

- [54] **BROKEN BELT SWITCH CONTROL SYSTEM FOR CLOTHES DRYER**
[75] Inventor: **George V. Nichols**, Benton Harbor, Mich.
[73] Assignee: **Whirlpool Corporation**, Benton Harbor, Mich.
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[21] Appl. No.: **436,545**

- [52] U.S. Cl. 34/55; 34/43; 74/216.5
[51] Int. Cl. **F26b 19/00**
[58] Field of Search 34/43, 44, 45, 46, 55; 74/216.5

- [56] **References Cited**
UNITED STATES PATENTS
2,577,104 12/1951 Butler 34/55
2,641,062 6/1953 Wentz 34/44
2,644,246 7/1953 Robinson 34/55
2,803,454 8/1957 Tatro 74/216.5

Primary Examiner—John J. Camby
Attorney, Agent, or Firm—Hill, Gross, Simpson, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**
A clothes dryer employs a pivotally mounted resilient spring bracket for tensioning a drive belt which is entrained about a pulley of the dryer drive motor and a rotatable dryer drum, the idler pivoting to a free position upon release of belt tension due to belt breakage or the like. A switch is serially connected in at least one power lead of the drive motor and includes a switch actuator disposed in the path of travel of the spring bracket for direct contact and operation thereby to open the circuit of the motor. The switch is mounted on the base of the dryer by a bracket including a shoulder which extends above the body of the switch and below the extent of the switch actuator to engage the spring bracket immediately subsequent to operation of the switch to prevent damage to the switch.

