3,286,359
ANTI-WRINKLE CYCLE FOR DRYERS
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14 Claims. (Cl. 34—12)

The present invention relates to an improved automatic clothes dryer, and it is particularly directed to a method and apparatus for minimizing or inhibiting the setting of wrinkles in fabrics during drying.

The present invention is particularly directed to a means for preventing the setting of wrinkles in clothes which are allowed to remain in the dryer drum for any length of time. Not only does the present invention prevent the setting of such wrinkles but it also helps to prevent mildew which might occur under some conditions.

We have now found that the formation of deep set wrinkles which tend to occur when clothes are left in a dryer for significant times after the drying cycle has been completed can be largely eliminated by a periodic fluffing of the clothes within the dryer for short periods of time at intervals. The dryer of the present invention includes a control means for intermittently energizing the drive means of the dryer for short periods of time at intervals at the conclusion of the regular drying cycle.

In present day dryers, it is a common practice to provide a "cool down" period at the end of the normal heated drying period to allow the clothes to cool before bringing the dryer drum to rest and thereby prevent the immediate setting of wrinkles in the materials. The normal "cool down" period consists of operating the dryer without the addition of heat for a predetermined length of time after the normal drying period. Even with the incorporation of the "cool down" period, deep set wrinkles will occur after the materials have been left at rest within the dryer drum for a period of time. We have tried operating the dryer continuously without heat after the termination of the normal heated drying period but have found that this causes considerable wear on the dried clothes, consumes excessive electrical power and creates an excessive charge of static electricity in the dried materials. Also, when the drum is allowed to run continuously, the operator has no indication of when the normal heated drying period is finished. With the incorporation of the present invention in a clothes dryer, we have found that the additional clothes wear, the additional electricity consumed, and the static electricity build up is insignificant because the total time the dryer motor is energized during the periodic fluffing cycle is short compared to continuous operation. The operator can also determine when the dryer has completed its normal drying period by the observance of the periodic energization of the dryer motor.

An object of the present invention is to provide an improved dryer assembly, and control circuit therefor, which inhibits the setting of wrinkles in newly dried fabrics.

Another object of the invention is to provide an improved dryer of the rotating drum type with an automatic clothes fluffing and re-orientation cycle.

A further object of the invention is to provide a dryer with a control means which initiates a regular fluffing cycle upon completion of the regular drying cycle, and is automatically terminated by opening of the access door to the dryer.

A further object of the invention is to provide an improved method for preventing the setting of wrinkles in newly dried fabrics.

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 perspective of an automatic dryer in which the present invention can be incorporated;
FIGURE 2 is a wiring diagram illustrating one control circuit which may be employed; and
FIGURE 3 is a wiring diagram of another control circuit which may be employed.

As shown in the drawings:
In FIGURE 1, reference numeral 10 indicates generally a dryer cabinet having an access door 11 permitting introduction and withdrawal of clothes to the dryer. Within the cabinet 10 there is a rotatable drum 12 in which the clothes to be dried are tumbled during the drying and the subsequent fluffing cycles. The dryer assembly is also provided with a console 13 which may include a push-pull on-off type combined switch and interval selector 14, and an on-off switch 15 which controls the energization of the fluffing cycle circuitry.

The present invention is useful in conjunction with any type of rotatable drum dryer, whether it be gas fired or electrically heated. It is for this reason that specific details of the dryer mechanism such as the drive belt, igniter, blower, and the like have not been illustrated in detail in the drawings.

Turning now to a consideration of FIGURE 2, it will be seen that electrical energy for the operation of the dryer is derived from a set of three terminals 16, 17 and 18. The potential between terminals 16 and 17 may be the typical 120 volt alternating current, and the potential between terminals 16 and 18 may be 240 volts. The main drying cycle is under the control of a main timer motor 19 which controls the sequence of operations occurring in the dryer through a plurality of cams 21, 22 and 23 driven thereby. Cam 21 operates a switch arm 24 to apply and remove the source of heat to the articles being dried in the drum. Cam 22 operates a switch arm 26 to control the energization of the timer motor 19, and cam 23 operates a switch arm 27 to control the energization of the drive means.

The drive means provides rotational movement to the drum 12 and the blower 9; therefore, whenever the drive means is energized, the clothes are tumbled within the drum 12 and air is moved through the clothes in the drum 12.

