Jan. 30, 1968 D. F. EPPLEY 3,365,809

ANTI-WRINKLE CYCLE DRYER WITH SLOW ROTATION

Filed June 1, 1966

Fig. 1

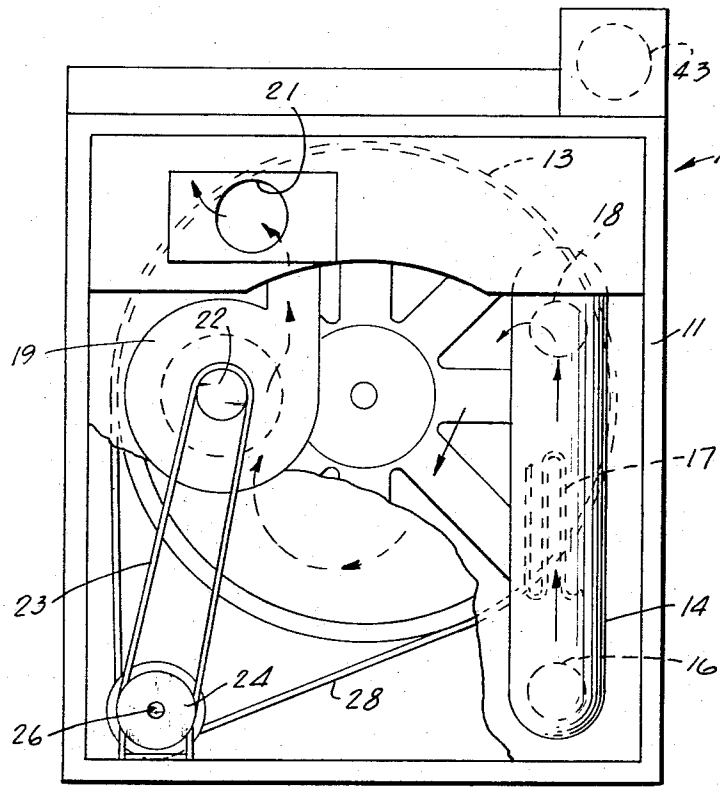


Fig. 5

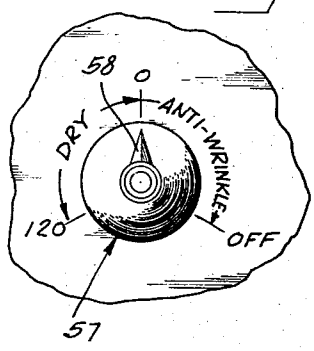


Fig. 2

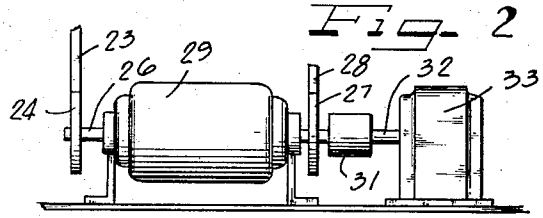
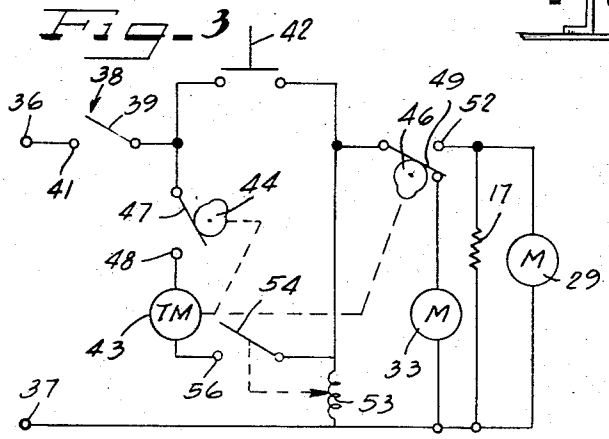