7 Claims, 4 Drawing Figures

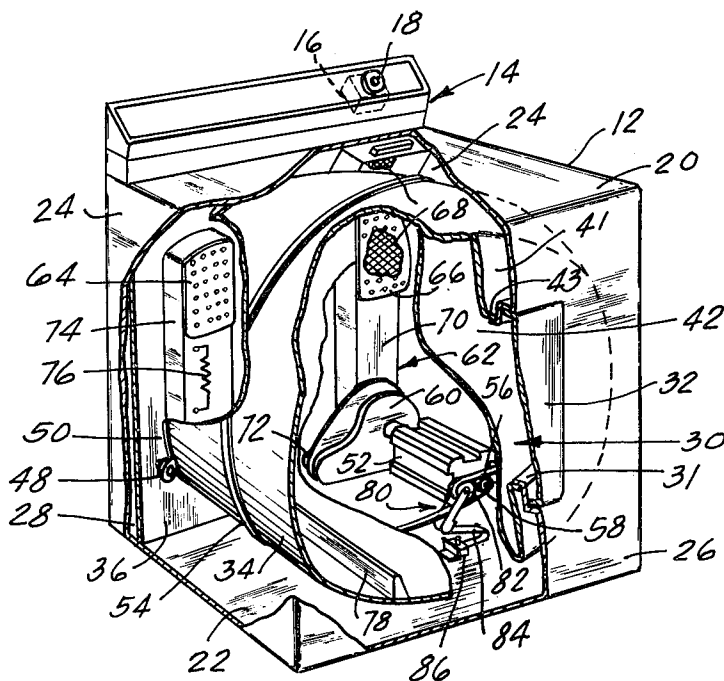


Fig. 1

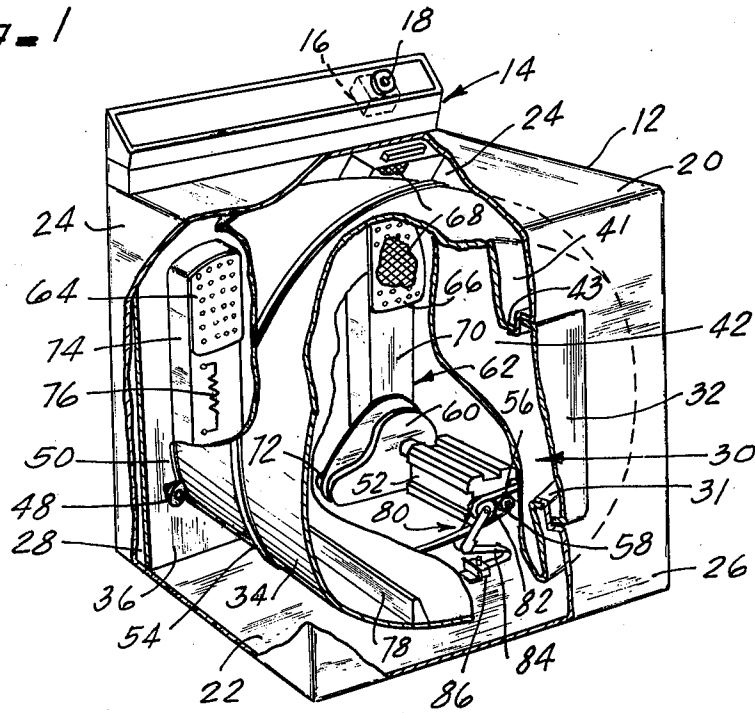


Fig. 2

