for driving said drum and said air translation means:

a sequential controller for controlling said dryer through a timed fabric treatment cycle of operation comprising a drying portion and an anti-wrinkle portion;

circuit means including said sequential controller, said air heating means, and said drive means;

first switch means in said circuit means controlled by said sequential controller for continuously actuating said drive means during said drying portion of said timed fabric treatment cycle; a manually operated switch in said circuit means; second switch means in said circuit means controlled by said sequential controller for intermittently energizing said drive means during said anti-wrinkle portion of said timed fabric treatment cycle; and

cam means in said sequential controller for controlling said second switch means only when said manually operated switch is actuated.

4. The dryer of claim 3 wherein said cam means comprises a first cam making not more than one revolution per cycle of dryer operation, and a second cam cooperating with said first cam and making a multiplicity of revolutions per cycle of dryer operation.

5. In a laundry dryer having a fabric tumbling drum, air translation means for moving air through said drum, air heating means for heating air entering said drum, and drive means for driving said drum and said air translation means:

a sequential controller for controlling said dryer through a timed fabric treatment cycle of operation comprising a drying portion, a cool-down portion and an anti-wrinkle portion;

circuit means including said sequential controller, said air heating means and said drive means;

first switch means in said circuit means, controlled by said sequential controller for actuating said air heating means during said drying portion of said timed fabric treatment cycle;

second switch means in said circuit means, controlled by said sequential controller for actuating said drive means during said drying and cool-down portions of said timed fabric treatment cycle;

third switch means in said circuit means, controlled by said sequential controller for intermittently energizing said drive means during said anti-wrinkle portion of said timed fabric treatment cycle; and manual switch means in said circuit means for selectively controlling operation of said third switch means.

6. The invention of claim 5 including cam means for actuating said first, second and third switch means.

7. The invention of claim 6 wherein said cam means for actuating said third switch means comprises at least two cams rotatable at different speeds.

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