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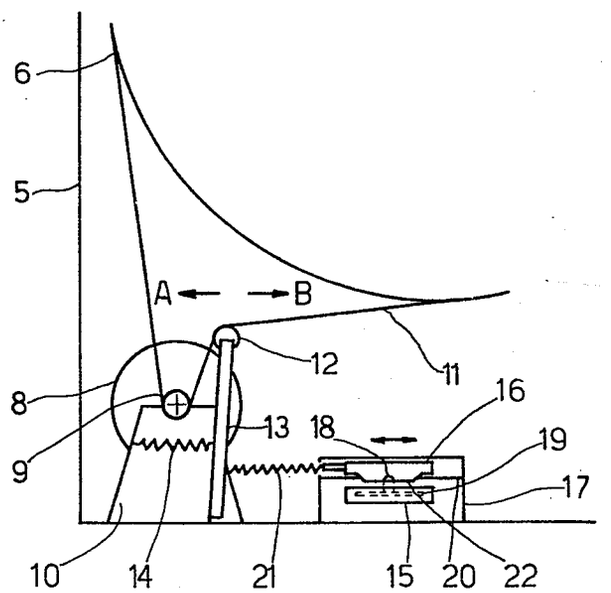
(54) Laundry dryer with a safety device for preventing overheating of the laundry.

(57) A laundry dryer is provided with a safety device for preventing overheating of the laundry in case of mechanical failure of the machine. The dryer comprises a drum (6) adapted to be rotated by a motor (8) through a transmission belt (11) extending around a belt pulley (9) of said motor (8) and said drum (6) and kept under tension by at least one tensioning roller (12) carried by a spring-loaded lever (13) pivotally mounted in the frame of the machine. The safety device comprises a slider element (16) connected to said lever (13) through a spring (21) and adapted to actuate a microswitch (15) connected to the motors (8, 26) driving said drum and a blower, and to a heater element (27) of the machine. Rupture of said driving belt (11) or of the return spring (14) connected to said lever (13) causes said slider element (16) to move in one of two opposite directions for actuating said switch (15) to its open position in both cases. As a result, the electric power supply to said motors (8, 26) and to said heater element (27) is interrupted.



EP 0 110 318 A1

Laundry Dryer with a Safety Device for Preventing Overheating of the Laundry

Description

The invention relates to a laundry dryer provided with a simple and reliable safety device for preventing overheating of the laundry in case of stoppage of the drum due to mechanical failure of the machine.

Conventional laundry dryers comprise a blower and heater elements for circulating heated air through a conduit and the interior of a drum containing the laundry to be dried and adapted to be rotated by means of an electric motor.

Machines of thsi type additionally comprise suitable safety devices electrically connected to said heater elements for preventing the temperature during operation of the machine from exceeding a predetermined level beyond which the laundry would be overheated with the danger of being burnt.

Known safety devices of this type are associated with a filter included in the heated air circulating conduit for retaining lint released by the laundry or any other foreign matter.

These safety devices continually monitor the degree of obstruction of the filter and thus serve to indirectly control the temperature of the circulating heated air downstream of the filter.

As the filter is gradually obstructed, the circulating air reaches the predetermined temperature level, whereupon the safety device operates to interrupt the electric power supply to the heater elements, at the same time indicating this condition to the user, so that the filter is then cleaned or replaced.

Other known safety devices are employed for continually monitoring the temperature of the heated air circulating within the laundry dryer and for interrupting the electric power supply to the heater elements in case of electrical failure or interruption of the power supply to the electric motors driving the drum or the blower.

Although these known safety devices are highly effective in protecting the laundry dryer in case of any electric faults, they are not able to give similar protection in case of mechanical faults resulting in stoppage of the drum or rotation thereof at a reduced speed. Mechanical faults of this type may for instance be caused by rupture or excessive elongation of the driving belt extending around the drum and a belt pulley of the respective electric motor and kept under tension by a number of tensioning rolls disposed in the lower rear portion of the machine.