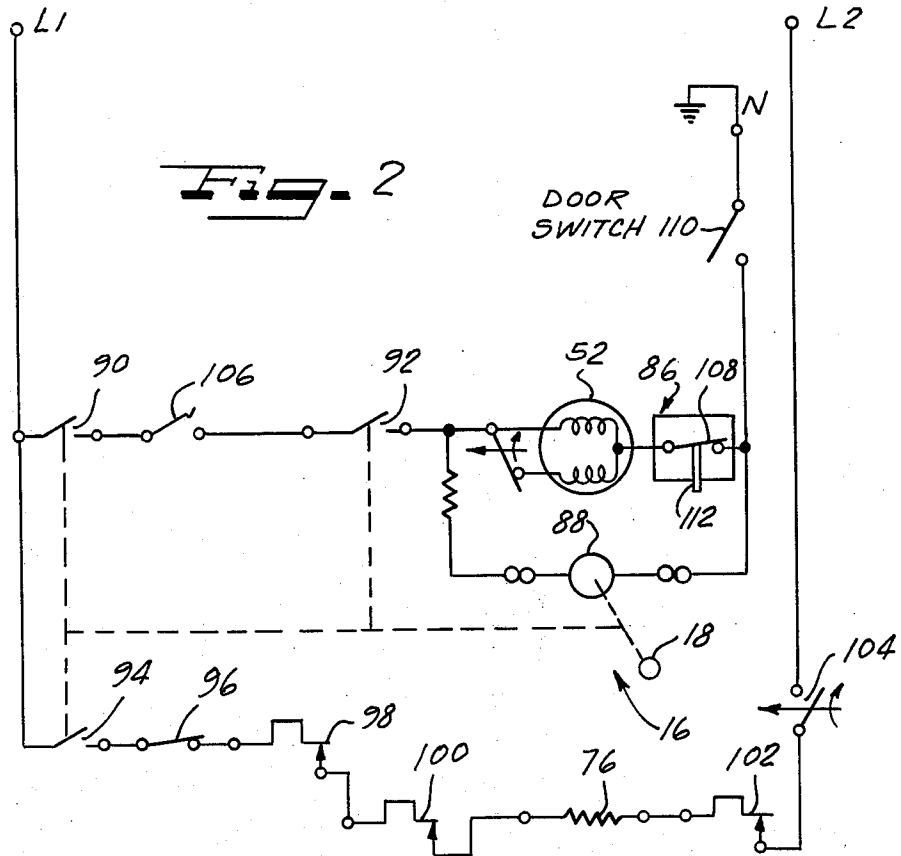


Fig. 3

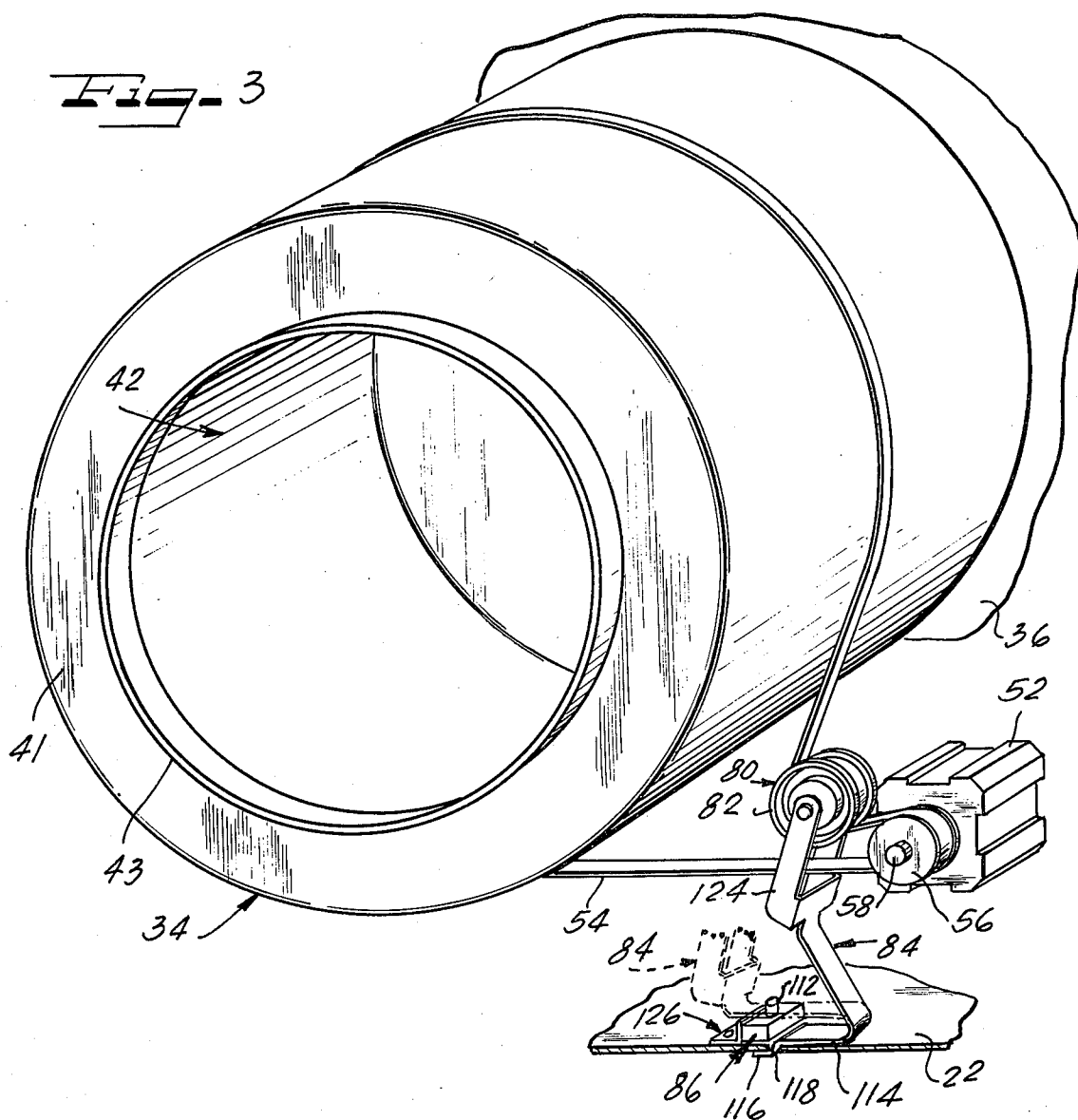
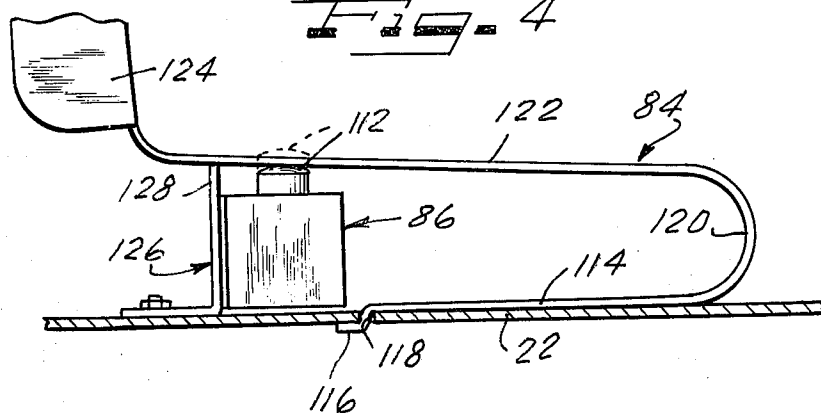