Fig. 3



SWITCH	DRY	ANTI-WRINKLE	OFF
49-52	ON	OFF	OFF
47-48	ON	ON	OFF
49-51	OFF	ON	ON
54-56	ON	ON	OFF

Fig. 4

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United States Patent Office 3,365,809 Patented Jan. 30, 1968

3,365,809

ANTI-WRINKLE CYCLE DRYER WITH SLOW ROTATION

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Filed June 1, 1966, Ser. No. 554,465
10 Claims. (Cl. 34—12)

The present invention relates to an improved automatic clothes dryer and, more specifically, is directed to a method and apparatus for minimizing or inhibiting the setting of wrinkles in fabrics during drying by continuously tumbling the clothes after termination of the normal drying cycle at drum rotational speeds substantially lower than those employed during the normal drying cycle.

One of the objects of the present invention is to provide an improved method for drying clothes to prevent deep set wrinkles wherein the clothes are continuously tumbled at slow speeds during an anti-wrinkle cycle which follows the normal drying cycle.

A further object of the invention is to provide an improved method for preventing deep set wrinkles in clothes which avoids the additional wear imposed on belts, motor and bearings subjected to intermittent, repeated energization of the drive means.

A further object of the invention is to provide an improved clothes dryer with means for automatically shifting from a normal programmed drying cycle to an anti-wrinkle cycle wherein the clothes are tumbled at a very slow rotational speed.

Still another object of the invention is to provide an improved clothes dryer in which means are provided for tumbling the clothes at the completion of the normal drying cycle in an anti-wrinkle cycle, with termination of the anti-wrinkle cycle being dependent either upon opening the access door to the dryer, or automatically at the conclusion of a predetermined time interval.

Other objects and features of the present invention will become apparent to those skilled in the art from the following description of the attached sheet of drawings which illustrates one embodiment of the invention.

In the drawings:

FIGURE 1 is a view in elevation of a dryer assembly embodying the principles of the present invention, with portions thereof broken away to illustrate the interior construction more completely;

FIGURE 2 is a fragmentary view in elevation of the drive means as seen from the right side of the assembly of FIGURE 1;

FIGURE 3 is a circuit diagram of a control system which can be used in accordance with the present invention;

FIGURE 4 is a chart illustrating the positions of the switches shown in FIGURE 3 during various phases of the operation; and

FIGURE 5 is a fragmentary view of a selector switch which is associated with the timer mechanism to automatically convert the machine from the normal drying cycle to the anti-wrinkle cycle.

As shown in the drawings:

In FIGURE 1, reference numeral **10** indicates generally a clothes dryer housed within a cabinet **11**. A shaft **12** supports a rotatable, perforated drum **13** for rotation within the cabinet **11**. The heating elements for the dryer

are enclosed within a heater box **14** in which there is provided an inlet **16** for drawing outside air therethrough. A heating element which may be an electrical resistance element **17** warms the air passing through the heater box **14**, whereupon the heated air is discharged through a discharge opening **18** into the clothes being tumbled within the drum **13**. While the particular showing of FIGURE 1 involves the use of an electrical heating element **17**, it should be recognized that the principles of the present invention are equally applicable to a gas heated dryer wherein the electrical heating element **17** would be replaced by a gas manifold and an electrically operated igniter or standing pilot.

A blower **19** provides for circulation of heated air through the assembly, serving to move the air in the direction indicated by the arrows of FIGURE 1, and ultimately discharging it through a discharge opening **21** provided in the cabinet **11**. The blower **19** includes a shaft **22** driven by means of a belt **23** from a pulley **24** mounted on a motor shaft **26**. As best evidenced in FIGURE 2, a second pulley **27** is also mounted on the shaft **26**, and drives a belt **28** which is trained around the drum **13** to provide for rotation of the drum during the normal drying cycle.

With conventional machines, of the type used for household laundry equipment, the drum **13** is driven at a speed of about 44 to 50 r.p.m. during the normal drying cycle.