Heat is applied to the clothes being dried by means of an electrical heater element 28 which is put across the 240 volt line when the switch arm 24 is in its closed position, and when a centrifugally operated switch 29 is also closed, as will be apparent from a succeeding portion of this description. A bi-metallic safety thermostat 31 is included in the heater line to prevent overheating.

The drive means for the assembly may consist of a motor 32 including a running winding 33 and a starting winding 34. The starting winding 34 is in the circuit only as long as a centrifugally operated switch 36 is connected thereto is closed, the opening of switch 36 being effective to close switch 29.

The portions of the circuit described thus far are more or less conventional. The additional circuitry which provides for the intermittent fluffing action includes a door operated switch 41 having a pair of ganged switch arms 42 and 43. Also included in the circuitry is a holding relay having a coil 44 and a pair of ganged switch arms 45 and 46. An auxiliary timer motor 47 controls the frequency and the period of the fluffing cycle, the motor 47 driving a cam 48 which periodically closes a switch 49 and thereby periodically energizes the motor 32 even when the main
timer motor 19 is no longer energized. The circuit is completed by the inclusion of a spring biased push-to-
switch 51 which starts the cycle initially.

Taking as an example of operation, the user injects the fluffing circuitry into the overall programmed sequence by closing the switch 15. Then, the timer cam bank of the main timer motor 19 is set to the desired length of the drying cycle. After the clothes have been loaded into the drying drum, the door 11 is closed, thereby closing switch 38 and holding relay coil 39. Then, the push-to-start switch 51 is operated, thereby applying the potential across the motor windings 33 and 34. The push-to-start switch 51 also energizes the holding relay coil 44, thereby closing the switches 45 and 46. When the motor 32 reaches a predetermined speed, the centrifugal switch 36 de-energizes the start winding 34 and centrifugal switch 29 closes, thereby energizing the heater 28. When this predetermined speed is reached, the closing of the centrifugal switch 36 also provides a current path to the running winding 33 of the motor through the door switch arm 43.

The dryer then proceeds through a typical drying cycle of tumbling the clothes in the heated air. Shortly before the end of the cycle, switch 24, operated by cam 21, opens thereby de-energizing the heater 28 and allowing for a cool down period. At the end of the drying cycle, the timer operated switches 26 and 27 open, de-energizing the drive motor 32 and the main timer motor 19.

At the completion of the normal drying cycle, the holding relay coil 44 is still energized through its own switch 46, door switch 42, and the selector switch 15. The holding relay switch 45 provides a current path to the auxiliary interval timer motor 47 which drives cam 48 to operate switch 49 and thereby intermittently actuate the drive motor 32 at regular intervals. We have found that actuating pulses of approximately 4 seconds duration and at 6 minute intervals are particularly effective for preventing resetting of wrinkles although various other time interval arrangements may be used depending on the size and construction of the dryer. The intermittent energization of the drive motor 32 causes the tumbling and rearrangement of the clothes in the drum to prevent the setting of wrinkles and replenishing the air in the drum to freshen the clothes. This intermittent tumbling continues until the user opens the door 11, thereby breaking the circuit to the holding relay coil 44, and thus de-energizing the auxiliary interval timer motor 47.

A modified form of control circuit is illustrated in FIGURE 3. Those elements of the circuit of FIGURE 3 which are common to the circuit of FIGURE 2 have the same reference numerals applied to them as in FIGURE 2.

The circuit of FIGURE 3 is energized by the operation of a manual double pole, single throw switch 56 having switch arms 57 and 58. When the switch 56 is closed, and door switch 41 is closed, switch arm 57 applies the line voltage across an indicator lamp 59. Simultaneously, switch arm 58 applies the line voltage to a thermal switch 61 in series with the motor 32. The thermal switch 61 consists of an electrical heating element 62 and a bi-metallic switch arm 63. After timer switch 27 opens at the end of the regular drying cycle, the motor winding 33 is energized through the thermal switch 61. The current flowing through the heating element 62 causes it to heat up rapidly, and eventually causing the bi-metallic switch arm 63 to open, de-energizing the motor 32. After the heating element 62 has cooled sufficiently, the switch arm 63 closes again, restarting the motor 32. This circuit thus provides intermittent energization of the motor 32 at intervals depending on the characteristics of the thermal switch 61.

The type of circuits as described above were incorporated into a domestic dryer, and test runs were made simultaneously in the modified dryer, and in an identical unmodified model. Overnight comparison showed appreciably less wrinkling had occurred in the clothes dried in the modified dryer.

From the foregoing, it will be understood that the present invention provides an improved method and apparatus for preventing the setting of wrinkles in the drying of clothes. The circuitry involved is completely automatic and is independent of operator attention. It will also be seen that the circuit of the present invention is easily adaptable to either a timed drying cycle or one of automatic termination, said fabrics for short periods of time at intervals to thereby prevent the formation of deep set wrinkles in said fabrics.

It will be understood 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. A method of inhibiting the setting of wrinkles in fabrics during drying which comprises continuously tumbling said fabric for a predetermined time interval sufficient to dry the fabrics substantially, terminating the tumbling at the completion of said time interval, and thereafter intermittently tumbling said fabrics for short periods of time at intervals to thereby prevent the formation of deep set wrinkles in said fabrics.

2. A method of inhibiting the setting of wrinkles in fabrics during drying which comprises continuously tumbling said fabrics for a predetermined time interval sufficient to dry the fabrics substantially, terminating the tumbling at the completion of said time interval, and thereafter intermittently tumbling said fabrics for about 4 seconds at intervals of about 6 minutes to thereby prevent the formation of deep set wrinkles in said fabrics.

3. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, control means for energizing said drive means through a drying cycle of predetermined duration, and means for intermittently energizing said drive means for short periods of time at intervals at the conclusion of said drying cycle.

4. A clothes dryer comprising a rotatable drum, an access door for introducing and withdrawing clothes from said drum, drive means for rotating said drum, primary control means for energizing said drive means through a cycle of predetermined duration, secondary control means for intermittently energizing said drive means for short periods of time at regular intervals at the conclusion of said cycle, and a switch operated by opening of said access door, said switch operating to de-energize said secondary control means.

5. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, a first timer motor, cam operated switch means controlling energization of said drive means, a second timer motor, and switch means operated by said second timer motor to energize said drive means for short periods of time at regular intervals.

6. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, a first timer motor, cam operated switch means actuated by said first timer motor and controlling energization of said drive means, a second timer motor, switch means operated by said second timer motor to energize said drive means for short periods at regular intervals after said cam operated switch is opened, and a door operated switch in said dryer arranged to de-energize said second timer motor.

7. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, a first timer motor, cam operated switch means driven by said first timer motor and controlling energization of said drive means, a door operated switch means including at least one switch arm, a holding relay including at least one switch arm, a second timer motor, the switch arms of said door operated switch means and said holding relay in series with the energizing lead to said second timer motor, and a cam operated switch means driven by said second timer motor and arranged to intermittently energize said drive means at regular intervals.
8. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, control means for energizing said drive means through a drying cycle of predetermined duration, a manually operated switch, and a thermal responsive switch in series with said manually operated switch, said switches being in the energizing circuit for said drive means to energize the same periodically and independently of said control means.

9. A clothes dryer comprising a rotatable drum, an electric motor for rotating said drum, control means for energizing said motor through a drying cycle of predetermined duration, an electrical heating element, a bimetallic switch actuated by said heating element, and a manually operated switch in series with said bimetallic switch, both said switches being in an energizing circuit for said motor.

10. The dryer of claim 9 which also includes a door operated switch in series with said bimetallic switch and said manually operated switch.

11. A clothes dryer comprising a rotatable drum, an access door for introducing and withdrawing clothes from said drum, air translation means for the movement of air through said drum, drive means for rotating said drum and said air translation means, control means for energizing said drive means through a drying cycle of predetermined duration, and means for intermittently energizing said drive means for short periods of time at intervals at the conclusion of said drying cycle.

12. The method of inhibiting the setting of wrinkles in fabrics during drying which comprises continuously tumbling said fabric for a time sufficient to dry the fabrics substantially, terminating the tumbling, and thereafter intermittently tumbling the fabrics for short periods of time at intervals to thereby prevent the formation of deep set wrinkles in said fabrics.

13. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, control means for energizing said drive means through a drying period, and means for intermittently energizing said drive means for short periods of time at intervals at the conclusion of said drying period.

14. A clothes dryer comprising a rotatable drum, drive means for rotating said drum, switch means controlling operation of said drive means, blower means driven by said drive means for moving drying air through said drum, means for opening said switch means at a conclusion of a prolonged drying interval, and means for intermittently actuating said switch means after the conclusion of said prolonged interval to thereby energize said drive means for a plurality of short intervals of time each shorter than said prolonged drying interval.

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