Fig. 4



BROKEN BELT SWITCH CONTROL SYSTEM FOR CLOTHES DRYER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to automatic clothes drying machines and more particularly to a power disconnect system for automatically terminating operation of a clothes dryer in response to breakage of the dryer drum drive belt.

2. Description of the Prior Art

A wide variety of apparatus is known in the art for sensing the condition of a drive belt. U.S. Pat. No. 3,308,795, for example, discloses an engine cutoff device for an automobile in which contacts are closed by a pulley upon release of tension on the pulley mount to short circuit the engine ignition system. U.S. Pat. No. 1,213,968 disclosed a web moisture sensing arrangement for a paper making machine for controlling the amount of moisture in the traveling web. U.S. Pat. No. 1,882,275 discloses an engine cutoff mechanism for an internal combustion engine in which a switch is employed to open the energizing circuit thereof in response to breakage or displacement of the fan belt. Also, U.S. Pat. No. 2,679,112 discloses the utilization of a pivotally mounted idler mechanism for adjusting the tension on a drive belt of a clothes dryer drum. In addition, it is known in the art to utilize an idler mechanism to operate a switch via a lever arrangement to control the drive motor of a clothes dryer.

The primary object of the present invention is to provide a safety feature for a clothes drying machine which will effect automatic shut off of the machine if the belt driving the dryer drum should break or otherwise become inoperatively displaced with respect to the dryer drum or the drive motor. A more specific object of the invention is to provide a power disconnect system for a clothes dryer which will remove power from the dryer drive motor in response to belt breakage or the like.

Another object of the invention is to provide a power disconnect system for a clothes dryer which will terminate the operation of the dryer, in particular the heating means of the dryer which supplies hot or warm air to the dryer drum, in order to protect fabrics within the drum and to prevent any damage to the dryer or its environment as may be caused by overheating.

According to the invention, a resilient spring bracket carrying an idler pulley is mounted on the base of clothes dryer so that in its normal operating position the bracket is flexed to store energy and apply tension to the dryer drive belt which is entrained about the drive pulley of the drive motor and the rotatable drum of the clothes dryer. Upon breakage of the belt, the stored energy is released causing a portion of the flexed bracket to move downwardly toward the base of the clothes dryer. A safety switch which is serially connected in the drive motor circuit is positioned in the path of movement of the bracket and includes a switch actuator which is directly contacted and operated by the bracket to open the drive motor circuit. The switch is mounted on the base of the clothes dryer by a mounting bracket which includes a shoulder which projects above the switch to engage and stop the spring bracket and prevent damage to the switch immediately subsequent to operation of the switch actuator.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description of a preferred embodiment of the invention taken in conjunction with the accompanying drawings, on which:

FIG. 1 is a cut-away sectional view of an automatic clothes dryer constructed in accordance with the principles of the present invention;

FIG. 2 is a simplified schematic diagram of a dryer control circuit for use in connection with the present invention;

FIG. 3 is a pictorial representation of a preferred embodiment of the invention specifically showing the spring bracket in its normal operating position; and

FIG. 4 is an elevation view of a portion of the apparatus of FIG. 3 specifically showing the position assumed by the spring bracket in response to breakage of the dryer drive belt.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a clothes dryer 10 is illustrated as comprising an enclosure cabinet or housing 12 with a control console 14 thereon, housing a control device 16 for regulating the drying operation. A control knob 18 selectively sets the control device 16 for various drying cycles of operation, as for example, automatic or timed drying cycles. The enclosure cabinet or housing 12 comprises a horizontal top panel 20 and a horizontal bottom panel or base 22, a pair of vertical side panels 24, a vertical front panel 26 and a vertical rear panel 28. An access opening 20 is provided in the front panel 26, as defined by an axially in-turned flange 31, having a closure door 32 cooperating therewith for loading and unloading the clothes drying appliance or dryer 10.