As shown in FIGURE 2, the shaft **26** is driven by a motor **29** which controls the rotation of the drum **13** during the normal drying cycle. The shaft **26** extends through both ends of the motor **29**, at one end carrying the pulley **24**, while the other end of the shaft **26** carries pulley **27** and is coupled to a oneway clutch **31**. Also coupled to the clutch **31** is a shaft **32** driven by a slow speed auxiliary motor **33** which may be of the shaded pole gear type. The clutch **31** operates such that when the motor **29** is energized, and the motor **33** is deenergized, the shaft **32** of motor **33** is not rotated. Under these conditions, the drum **13** rotates at the normal speed of approximately 44 to 50 r.p.m. On the other hand, when motor **33** is energized and motor **29** is deenergized, the shaft **32** rotates and, through clutch **31**, picks up shaft **26** to thereby cause rotation of the pulley **27** and consequently drives the drum **13** at a slow speed, on the order of 1 to 5 r.p.m. This speed is not entirely critical, but the best results have been derived through use of rotational speeds in this range.

The electrical circuit for the improved dryer of the present invention is represented in FIGURE 3 of the drawings. Input line voltage is applied to the circuitry at a pair of terminals **36** and **37**. A switch **38** having a movable switch arm **39** arranged to engage a contact **41** is included as part of the access door to the dryer so that whenever the door is closed, the switch arm **39** engages the contact **41**. An on-off switch **42** of the momentary contact type is provided to initiate the operation of the dryer.

A timer motor **43** operates a pair of cams **44** and **46** to provide the programmed cycle of normal clothes drying, followed by the anti-wrinkle cycle. The cam **44** operates on a switch arm **47** to cause the same to engage a contact **48**, while the cam **46** operates on a switch arm **49** of a single pole double throw switch to cause the arm **49** to selectively engage either a contact **51** or a contact **52**.

The circuit also includes a relay **53** operating a switch

arm **54** such that when the arm **54** engages its associated contact **56**, a holding circuit is established so that the on-off button **42** can be released without deenergizing the circuitry. It will be apparent that the relay **53** could be eliminated and its function maintained by replacing the relay operated switch arm **54** and contact **56** by a centrifugal switch operated by motor **29**. In such an embodiment, the centrifugal switch would close soon after pressing pushbutton switch **42** to provide the necessary holding circuit.

The remainder of the circuit includes a motor **29** which is selectively energized by operation of the switch arm **49**, the electrical heating element **17**, and the auxiliary motor **33**.

The cams **44** and **46** of the timer motor assembly are initially positioned by rotation of a selector switch generally indicated at reference numberal **57** in the drawings. A pointer **58** on the selector switch **57** is arranged to be positioned along its scale to select drying times, for example, in the range from 0 to 120 minutes.

When clothing is loaded into the drum **13**, and the door is closed, thus closing the switch **38**, the operator selects the desired drying time by moving the selector switch **57** to the appropriate point on the scale. This action causes the switch arm **47** to engage the contact **48**, and the switch arm **49** to engage the contact **52**. When the pushbutton switch **42** is momentarily closed, the relay coil **53** is energized, thereby bringing the switch arm **54** into contact with the contact **56** to establish a holding circuit for the relay. At the same time, the motor **29** is energized, and a normal, timed drying cycle commences,

When the timing motor **43** has advanced the selector switch **57** to the "0" position on the dial, the cam **46** acts to move the switch arm **49** from engagement with the contact **52** to engagement with the contact **51**. This movement of the switch causes deenergization of the heater **17** and the motor **29**. Simultaneously, however, the anti-wrinkle cycle is commenced due to the energization of the motor **33**, the switch arm **47** still engaging the contact **48**. The motor **33** thereupon drives the shaft **32**, and, through the clutch **31**, drives the shaft **26** at a slow, continuous rotational speed. During the anti-wrinkle cycle, the operator can terminate fluffing of the clothes at any time by opening the door and thereby opening the switch **38**. The opening of this switch causes the relay coil **53** to become deenergized and thereby disengages switch arm **54** from its contact **56**. When the door is again closed, the motor **33** will not be reenergized because of the open circuit at the holding contacts, and thus the cycle will have been completed.