In a case of this nature the blower and the heater elements of the laundry dryer continue to be connected to the electric power supply, while the laundry remains stationary or is moved at a reduced speed, so that the continuously circulating heated air causes progressive overheating of the laundry with the danger of the laundry being singed or burnt.

It is an object of the present invention to eliminate the above described shortcomings of known laundry dryers by the employ of a safety device adapted to effectively protect the dryer and the laundry contained therein in the case of mechanical failure of the type indicated above.

According to the invention, a safety device of the type referred to above essentially comprises an electric breaker switch connected to the electric circuit of the dryer together with the heater elements and mechanically connected to the transmission belt in such a manner as to interrupt the electric power supply to the heater elements in the case of rupture or excessive elongation of the belt.

These and other objects are attained according to the invention by a laundry dryer comprising a blower driven by an electric motor and at least one heater element for circulating heated air within a drum containing the laundry to be dried, said drum being rotatively driven by a second electric motor via at leat one transmission belt extending around said drum and a belt pulley of said second motor and kept under tension by means of at least one tensioning roll carried by a spring-loaded lever pivotally mounted in the lower rearward portion of the machine.

According to the invention, a laundry machine of this type is characterized by comprising actuator means cooperating with said lever, said heater element and said motors so as to control the connection and disconnection, respectively, of said heater element and said motors to the electric power supply of the machine in response to the position assumed by said lever.

For better understanding of the invention, preferred embodiments thereof shall now be descriebd by way of example with reference to the accompanying drawings, wherein:

figs. 1 and 2 show diagrammatic elevational views of two embodiments of a safety device according to the invention disposed in the rear portion of a laundry dryer, and

figs. 3 and 4 show portions of electric circuit diagrams associated with the embodiments of figs. 1 and 2, respectively.

With reference to fig. 1, a laundry dryer according to the invention comprises a frame 5 and a drum 6 mounted therein for rotation about a horizontal axis and adapted to contain the laundry to be dried. The machine further comprises a blower and at least one electric heater element (not shown) for generating a flow of heated air through drum 6. Drum 6 is adapted to be rotated by an electric motor 8

provided with a belt pulley 9 and mounted on a support 10 at the lower rear portion of the frame of the machine.

In particular, drum 6 is rotated with the aid of a conventional transmission belt 11 extendign around pulley 9 of motor 8 and around drum 6 and kept under tension by means of a tension roll 12. Tension roll 12 is carried by a lever 13 pivotally mounted at one end thereof on the frame of the machine adjacent motor 8. Tension roll 12 is continually biased into engagement with belt 11 by a return spring 14 having its respective end anchored to lever 13 and support 10.

By properly selecting the characteristics of return spring 14, it is tbus possible to keep belt 11 under sufficient tension for effectively transmitting the rotation of motor 8 to drum 6 with a minimum of wear of the belt itself.

The described laundry dryer is further provided with a safety device for preventing possible overheating and burning of the laundry in case of rupture or excessive elongation of belt 11.

The safety device in the embodiment shown essentially comprises an electric breaker switch 15 and an associated slider element 16, both mounted on a support 17 adjacent motor 8 and lever 13.

Switch 15 is provided with a spring-loaded button 18 cooperating with a normally open contact 19 connected to the electric circuitry of the machine in a manner to be described.

Slider element 16 is adapted to slide back and forth alcng a horizontal guide 20 of support 17. Slider element 16 is connected to lever 13 by a compression spring 21 and provided with a plane surface portion 22 for actuating button 18.

Plane surface portion 22 is dimensioned such as to retain button 18 in its depressed state, and thus contact 19 in its closed position, also in case of small displacements of slider element 16 due to the action of the resilient transmission belt 11 on tension roll 12 and lever 13 during rotation of drum 6.

As evident from fig. 3, contact 19 is connected in series with the program unit 23 of the machine, said unit being adapted to control the connection and disconnection, respectively, of the two motors 8 and 26 driving the blower and drum, respectively, and of the heater element 27, itself connected in series with a conventional protective thermostat 28.

During a normal drying cycle contact 19 is kept closed in the manner described, permitting electric power to be simultaneously supplied to motors 8 and 26 and heater element 27 in series with thermostat 28.

In the case of rupture of belt 11, drum 6 stops and lever 13 is displaced in the direction of arrow A by the action of return spring 14, resulting in a corresponding displacement of slider element 16 by the action of spring 21 (fig. 1).

This results in plane surface portion 22 of slider element 16 releasing button 18, causing it to snap back to its rest position, whereby contact 19 is permitted to open.

The open position of contact 19 is shown in dotted lines in fig. 3. In this position, motors 8 and 26 as well as heater element 27 and thermostat 28 are disconnected from the electric power supply.

As a result, the flow of heated air through the drum is discontinued, and overheating or even burning of the laundry is effectively prevented.

In a similar manner, failure of return spring 14 results in a displacement of lever 13 in the direction of arrow B under the action of transmission belt 11. The resulting slack in transmission belt 11 around drum 6 results in rotation of the drum at a reduced speed or even in stoppage of the drum.

In this case, slider element 16 is also displaced in the direction of arrow B by the action of spring 21, whereby plane surface portion 22 is again cause to release button 18. This results in button 18 and contact 19 assuming their rest positions as above descriebd, so that motors 8 and 26 and heater element 27 with thermostat 28 are again disconnected from the electric power supply.

Shown in fig. 2 is a laundry dryer equipped with a safety device in a second embodiment of the invention. In this figure, the above described elements of the dryer are designated by the same reference numerals as in fig. 1.

In the second embodiment, the safety device essentially comprises two breaker switches 29 and 30 facing each other over a short spacing and fixedly mounted in the machine adjacent motor 8 and lever 13, and a slider element 31 carried by a support 32 secured to the machine in a position adjacent switches 29 and 30.

Each breaker switch 29 and 30 is provided with a spring-loaded button 33 and 34, respectively, cooperating with a normally closed electric contact 35 and 36, respectively, said contacts being connected to the electric circuitry of the machine in a manner to be described.

Slider element 31 is adapted to slide back and froth between a pair of parallel horizontal guides 37 and 38 of support 32, and is connected to lever 13 by a compression spring 39.

Slider element 31 is further provided with a projection 40 located at a position between the buttons of the two

breaker switches so as to be able to selectively actuate one or the other thereof.

The dimensions of projection 40 are selected so as to permit limited displacement of slider element 31 under the resilient action of transmission belt 11 on tension roll 12 and lever 13 during rotation of drum 6 withou projection 40 coming into contact with one of the two buttons.

As shown in fig. 4, contacts 35 and 36 are connected in series with each other and with program unit 23 of the machine, the program unit being in turn connected to the electric components of the machine in the above descriebd manner.

During normal operation of the dryer, slider element 31 does nos act on contacts 35 and 36, so that they remain closed during the operating cycle of the dryer, permitting the electric components of the machine to be supplied with electric power by program unit 23.

In the case of rupture of transmission belt 11 or failure of return spring 14, slider element 31 is displaced in the direction of arrow A or B, respectively, under the action of lever 13 as described above.

As a result, projection 40 actuates the respective button 33 or 34, respectively, causing the respective contact 35 or 36 to open, as shown in dotted lines, so as to disconnect the electric components of the machine from the power supply.

Displacement of slider element 31 in one or the other direction thus results in the flow of heated air through the drum being interrupted, so as to prevent overheating and burning of the laundry from occurring.

The safety device according to the invention is of a simple and reliable type and may be employed in combination with conventional safety devices protecting the machine against electric failure, resulting in a laundry dryer thus being effectively protected against any failure of its electric and mechanical components.

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Laundry Dryer with a Safety Device for Preventing Overheating of the Laundry

Patent Claims

1. A laundry dryer comprising a blower driven by an electric motor and at least one heater element for circulating heated air within a drum containing the laundry to be dried, said drum being rotatively driven by a second electric motor via at least one transmission belt extending around said drum and a belt pulley of said second motor and kept under tension by means of at least one tensioning roll carried by a spring loaded lever pivotally mounted in the lower rearward portion of the machine, characterized by actuator means cooperating with said lever (13), said heater element (27) and said motors (8, 26) so as to control the connection and disconnection, respectively, of said heater element (27) and said motors (8, 26) to the

electric power supply of the machine in response to the position assumed by said lever (13).

2. A laundry dryer according to claim 1, characterized in that said actuator means comprise a slider element (16) and a breaker switch (15) having a contact (19) for controlling said heater element (27) and said motors (8, 26), said slider element (16) being connected to said lever (13) by a spring (21) and comprising a plane surface protion (22) adapted to actuate said contact (19) to its closed or open position.

3. A laundry dryer according to claim 1, characterized in that said actuator means comprise a slider element (31) and two breaker switches (29, 30) having their contacts (35, 36) connected in series with one another for controlling said heater element (27) and said motors (8, 26), said slider element (31) being connected to said lever (13) by a spring (39) and having a projection (40) disposed between said breaker switches (29, 30) for actuating one or the other thereof to its open or closed position.

4. A laundry dryer according to the preceding claims, substantially as described with reference to the accompanying drawings and for the stated purposes.

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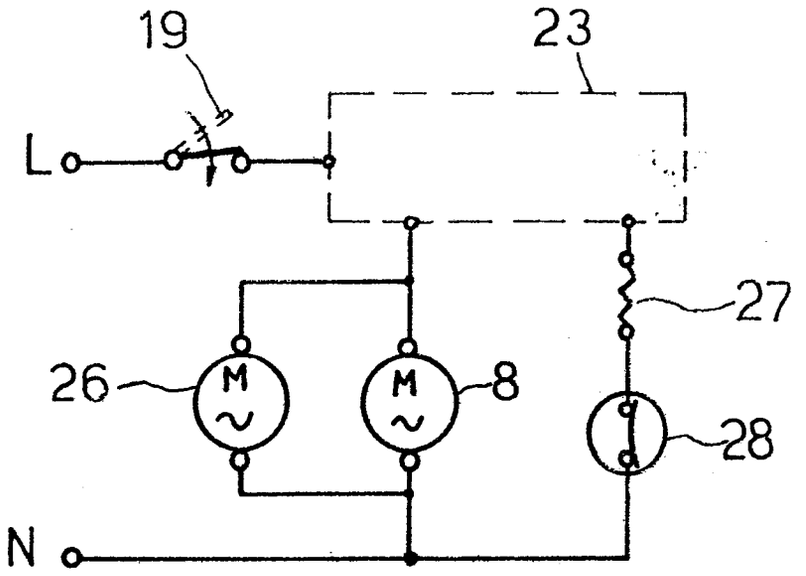

FIG. 3

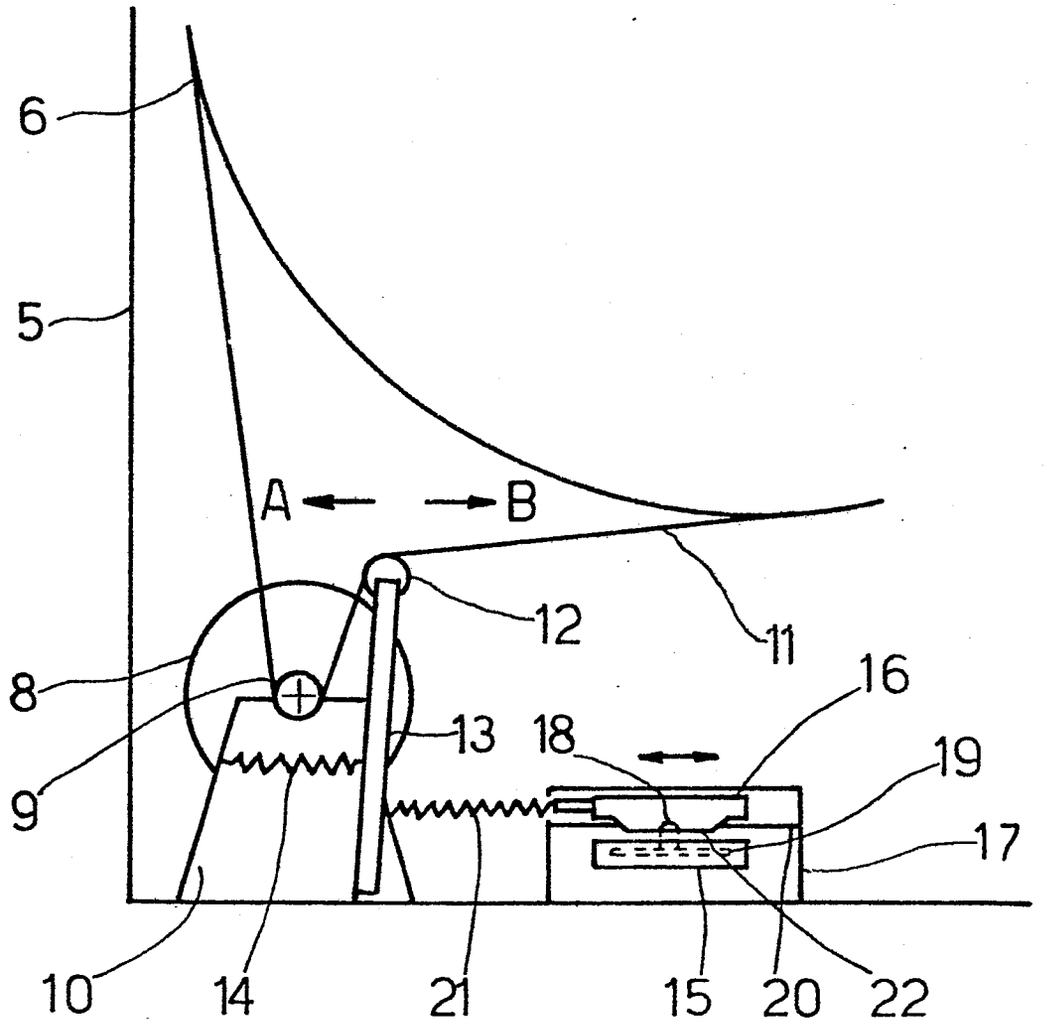

FIG. 1

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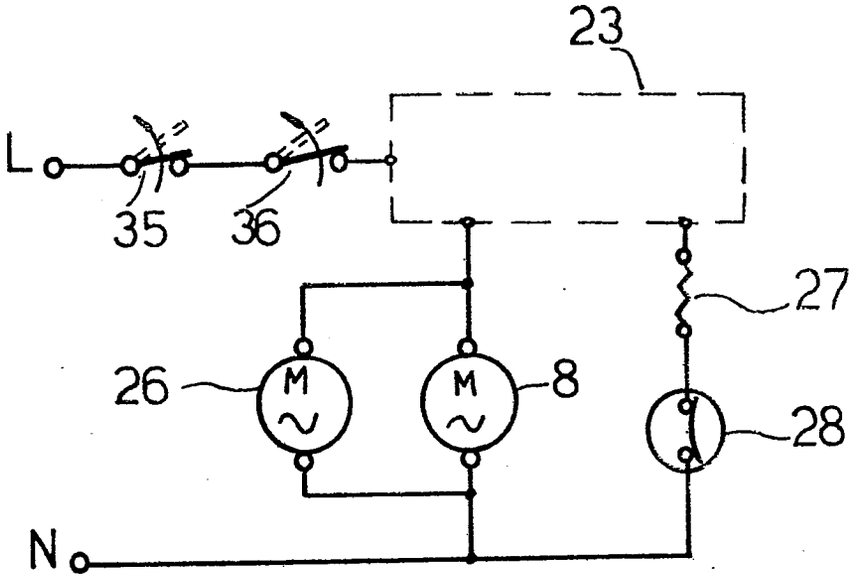

FIG. 4

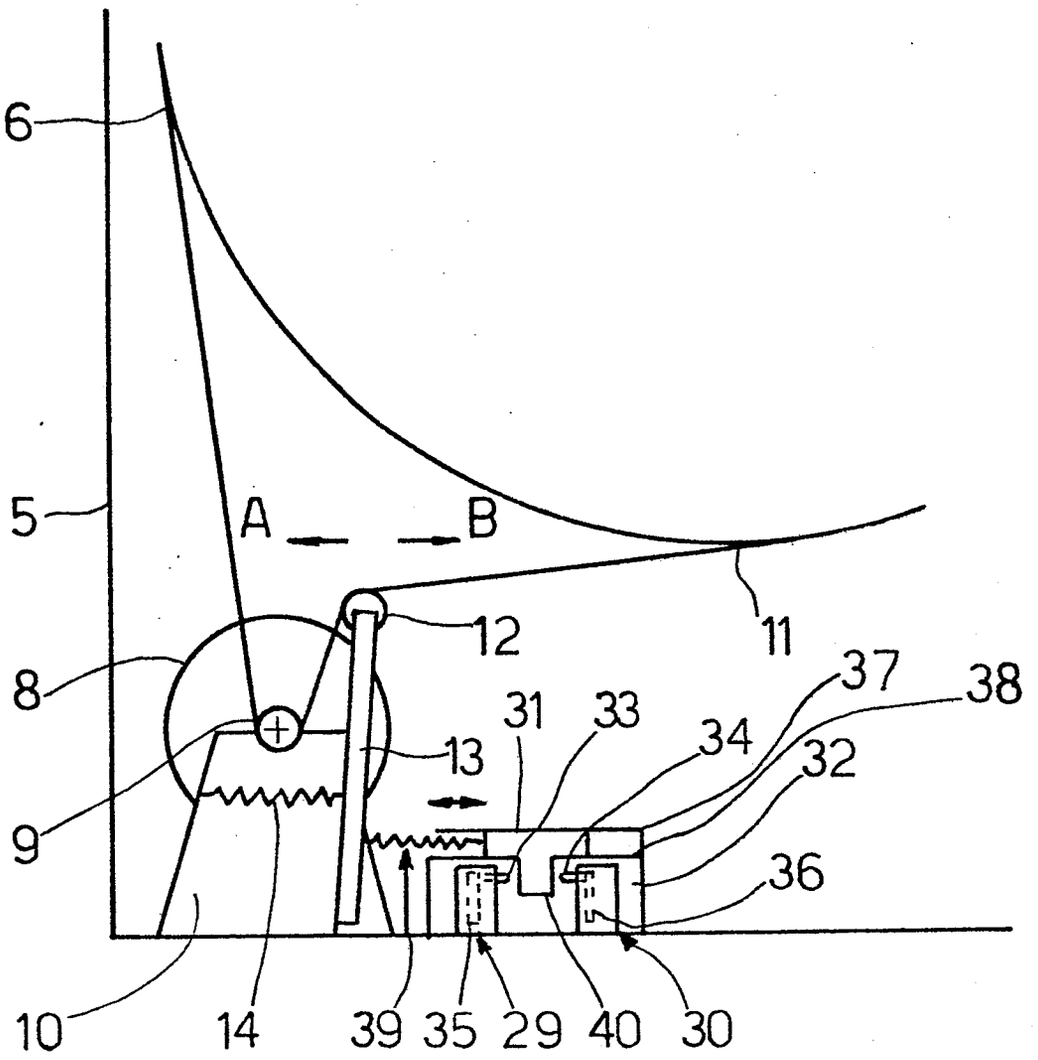

FIG. 2

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EUROPEAN SEARCH REPORT

0110318
Application number

EP 83 11 1728

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	US-A-3 890 719 (BRAGA et al.) * Column 3, lines 60-68; column 4, lines 1-44 *	1-4	D 06 F 58/08
X	US-A-3 890 720 (NICHOLS) * Claim 1; figures *	1	
X	GB-A- 839 471 (GENERAL ELECTRIC) * Page 3, lines 29-42; page 4, lines 6-130; page 5, lines 1-23 *	1,2	
A	FR-A-1 404 300 (SIEMENS)		
A	GB-A- 885 171 (FISHER & PAYKEL)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			D 06 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24-02-1984	D HULSTER E.W.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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