The dryer 10 further includes a fabric treatment zone or drying container for tumbling clothes, in the form of a rotatable drum 34 housed within the cabinet 12 and extending axially from the front panel 26 to a bulkhead 36 spaced forwardly of the rear panel 28. In order to encourage tumbling action in the clothing being dried, a plurality of circumferentially spaced baffles 78 (only one being illustrated) are mounted on the inner surface of the drum 34. The drum 34 includes a radially inwardly extending front closure wall 41 having an access opening 42 therein formed by means of an axially out-turned flange 43. The flange 43 provides a forwardly extending bearing annulus which overlies and is suitably journaled on the complementary flange 31 of the cabinet 12. It will be apparent from the foregoing that the opening 42 into the drum 34 and the opening 30 formed in the front panel 26 are substantially concentric, providing access into the rotatable drum 34 from the outside of the cabinet 12. The drum 34 is supported at the rear by a pair of support rollers 48 (only one being illustrated) mounted on the bulkhead 36. A raceway or circumferential groove 50 indented in the peripheral wall of the rear portion of the drum 34 serves as a track for the rollers 48.

A drive motor 52 is mounted on the bottom panel or base 22 in a rear corner of the cabinet 12 and rotatably drives the drum 34 by means of a transmission, in this instance a tensioned transmission member or endless drive belt 54, which extends about the periphery of and

in frictional engagement with the drum 34 and around a motor pulley 56 mounted at one end of a motor shaft 58. An idler device 80 has an idler pulley 82 rotatably mounted on a spring idler bracket 84 which, in turn, is mounted on the base 22 so as to be biased against the tension of the drive belt 54. A safety switch 86 is mounted below a portion of the spring bracket 84 and connected in the dryer control circuit, as will be set forth below in greater detail. The other end of the motor shaft 58 drives a blower 60, arranged to circulate air through the drum 34. The blower 60 is included in a warm air system 62 positioned between the rear panel 28 and the bulkhead 36.

The bulkhead 36 serves to enclose the opened ended rear portion of the drum 34 and provide a fixed rear wall in which to locate a pair of spaced openings comprising an air inlet 64 and an air outlet 66. The blower draws moisture-laden air from the interior of the drum 4 through the outlet 66, through a removable lint screen 68, an air duct 70, through the blower 60 and out of the cabinet through an exhaust duct 72. Air exhausted from the drum 34 is replaced by ambient air entering the warm air system 62 by way of an air intake opening (not shown) in the rear panel 28, the ambient air being drawn through a fresh air duct 74, passing over a heater means 76 and into the drum 34 through the inlet 64. The warm air system 62 thus circulates a stream of warm air through the drum 34, subjecting clothing being placed therein to a drying environment to remove moisture from the fabric while the clothing is tumbled as the drum rotates.