It is not desirable to permit the drum **13** to rotate slowly for indefinitely long periods, so that the timer motor is arranged to terminate the fluffing cycle after a predetermined time interval has elapsed. Thus, when the selector switch **57** has rotated to the "off" position, the cam **44** causes the switch arm **47** to be disengaged from the contact **48**, thereby opening the circuit to the relay coil **53** and also to the motor **33**.

From the foregoing it will be understood that the method and apparatus of the present invention provide an anti-wrinkle cycle which can be automatically inserted into the normal programmed operation of a clothes dryer to prevent the setting of deep wrinkles in the fabrics after the conclusion of the normal drying cycle. It should be understood, also, that the "normal drying cycle" as referred to herein may include a cool down period in which the drum still rotates at the relatively high velocity, but at which the heating means is deenergized prior to the expiration of the times set on the selector switch.

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. The method of inhibiting the setting of wrinkles in fabrics during drying which comprises
continually tumbling said fabrics at a first normal speed throughout a clothes drying period,
terminating the tumbling at said first normal speed upon completion of said clothes drying period, and
thereafter continuously tumbling said fabrics at a second speed substantially slower than said first speed to thereby preclude the formation of wrinkles in said fabrics.

2. The method of inhibiting the setting of wrinkles in fabrics
during drying of claim **1** wherein said first speed is approximately 44–50 r.p.m. and said second speed is approximately 1–5 r.p.m.

3. A clothes dryer comprising a rotatable drum,
drive means for rotating said drum at a first speed and a second slower speed,
control means including means for energizing said drive means at said first speed throughout a clothes drying period, and
means for energizing said drive means at said second slower speed at the conclusion of said clothes drying period.

4. A clothes dryer comprising a rotatable drum,
drive means for rotating said drum at a first speed and a second slower speed,
control means including first switch means for energizing said drive means at said first speed throughout a clothes drying period,
second switch means for energizing said drive means at said second slower speed at the conclusion of said clothes drying period, and
timer means for operating said second switch means to deenergize said drive means after a predetermined time period following said clothes drying period.

5. A clothes dryer comprising a rotatable drum,
first drive means arranged to rotate said drum at a substantially constant predetermined speed,
timer means arranged to energize said first drive means for a preselected time interval to thereby tumble the contents of said drum during said interval,
a second drive means arranged to drive said drum at a substantially constant predetermined speed substantially less than said predetermined speed at which said first drive means rotates said drum, and
switch means operated by said timer means and selectively transferring rotation of said drum from said first drive means to said second drive means at the completion of said preselected time interval.

6. The clothes dryer of claim **5** in which said timer means is arranged to terminate energization of said second drive means after expiration of a predetermined time interval.

7. A clothes dryer comprising:
a rotatable drum having an access opening for inserting fabrics to be dried,
a door covering said access opening,
first drive means for rotating said drum at a first speed,
second drive means for rotating said drum at a second speed which is substantially less than said first speed, and
control means including, first control means for energizing said first drive means throughout a clothes drying period, and second control means for energizing said second drive means at the completion of said clothes drying period.

8. The clothes dryer of claim **7** in which said second control means includes a door operated switch means for terminating the operation of said second drive means upon opening of said door.

9. The clothes dryer of claim **7** in which said first drive means and said second drive means each includes

a motor, and the two motors are interconnected through a one-way clutch means.

10. The clothes dryer of claim 7 wherein said second control means includes a timer, and a switch means operated by said timer for terminating the energization of said second drive means upon expiration of a predetermined time interval.

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