Referring now to FIG. 2, a simplified schematic diagram, showing only those components pertinent to the present invention, is illustrated as an aid in understanding the present invention. As seen on the drawing, this simplified, but exemplary electrical circuit for controlling the operation of the dryer 10 comprises the drive motor 52 and a programmer or control device 16 including a timer motor 88 coupled to the control knob 18. The control device 16 further includes a plurality of timer-controlled, cam-operated contacts, represented by the contacts 90, 92 and 94. The circuit also includes a heater circuit comprising the heating means 76 connected in series with the contacts 94, an air-heat switch 96, and a plurality of thermostat switches 98, 100 and 102. The heater circuit is connected across the conventional electrical supply, normally Hz Hz 230 VAC at the terminals L1 and L2 via a centrifugal switch 104. The drive motor 52 is connected across a portion of the electrical supply, for example 115 VAC by way of the timer contacts 90, 92, a push to start switch 106, the safety switch 86 having contacts 108 and a door operated switch 110. The safety switch 86 also includes a switch actuator, symbolically represented by a plunger 112, for operating the switch as set forth below. A detailed description of the operation of this type of dryer circuit is specifically set forth in U.S. Pat. No. 3,571,941, issued to Richard L. Garfield and Harold S. Stacik and assigned to Whirlpool Corporation. Reference may therefore be taken to that patent and a detailed description of operation of the circuit will not be given here. It should be noted, however, that the centrifugal switch 104 is only closed to supply power to the heater means 76 when the drive motor 52 has a rotational speed above a predetermined value. When the speed of the motor falls below the predetermined value, at the termination of a drying operation,

or in response to the energization of the motor in accordance with the present invention, the heater means 76 is deenergized to prevent overheating of the fabrics being dried, the machine itself, and the area in proximity to the machine.

Although the circuit could be opened at other points, or at multiple points of the circuit, the switch 86 is illustrated as being connected in the neutral line to the motor as a simple nonlimiting example. Referring to FIG. 3, a drive belt 54 is illustrated in a normal operating condition entrained about the motor pulley 56, the rotatable drum 34 and the idler pulley 82 carried by the spring bracket 84. The spring bracket 84 comprises a portion 114 which is supported on the base 22, an S shaped end 116 which extends through a slot 118 in the base 22, an arcuate portion 120, a switch operating portion 122, and a yoke portion 124 which rotatably mounts the idler pulley 82. In FIG. 4 the spring bracket 84 is illustrated in the shape assumed thereby when there is little or no flexure of the arcuate portion 120. In FIG. 3, however, the spring bracket 84 is illustrated in a flexed and energy storing condition so that it applies tension to the drive belt 54. In the event that the drive belt breaks and no longer holds the spring arm in its normal operating position, the energy stored therein is released and the switch operating portion 122 moves toward the base of the machine.

As best seen in FIG. 4, the safety switch 86 is mounted on the base 22 by an L-shaped mounting bracket 126 by suitable means, such as machine screws. The mounting bracket 126 comprises an end portion or shoulder 128 which extends above the body of the switch 86 and serves as a stop for the switch operating portion 122 of the spring bracket to prevent damage to the switch 86. The extent of the shoulder 128, however, is less than the extent of the actuator 112 so that the switch operating portion 122 directly contacts the actuator 112 and operates the switch contacts 108 prior to striking the shoulder 128.

As indicated above, and as is readily apparent from the circuit of FIG. 2, opening of the contacts 108 effects deenergization of the drive motor 52, and as the speed of the drive motor falls below a predetermined value, the centrifugal contacts 104 open to deenergize the heating means 76 and terminate the application of heat to the interior of the rotatable drum. Clothing within the drum, the clothes dryer itself, and the surroundings of the clothes dryer are therefore protected from overheating.

Referring specifically to FIG. 4, it will be noted that the position of the switch 86 effectively clamps the spring bracket 84, notwithstanding the otherwise pivotal connection to the base 22 at the slot 118 and the S-shaped end 116 so that the bracket does not become dislodged due to inertial forces as it releases the stored energy and moves to operate the switch 86.

Although I have described my invention by reference to a particular illustrative embodiment thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. I therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

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

1. In a clothes dryer having a rotatable drum, heater means for drying clothes in the drum, a motor to rotate the drum, a belt connecting the motor and the drum for rotating the drum, tensioning means including a spring bracket and belt engagement means for applying tension to and held in an energy storing position by the belt, and an electrical circuit for connection to an electrical supply including the motor and the heater means, the improvement comprising:

means for preventing damage to the dryer and clothes therein on breaking of the belt, comprising a switch connected in the electrical circuit for controlling the energization of the motor, said switch including

a switch actuator mounted spaced from and in the path of movement of the spring bracket for direct contact by the spring bracket upon breaking of the belt and release of the energy stored in the bracket to open the circuit and interrupt energization of the motor.

2. In a clothes dryer as claimed in claim 1, wherein the electrical circuit includes control means connecting the motor and the heater means and responsive to de-energization of the motor to open the circuit to the heater means.

3. In a clothes dryer as claimed in claim 1, comprising means connected to said switch and disposed in an interference relationship with respect to movement of the spring bracket for limiting movement of the bracket toward the switch to prevent damage to the switch.

4. In a clothes dryer having a rotatable drum, heater means for drying clothes in the drum, a motor to rotate the drum, a belt connected the motor and the drum for rotating the drum, tensioning means including a spring bracket and belt engagement means for applying tension to and held in an energy storing position by the belt, and an electrical circuit for connection to an electrical supply including the motor and the heater means, the improvement comprising:

means for preventing damage to the dryer and clothes therein on breaking of the belt, comprising a switch connected in the electrical circuit for controlling

a switch actuator mounted spaced from and in the path of movement of the spring bracket for direct contact by the spring bracket upon breaking of the belt and release of the energy stored in the bracket to open the circuit and interrupt energization of the motor, and

the dryer including a base and comprising mounting means mounting said switch on said base, said mounting means including a shoulder extending adjacent said switch actuator and in the path of movement of the spring bracket to limit depression of said switch actuator.

5. In a clothes dryer having a rotatable drum, heater means for drying clothes in the drum, a motor to rotate the drum, a belt connecting the motor and the drum for rotating the drum, tensioning means including a spring bracket and belt engagement means for applying ten-

sion to and held in an energy storing position by the belt, and an electrical circuit for connection to an electrical supply including the motor and the heater means, the improvement comprising:

means for preventing damage to the dryer and clothes therein on breaking of the belt, comprising a switch connected in the electrical circuit for controlling the energization of the motor, said switch including

a switch actuator mounted spaced from and in the path of movement of the spring bracket for direct contact by the spring bracket upon breaking of the belt and release of the energy stored in the bracket to open the circuit and interrupt energization of the motor, and

the dryer including a base and said switch including a switch body, said actuator extending from said switch body, and comprising mounting means mounting said switch on said base, said mounting means including a portion which extends adjacent said switch actuator beyond said switch body and less than the extent of said switch actuator to stop the bracket after contact thereof with and operation of said switch actuator to prevent damage to said switch.

6. In a clothes dryer as claimed in claim 1, wherein said dryer includes a base and comprising mounting means mounting said switch on said base and securing a portion of the spring bracket to said base.

7. A clothes dryer having

a rotatable drum,

heater means to dry clothes in the drum,

a motor to rotate the drum,

a belt to connect the motor to the drum to rotate the drum,

a spring bracket having pulley means mounted thereon for applying tension to the belt, said bracket being held in a flexed position when applying tension to the belt and moving from a flexed position to an unflexed position on release of tension on the belt,

an electrical circuit connected to a power source and to said heater means and said motor for energizing said motor and said heater means, said circuit including control means for causing interruption of the energization of said heater means on the interruption of energization of the motor:

and means for preventing damage to the dryer and clothes therein on breaking of the belt comprising a switch in said circuit for controlling the energization of said motor, said switch having a switch actuator mounted in the movement path of said bracket for direct contact of the switch actuator by the bracket, said switch having means associated therewith to prevent damage to the switch by movement of the bracket, the tension of said belt holding said bracket spaced from said switch actuator, the release of tension on the belt by the breaking of the belt releasing the spring bracket for movement such that it contacts and actuates the switch actuator, opening the circuit and interrupting energization of the motor.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,890,720
DATED : June 24, 1975
INVENTOR(S) : George V. Nichols

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, claim 4, line 36, correct spelling of
--connecting--.

Column 5, claim 4, line 46, after "trolling" insert
--the energization of the motor, said switch including--.

Signed and Sealed this
third Day of February 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks