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Description

The invention relates to a laundry dryer and in particular to a safety device for a laundry drier adapted to interrupt the electric power supply to the machine whenever the drum is not properly rotated by the associated electric motor, in the case for instance of rupture or excessive elongation of the transmission belt connected between the drum and the electric motor.

Known laundry driers substantially comprise a blower and at least one heater element operable to establish a circulation of hot air through a conduit containing a filter for retaining fluff and any possible foreign bodies to the interior of a drum containing the laundry to be dried and adapted to be rotated by an electric motor with the aid of a transmission belt connected between the drum and the electric motor.

In known machines of this type, the possible rupture or excessive elongation of the transmission belt, held under tension by at least one tension roller disposed at a lower rearward location of the machine, will cause the drum to come to a standstill or to be rotated at a considerably reduced speed, with the resultant danger of overheating and/or scorching of the laundry contained in the drum by the hot air flow passing through the drum.

For preventing such malfunctions from occurring, electro-mechanical safety devices have already been proposed, such safety devices being operable to interrupt the electric power supply to the machine in response to rupture or excessive elongation of the transmission belt.

Known in particular from US Patents 3,890,719 and 3,890,720 is such a safety device comprising a tension roller associated to the transmission belt and carried by an elastic bracket secured to the base of the machine and cooperating with a breaker switch incorporated in the electric power supply circuit of the machine.

During normal operation of the machine, the bracket is resiliently biased by the tension of the transmission belt towards an operative position to thereby keep the breaker switch in the closed state ensuring the continued supply of electric power to the machine.

In the case of possible rupture or excessive elongation of the belt, however, the bracket is no longer biased by the tension of the belt and thus permitted to assume an alternative operative position, causing the breaker switch to open and to thereby interrupt the power supply to the machine.

Another safety device is known from GB Patent 839,471.

This safety device is employed in a laundry washing machine comprising a tension roller acting on the transmission belt and carried by a spring-

biased lever mounted on the base of the machine and acting on a breaker switch incorporated in the electric power supply circuit of the machine.

Also in this case a possible rupture or excessive elongation of the transmission belt causes the breaker switch to be actuated to its open position, as in the preceding case, to thereby interrupt the power supply to the machine.

In any case, these known safety devices are not capable of interrupting the electric power supply to the respective machine in the possible case of damage or malfunction of the belt tensioning mechanism (comprising the elastic bracket or the spring-biased lever, respectively) so that in this case the electric power supply to the machine is continued although the drum might have come to a standstill or might be rotated at a reduced speed.

As a result, the hot air continuously circulating through the drum of the laundry drier leads to a progressive over-heating of the laundry, with the danger of the laundry being scorched.

From US-A-4 488 363 a laundry drier is known having a combination idler and belt failure switch associated to a pulley engaged by a belt by means of which the drum of the drier is driven by a motor. An idler pulley is supported and biased by a bracket to maintain tension of the belt. Further, linkage means are provided interconnecting the idler pulley and the centrifugal switch for deactuating said switch to cease operation of the motor in response to the breaking of the belt. As power supply to heater elements is controlled by the same switch, heating is interrupted as well upon deactuation of the switch. This drier is prior art according to the preamble of claim 1.

From FR-A-2 370 283 a control device for a rotational movement of a turning member in an apparatus like a laundry washing-machine is known comprising electronic means for detecting the rotational speed of the rotating member which may be a pulley to drive a drum. The detector is formed by a magnetic coil connected to an electronic circuit, and the coil is influenced by a magnet disposed at the rotating member. If rotational speed of the rotating member does not exceed the predetermined threshold, heating elements of the washing-machine are switched off or a programme unit is controlled to attain its initial position in which all power to the electric components of the washing-machine is switched off.

The known arrangements suffer from suitably indicating any condition of disorder of the machine, so that it is the object of the invention to provide a laundry drier permitting to signal automatically the correct or incorrect operation of the drier through suitable control means.

This object is obtained by the characterising features of claim 1. Preferred embodiments of the

invention are subject-matter of the dependent claims.

The characteristics of the invention will become more evident from the following description, given by way of example with reference to the accompanying drawings, wherein:

Figure 1 shows a diagrammatic side view of the parts of a laundry drier equipped with a safety device according to the invention,

Figures 2 and 3 show a first embodiment of the present safety device in two different operative positions,

Fig. 4 shows a second embodiment of the present safety device, and

Figs. 5 and 6 show an electric circuit diagram of the present safety device in a first and a second embodiment thereof, respectively.

With reference to Fig. 1, there is shown a lower portion of a laundry drier 7 having a housing 8 surrounding a drum 9 adapted to be rotated by an electric motor 10 of conventional construction mounted on the base 11 of the machine.

The present laundry drier also comprises a blower 12 connected to a conduit 13 leading to the interior of drum 9 and defined between the walls of housing 8 and the drum 9 itself.

Mounted within conduit 13 are at least one heater element and a filter of conventional construction (both of which are not shown), adapted respectively to heat the flow of air produced by blower 12, and to retain fluff and any foreign bodies possibly entrained by the air flow.

Drum 9 of the described machine on its part is adapted to be rotated by electric motor 10, preferably in a single direction, with the aid of a transmission belt 14 extending between a driving pulley 15 associated to motor 10 and a driven pulley formed by or on the circumferential surface of drum 9.

During operation of the machine, transmission belt 14 is kept under tension by at least one tension roller 16 of conventional type to thereby ensure the efficient transmission of the driving force from motor 10 to drum 9, said tension roller 16 being mounted in a lower portion of the machine in the manner to be described.

With reference now to Figs. 2 and 3, there is shown a first embodiment of a safety device according to the invention.

As shown in these figures, tension roller 16 has a centrally mounted extended shaft 17 adapted to extend through the bore (not shown) of a slide bushing 18 and through a corresponding bore (not shown) drilled in a projection 19 of the front shield 20 of motor 10.

This tension roller 16 is further provided with two lateral stop disks 21 and 22 adapted to prevent any lateral displacement of transmission belt 14

during operation of the machine.

Tension roller 16 is thus mounted in the bore of projection 19 in a freely rotatable manner and in pressure contact with transmission belt 14 due to the tension of the latter, so as to be rotated by the movement of the belt during operation of the machine.

According to the invention, the present safety device comprises a set of radial-expansion flyweights 23 connected at one end to stop disk 22 and biased away from one another by compression springs 24, their other ends being engaged with the cylindrical outer surface of slide bushing 18.

When tension roller 16 is rotated by the action thereon of transmission belt 14 at a speed comprised between predetermined limits and indicative of drum 9 of the machine being rotated at a proper speed, flyweights 23 are caused to expand radially as shown in fig. 2.

Under these conditions flyweights 23 thus assume an operative position to thereby cause slide bushing 18 to be axially displaced on shaft 17 to a position in which a further disc 25 carried by its free end is located closely adjacent projection 19.

In this position disc 25 acts on an actuator arm 26 of an electric breaker switch 27 incorporated in the electric circuit of the machine in a manner to be described, to thereby close the mobile contacts (not shown) of breaker switch 27 by the action thereon of actuator arm 26.

This results in the machine being supplied with electric power, permitting the selected drying cycle to proceed.

When on the other hand tension roller 16 is not rotated, or is rotated at a reduced speed below the above specified limits, i.e. in the case of rupture or excessive elongation of transmission belt 14, under a condition thus, in which drum 9 has come to a standstill or is rotated at a considerably reduced speed, resulting in the danger of the laundry being damaged by the flow of heated air directed through the drum, flyweights 23 assume their rest position as shown in fig. 3, in which they are not radially expanded.

Under these conditions flyweights 23 are automatically returned to their rest position by the resilient action thereon of compression springs 24, causing axial displacement of slide bushing 18 towards tension roller 16, see Fig.3.

The resultant displacement of disc 25 permits actuator arm 26 of breaker switch 27 to assume a second position in which the mobile contacts of the breaker switch are opened to thereby interrupt the electric power supply to the machine.

As a result, the performance of the selected drying cycle is interrupted for permitting the malfunction of the machine to be attended to.

Shown in Fig. 5 is an electric circuit diagram of

the described safety device.

This device substantially comprises an electronic control stage constituted by an electronic comparator 28 connected to the electric circuit of the machine together with breaker switch 27, motor 10 and a program timing unit 29 provided for selecting the duration and the maximum temperature of a drying cycle in view of the type and amount of the fabrics introduced into drum 9.

In particular, comparator 28 is supplied from the main conductors 30 and 31 of the electric circuit of the machine through a rectifying and voltage limiting circuit 32 and conductors 33 and 34.

Program timing unit 29 on its part is connected to main conductor 30 through a manually operable breaker switch 35 of the normally-open type, and to main conductor 31 through the electric motor 10 for rotating drum 9.

Comparator 28 has a DC reference voltage of a predetermined level applied to a first input terminal 36 connected to this purpose to circuit 32 adapted to also supply this reference voltage, a second input terminal 37 being connected to the juncture 38 between program timing unit 29 and motor 10 through a rectifying and voltage limiter circuit 39, a logic AND gate 40 supplied from mains, a time-constant circuit 41 of conventional type, and a limiting resistor 42.

This second input terminal 37 is additionally adapted to be connected to ground 43 by means of a mobile contact 44 of breaker switch 27, associated to a further mobile contact 45 adapted to be actuated contemporaneously to the same operative positions and adapted to be connected to main conductor 30 parallel to manually operable breaker switch 35. Logic AND gate 40 on its part has a first and a second input terminal 46 and 47 connected respectively to rectifying and voltage limiter circuits 32 and 39 through conductors 33 and 48, respectively, and an output terminal 49 connected to the second input terminal 37 of comparator 28 through time-constant circuit 41.

Logic AND gate 40 serves the purpose of permitting or preventing the DC voltage generated by circuit 41 in the manner to be described to be applied to second input terminal 37 of comparator 28 in the course of the drying cycle.

Time-constant circuit 41 is composed of a series of electric components of the R-C type (i.e. comprising resistors and capacitors) connected and dimensioned so as to establish, in the presence of a DC input voltage of a constant level, a DC output voltage of a rising level of exponential configuration to be applied to second input terminal 37 of comparator 28.

Depending on the comparison of this voltage to the reference voltage applied to first input terminal

36 of comparator 28, it is possible in this manner to control the energization of a specific signalling device 50, for instance a warning lamp, an acoustic warning device or the like, to which purpose said signalling device is connected between main conductor 30 and output terminal 51 of comparator 28 through a pilot stage 52 of conventional type energized by circuit 32 and connected between the latter and main conductor 31.

The present safety device is put into operation by closing the main switch 53 of the machine and manually operable breaker switch 35 subsequent to adjusting program timing unit 29 to a drying cycle selected in view of the kind and amount of the fabrics to be dried and introduced into the drum.

Under these conditions motor 10 and tension roller 16 are initially at a standstill, so that flyweights 23 are not radially expanded, and mobile contacts 44 and 45 of breaker switch 27 remain open.

The energization of program timing unit 29 permits the energization of motor 10, of the remaining electric components of the machine required for controlling the selected drying cycle, and of rectifying and voltage limiter circuits 32 and 39, comparator 28, pilot stage 52 and logic AND gate 40.

As a result, the first input terminal 36 of comparator 28, the output 51 of which is initially in the disabled state, is supplied with the reference voltage generated by circuit 32, while second input 37 of comparator 28 is supplied with the voltage generated by circuit 39 through limiting resistor 42, time-constant circuit 41 and logic AND gate 40, the output 49 of which is switched to the conductive state as soon as the voltages generated by circuits 32 and 39, respectively, are applied to its input terminals 46 and 47.

As a result, an exponentially rising DC voltage generated by time-constant circuit 41 is applied to second input 37, the level of this voltage being lower than that of the reference voltage applied to first input 36 of comparator 28 at least during the short period during which breaker switch 27 remains open before the flyweights 23 are fully expanded in the radial direction by the action of motor 10.

Only after flyweights 23 are fully expanded they cause mobile contacts 44 and 45 of breaker switch 27 to be contemporaneously closed to thereby connect second input 37 of comparator 28 to ground 43 while maintaining the power supply to the electric circuit of the machine also after manually operable breaker switch 35 has been released.

As a result, the voltage generated by circuit 41 is applied to ground through limiting resistor 42, so that no voltage appears at second input 37 of

comparator 28.

Comparator 28 is thus maintained in the non-conductive state, so that signalling device 50 remains deenergized during the full drying cycle.

In the case of a possible rupture of transmission belt 14, on the other hand, tension roller 16 is no longer rotated by motor 10 and thus comes to a standstill, as a result of which flyweights 23 return to their non-expanded rest position, while motor 10 remains in operation.

Under these conditions the rotation of drum 9 is likewise stopped, resulting in the danger of the laundry contained therein being scorched by the flow of heated air directed therethrough, which to avoid flyweights 23 cause mobile contacts 44 and 45 of breaker switch 27 to be opened.

This results in program-timing unit 29 and motor 10 being deenergized, and the connection of second input 37 of comparator 28 to ground 43 and time-constant circuit 41 to be interrupted.

In this manner the voltage generated by time-constant circuit 41 is applied to limiting resistor 42, the resultant voltage drop being applied to second input 37 of comparator 28, as a result of which, as soon as this voltage rises above the reference voltage constantly applied to first input 36 of comparator 28, output 51 of comparator 28 is rendered conductive to thereby energize signalling device 50 through pilot stage 52.

For preventing the interruption of the power supply to program-timing unit 29 from again inverting the logic state of comparator 28, due to the fact that time-constant circuit 41 is no longer energized, so that it no longer applies a voltage to second input 37 of comparator 28, resulting in undesirable deenergization of signalling device 50, the present safety device further includes a feedback circuit 54 connected between output 51 and second input 37 of comparator 28.

This feedback circuit may for instance comprise a diode (not shown) conductive in the direction towards second input 37 of comparator 28, and at least one resistor (not shown) connected in series with said diode for constantly applying to input 37 a voltage higher than that applied to first input 36 of comparator 28.

In this manner, even when the machine is deenergized by the opening of breaker switch 27, comparator 28 remains always in the conductive state to thereby maintain signalling device 50 energized through pilot stage 52.

In this manner it is possible to detect the malfunction of the machine and to consequentially attend to such malfunction.

The present safety device is also capable of indicating in a similar manner as described above a state of malfunction caused by excessive elongation of transmission belt 14, as a result of which

drum 9 comes to a standstill or continues to be rotated at a reduced speed insufficient for maintaining flyweights 23 in their expanded state, with the resultant danger of the laundry being damaged for the reasons given above.

With reference to Fig. 4, there is shown a second embodiment of the safety device according to the invention.

In this case, slide bushing 18 and flyweights 23 have been eliminated, the extended shaft 17 of tension roller 16 being directly received in the bore of projection 19.

In this embodiment of the invention, the safety device comprises an element for detecting the rotational speed of tension roller 16. In the embodiment shown, a small permanent magnet 55, a coloured or reflective lamina or a similar element of a per se known type is secured to stop disc 22 of tension roller 16 at a position facing towards shield 20 of motor 10, to cooperate with a stationary transducer 56.

This transducer particularly comprises a conventional magnetic and/or optical sensor (including for instance light-emitting diodes and a phototransistor or similar electronic components) or other suitable elements of a per se known type, and is mounted at a position opposite element 55.

In this manner the described detector element is capable of detecting whether or not tension roller 16 is being rotated, by means of sensor 56 directly responsive to the corresponding rotation of element 55.

This sensor is thus effective to generate an electric voltage corresponding to the rotational speed of tension roller 16, and to transmit this electric voltage to the electric circuit of the laundry drier via a transmission cable 57 connected between said electric circuit and a connector 58 associated to sensor 56.

Fig. 6 depicts the electric circuit diagram of this second embodiment of the safety device.

This electric circuit substantially comprises an electronic control stage constituted by a conventional electronic NAND gate 59 connected to the electric circuit for the purpose and in the manner to be described, together with a control relay 60, a signalling device 50 of the type described above, the program-timing unit 29 of the machine, the electric motor 10 and the above described transducer 56.

Program-timing unit 29 is connected to main conductor 61 by a breaker switch 62 adapted to be actuated by control relay 60, and to main conductor 63 through the electric motor 10 provided for rotating drum 9.

NAND gate 59 on its part is energized from the mains via a conductor 64 connected to the junction 65 between program-timing unit 29 and motor 10

through a rectifying and voltage limiter circuit 66, and via a common conductor 67.

A first input 68 of NAND gate 59 is also connected to junction 65, likewise through rectifying and voltage limiting circuit 66, a second input 69 being connected to transducer 56 through a circuit 70 adapted to amplify and process the electric signal generated by transducer 56 in the manner described above, and to thereby apply a corresponding DC voltage to second input 69.

Transducer 56 and circuit 70 on their part are energized in parallel to one another by rectifying and voltage limiter circuit 66 via conductors 64, 71 and 67.

In particular, NAND gate 59 serves the purpose of comparing the DC voltage applied to its second input 69 and generated in the manner described to a constant-level DC reference voltage applied to its first input 68 through circuit 66, enabling the electric circuit of the machine to be energized and deenergized during the drying cycle in response to the logic state of the output 72 of NAND gate 59 determined by this comparison.

Output 72 of NAND gate 59 on its part is connected to main conductor 63 through a driver circuit 73 of a conventional type and control relay 60 itself connected in parallel to signalling device 50, said driver circuit being energized from the mains through a rectifying and voltage limiter circuit 74 and via conductors 75 and 67.

The thus composed safety device operates as follows:

At the beginning, the main switch 53 of the electric circuit of the present laundry drier is closed after adjusting program-timing unit 29 to the temperature and the maximum duration of the selected drying cycle in accordance with the type and the quantity of the laundered fabrics introduced into the drum.

At this stage control relay 60 is deenergized to thereby keep breaker switch 62 in the closed state, as a result of which program-timing unit 29 is energized and permits motor 10 and/or the heater element and the blower (both of which are not shown) to be likewise energized.

This initiates the laundry drying cycle, which is subsequently thermostatically controlled by specific control thermostats (not shown) connected to the electric circuit of the machine and calibrated to different temperature levels.

As soon as electric motor 10 is energized for rotating drum 9, transmission belt 14 starts to rotate tension roller 16 together with element 55 secured thereto.

In response to the rotation of element 55, transducer 56 generates a corresponding electric signal which is amplified by circuit 70 and converted to a DC voltage of a practically constant level to be applied to second input 69 of NAND gate 59.

Since at the same time the reference voltage is applied to first input 68 of NAND gate 59, output 72 of NAND gate 59 is not switched to a different logic state, so that control relay 60 remains deenergized, and breaker switch 62 thus remains closed.

This correct operating state of drum 9 is indicated by the fact that signalling device 50 is not energized.

In the possible case of rupture of transmission belt 14, on the other hand, tension roller 16 is no longer rotated by motor 10 and thus comes to a standstill while motor 10 continues to operate for the time being.

Under these conditions the rotation of drum 9 is also stopped, with the resultant danger of the laundry contained therein being damaged for the reasons given above, while transducer 56 does no longer respond to the then stationary element 55, and does thus no longer generate an electric signal.

As a result, no voltage is applied to second input 69 of NAND gate 59, while the reference voltage continues to be applied to its first input 68. Output 72 of NAND gate 59 is therefore switched to a different logic state, as a result of which control relay 60 is energized through driver circuit 73 to thereby open breaker switch 62.

This results in program-timing unit 29, motor 10 and the remaining electric components of the machine being likewise deenergized to thereby interrupt the laundry drying cycle.

This malfunction state of the machine is indicated by the energization of signalling device 50 to thereby casue the malfunction to be attended to.

For preventing the interruption of the power supply from causing driver circuit 73 to be again rendered conductive due to output 72 of NAND gate 59 having also been switched to the non-conductive logic state, resulting in control relay 60 being deenergized and breaker switch 62 closed, thus causing the power supply to the machine to be undesirably resumed and signalling device to be deenergized in the manner described, the present safety device is provided with a feedback circuit 76 connected between output 77 and input 78 of driver circuit 73.

As in the previous embodiment, this feedback circuit may comprise a diode (not shown) conductive in the direction towards input 78 of driver circuit 73, and at least one resistor (not shown) connected in series with the diode for always maintaining the input of the driver circuit at the same logic state as its output 77.

In view of driver circuit 73 thus remaining energized and thereby maintained in its conductive state even wehn the machine is deenergized, relay 60 is maintained energized to keep breaker switch 62 in the open state, while signalling device 50 on

its part remains energized.

The same function could obviously also be obtained with a feedback circuit different in design from the one described without thereby deviating from the spirit of the invention.

Another state of malfunction of the present laundry drier could also be brought about by excessive elongation of transmission belt 14, as a result of which the rotation of drum 9 could come to a standstill or be continued at a reduced speed, so that there is again the danger of the laundry being damaged for the reasons explained above.

Even if under these conditions transducer 56 operates to generate an electric signal at a reduced level, input 69 of NAND gate 59 has no voltage applied thereto, because circuit 70 is designed and dimensioned in such a manner that it does not produce any output voltage in the presence of this electric signal supplied thereto at said reduced level.

As a result thereof, NAND gate 59 causes relay 60 to be energized for opening breaker switch 62, and signalling device 50 to be energized in the manner explained above.

Claims

1. Laundry drier comprising a blower (12) and at least one heater element for creating a hot air flow through a conduit (13) to the interior of a drum (9) containing the laundry to be dried and adapted to be rotated by an electric motor (10) with the aid of a transmission belt (14), said transmission belt (14) being kept under tension by at least one tension roller (16) mounted in said laundry drier and adapted to be rotated by said transmission belt (14) and not to be rotated in the case of a rupture thereof, said drier further comprising an electric circuit connected to which are said blower (12), said heater element, said motor (10), a program timing unit (29) provided for selecting the duration and the maximum temperature of a drying cycle and connected to an electric breaker switch (27;62), which is operated by said tension roller (16) so as to energize and deenergize said motor (10) and said heater element respectively when said tension roller (16) is or is not sufficiently rotated, **characterized by** comprising control means (28;59) connected to a signalling device (50) and adapted to deenergize and energize thereof when said motor (10) and said heater element (29) are respectively energized and deenergized.
2. Laundry drier according to claim 1, wherein said tension roller (16) is mechanically coupled to a set of radial-expansion flyweights (23)

cooperating with said electric breaker switch (27), characterized in that said control means comprises an electronic comparator (28) of conventional type connected to said breaker switch (27), and provided with a first (36) and a second input (37) respectively supplied with a DC reference voltage at a predetermined level and with an exponentially rising DC voltage, as well as provided with an output (51) connected to said signalling device (50) through a pilot stage (52) of conventional type, said electronic comparator (28) being adapted to energize said signalling device (50) through said pilot stage (52) only when the exponentially rising DC voltage applied to said second input (37) rises above the DC reference voltage applied to said first input (36).

3. Laundry drier according to claim 2, characterized in that said second input (37) of said comparator (28) is connected to said electric motor (10) and said program timing unit (29) through a logic AND gate (40), a time-constant circuit (41) of conventional type adapted to generate the exponentially rising DC voltage and a limiting resistor (42), said second input (37) being adapted to be connected to a ground (43) by means of said breaker switch (27).
4. Laundry drier according to claim 3, characterized in that it comprises a feedback circuit (54) of per se known type connected between said output (51) and said second input (37) of said comparator (28), for maintaining said second input (37) at a higher voltage level than said first input (36) when a voltage appears at said output (51).
5. Laundry drier according to claim 1, wherein said tension roller (16) is mechanically coupled to an element (55) in the form of a permanent magnet, a coloured lamella or the like, which element (55) is associated to a transducer (56) of per se known type adapted to generate a corresponding electric voltage in accordance with the rotational speed of said tension roller (16), characterized in that said control means comprises an electronic NAND gate (59) of conventional type, provided with a first (68) and a second input (69) respectively connected to said electric motor (10) together with said program timing unit (29) and to said transducer (56), and with an output (72) connected through a driver circuit (73) to a control relay (60), connected in parallel with said signalling device (50) and associated to said breaker switch (62), said NAND gate (59) being adapt-

ed to control said relay (60) through said driver circuit (73) in response to comparison of a DC reference voltage at a constant level and of the DC voltage generated by said transducer (56) and respectively applied to said first (68) and second input (69).

6. Laundry drier according to claim 5, characterized in that it comprises a feedback circuit (76) of per se known type connected between the output (77) and the input (78) of said driver circuit (73).

Patentansprüche

1. Wäschetrockner, enthaltend ein Gebläse (12) und wenigstens ein Heizelement zum Erzeugen einer Heißluftströmung durch eine Leitung (13) in das Innere einer Trommel (9), die die zu trocknende Wäsche enthält und dazu eingerichtet ist, von einem Elektromotor (10) mit Hilfe eines Treibriemens (14) angetrieben zu werden, wobei der Treibriemen (14) durch wenigstens eine Spannrolle (16) unter Spannung gehalten wird, die in den Wäschetrockner montiert und dazu eingerichtet ist, von dem Treibriemen (14) in Drehung versetzt zu werden und im Falle eines Bruchs desselben nicht gedreht zu werden, wobei der Trockner weiterhin eine elektrische Schaltung enthält, die mit dem Gebläse (12), dem Heizelement, dem Motor (10), einer Programmsteuereinheit (29) zum Auswählen der Dauer und der Maximaltemperatur eines Trocknungszyklus verbunden ist, wobei die Programmsteuereinheit (29) mit einem elektrischen Unterbrecherschalter (27;62) verbunden ist, der durch die Spannrolle (26) betätigt wird, um den Motor (10) und das Heizelement ein- bzw. auszuschalten, wenn die Spannrolle (16) rotiert oder bzw. nicht ausreichend rotiert, **dadurch gekennzeichnet**, daß er eine Steuereinrichtung (28;59) enthält, die mit einer Signaleinrichtung (50) verbunden ist und dazu dient, diese aus- und einzuschalten, wenn der Motor (10) und das Heizelement (29) ein- bzw. ausgeschaltet sind.
2. Wäschetrockner nach Anspruch 1, bei dem die Spannrolle (16) mechanisch mit einem Satz radial auslenkbarer Fliehgewichte (23) gekoppelt ist, die mit dem elektrischen Unterbrecherschalter (27) zusammenwirken, **dadurch gekennzeichnet**, daß die Steuereinrichtung einen elektronischen Komparator (28) üblicher Bauart enthält, der mit dem Unterbrecherschalter (27) verbunden ist und einen ersten (36) und einen zweiten (37) Eingang aufweist, die mit einer Gleichbezugsspannung vorbestimm-

ten Pegels bzw. einer exponentiell ansteigenden Gleichspannung versorgt sind, und der einen Ausgang (51) aufweist, der mit der Signaleinrichtung (50) über eine Steuerstufe (52) üblicher Bauart verbunden ist, wobei der elektronische Komparator (28) dazu dient, die Signaleinrichtung (50) über die Steuerstufe (52) nur dann einzuschalten, wenn die exponentiell ansteigende Gleichspannung, die dem zweiten Eingang (37) zugeführt ist, über die Gleichbezugsspannung steigt, die dem ersten Eingang (36) zugeführt ist.

3. Wäschetrockner nach Anspruch 2, **dadurch gekennzeichnet**, daß der zweite Eingang (37) des Komparators (28) mit dem Elektromotor (10) und der Programmsteuereinheit (29) über eine logische Und-Schaltung (50), ein Zeitglied (41) üblicher Bauart zur Erzeugung der exponentiell ansteigenden Gleichspannung und einen Begrenzungstransistor (42) verbunden ist, und der zweite Eingang (37) zur Verbindung mit Masse (53) mittels des Unterbrecherschalters (27) eingerichtet ist.
4. Wäschetrockner nach Anspruch 3, **dadurch gekennzeichnet**, daß er eine Rückkopplungsschaltung (54) an sich bekannter Art aufweist, die zwischen den Ausgang (51) und den zweiten Eingang (37) des Komparators (28) geschaltet ist, um den zweiten Eingang (37) auf einem höheren Spannungspegel zu halten, als der erste Eingang (36), wenn eine Spannung an dem Ausgang (51) erscheint.
5. Wäschetrockner nach Anspruch 1, bei dem die Spannrolle (16) mechanisch mit einem Element (55) in Form eines Permanentmagneten, einer gefärbten Lamelle oder dergleichen gekoppelt ist, welches Element (55) einem Wandler (56) an sich bekannter Art zugeordnet ist, der dazu dient, eine entsprechende elektrische Spannung in Übereinstimmung mit der Drehgeschwindigkeit der Spannrolle (16) zu erzeugen, **dadurch gekennzeichnet**, daß die Steuereinrichtung eine elektronische Nand-Schaltung (59) üblicher Bauart enthält, die mit einem ersten (68) und einem zweiten (69) Eingang versehen ist, die mit dem Elektromotor (10) zusammen mit der Programmsteuereinheit (29) und mit dem Wandler (56) verbunden sind, und die einen Ausgang (72) aufweist, der über eine Treiberschaltung (73) mit einem Steuerrelais (60) verbunden ist, das der Signaleinrichtung (50) parallel geschaltet ist und dem Unterbrecherschalter (62) zugeordnet ist, wobei die Nand-Schaltung (59) dazu dient, das Relais (60) über die Treiberschaltung (73) in Abhän-

gigkeit von einem Vergleich einer Gleichbezugsspannung konstanten Pegels mit der Gleichspannung, die von dem Wandler (56) erzeugt wird und die im ersten (68) bzw. dem zweiten (69) Eingang zugeführt werden, zu steuern.

6. Wäschetrockner nach Anspruch 5, **dadurch gekennzeichnet**, daß er eine Rückkopplungsschaltung (76) an sich bekannter Art aufweist, die zwischen den Ausgang (77) und den Eingang (78) der Treiberschaltung (73) geschaltet ist.

Revendications

1. Sèche-linge comprenant une soufflante (12) et au moins un élément chauffant pour créer un courant d'air chaud par l'intermédiaire d'un conduit (13) jusqu'à l'intérieur d'un tambour (9) contenant le linge à sécher et adapté pour être entraîné en rotation par un moteur électrique (10) à l'aide d'une courroie de transmission (14), cette courroie (14) étant maintenue tendue par au moins un galet de tension (16) monté dans le sèche-linge et adapté pour être entraîné en rotation par la courroie de transmission (14) et pour ne pas tourner en cas de rupture de celle-ci, ce sèche-linge comprenant en outre un circuit électrique auquel sont raccordés la soufflante (12), l'élément chauffant, le moteur (10), un programmeur (29) prévu pour sélectionner la durée et la température maximale d'un cycle de séchage et raccordé à un rupteur électrique (27;62), qui est actionné par le galet de tension (16) de manière à exciter ou désexciter le moteur (10) et l'élément chauffant respectivement lorsque le galet de tension (16) tourne à une vitesse suffisante ou insuffisante, caractérisé en ce qu'il comporte des moyens de commande (28;59) raccordés à un dispositif de signalisation (50) et adaptés pour exciter et désexciter ce dispositif lorsque le moteur (10) et l'élément chauffant (9) sont respectivement désexcités et excités.
2. Sèche-linge selon la revendication 1, dans lequel le galet de tension (16) est mécaniquement couplé à un jeu de masselottes à écartement radial (23) coopérant avec ce rupteur électrique (27), caractérisé en ce que les moyens de commande comprennent un comparateur électronique (28) de type conventionnel raccordé au rupteur (27), et ayant une première entrée (36) et une deuxième entrée (37) respectivement alimentées par une tension de référence courant continu à une valeur prédéterminée et par une tension courant

continu augmentant exponentiellement, ainsi qu'une sortie (51) raccordée à ce dispositif de signalisation (50) par l'intermédiaire d'un étage pilote (52) de type conventionnel, ce comparateur électronique (28) étant adapté pour exciter le dispositif de signalisation (50) par l'intermédiaire de cet étage pilote (52) seulement lorsque la tension courant continu augmentant exponentiellement appliquée à la deuxième entrée (37) s'élève au-dessus de la tension de référence courant continu appliquée à la première entrée (36).

3. Sèche-linge selon la revendication 2, caractérisé en ce que la deuxième entrée (37) du comparateur (28) est raccordée au moteur électrique (10) et au programmeur (29) par l'intermédiaire d'une porte ET logique (40), d'un circuit à constante de temps (41) de type conventionnel adapté pour produire la tension continue augmentant exponentiellement et d'une résistance de limitation (42), cette deuxième entrée (37) étant adaptée pour être raccordée à la terre (43) au moyen du rupteur (27).
4. Sèche-linge selon la revendication 3, caractérisé en ce qu'il comprend un circuit de réaction (54) de type connu en soi monté entre la sortie (51) et la deuxième entrée (37) du comparateur (28), pour maintenir cette deuxième entrée (37) à une valeur de tension supérieure à celle de la première entrée (36) lorsqu'une tension apparaît à sa sortie (51).
5. Sèche-linge selon la revendication 1, dans lequel le galet de tension (16) est mécaniquement couplé à un élément (55) sous la forme d'un aimant permanent, d'une lamelle colorée ou analogue, lequel élément (55) est associé à un transducteur (56) de type connu en soi adapté pour produire une tension électrique correspondante en fonction de la vitesse de rotation du galet de tension (16), caractérisé en ce que les moyens de commande comportent une porte NON-ET électronique (59) de type conventionnel, ayant une première entrée (68) et une deuxième entrée (69) respectivement raccordées au moteur électrique (10) en même temps que le programmeur (29) et au transducteur (56), et une sortie (72) raccordée par l'intermédiaire d'un circuit pilote (73) à un relais de commande (60) raccordé en parallèle au dispositif de signalisation (50) et associé à ce rupteur (62), la porte NON-ET (59) étant adaptée pour commander le relais (60) par l'intermédiaire du circuit pilote (73) en réponse à la comparaison d'une tension de référence

courant continu à niveau constant et de la tension courant continu produite par le transducteur (56) et respectivement appliquée à la première entrée (68) et à la deuxième entrée (69).

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6. Sèche-linge selon la revendication 5, caractérisé en ce qu'il comporte un circuit de réaction (76) de type connu en soi monté entre la sortie (77) et l'entrée (78) du circuit pilote (73).

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FIG. 1

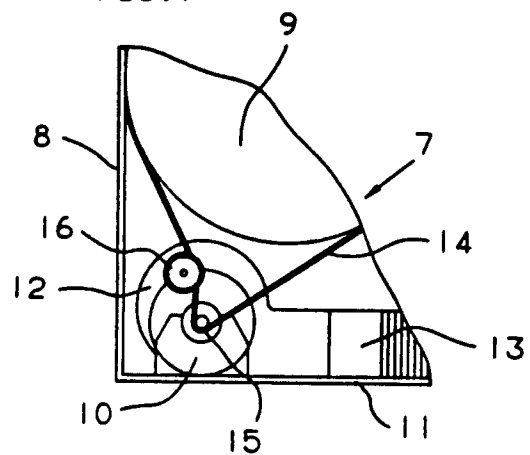


FIG. 2

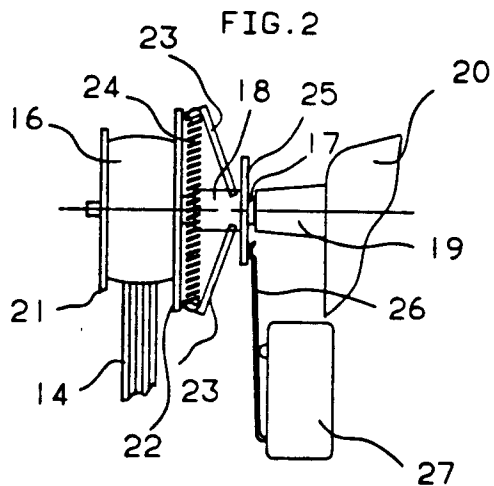


FIG. 3

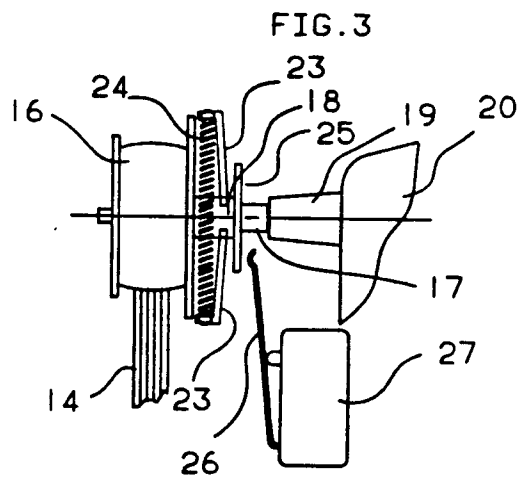


FIG. 4

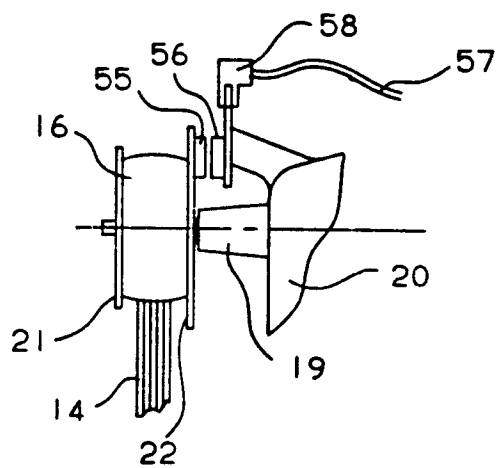


Fig 5

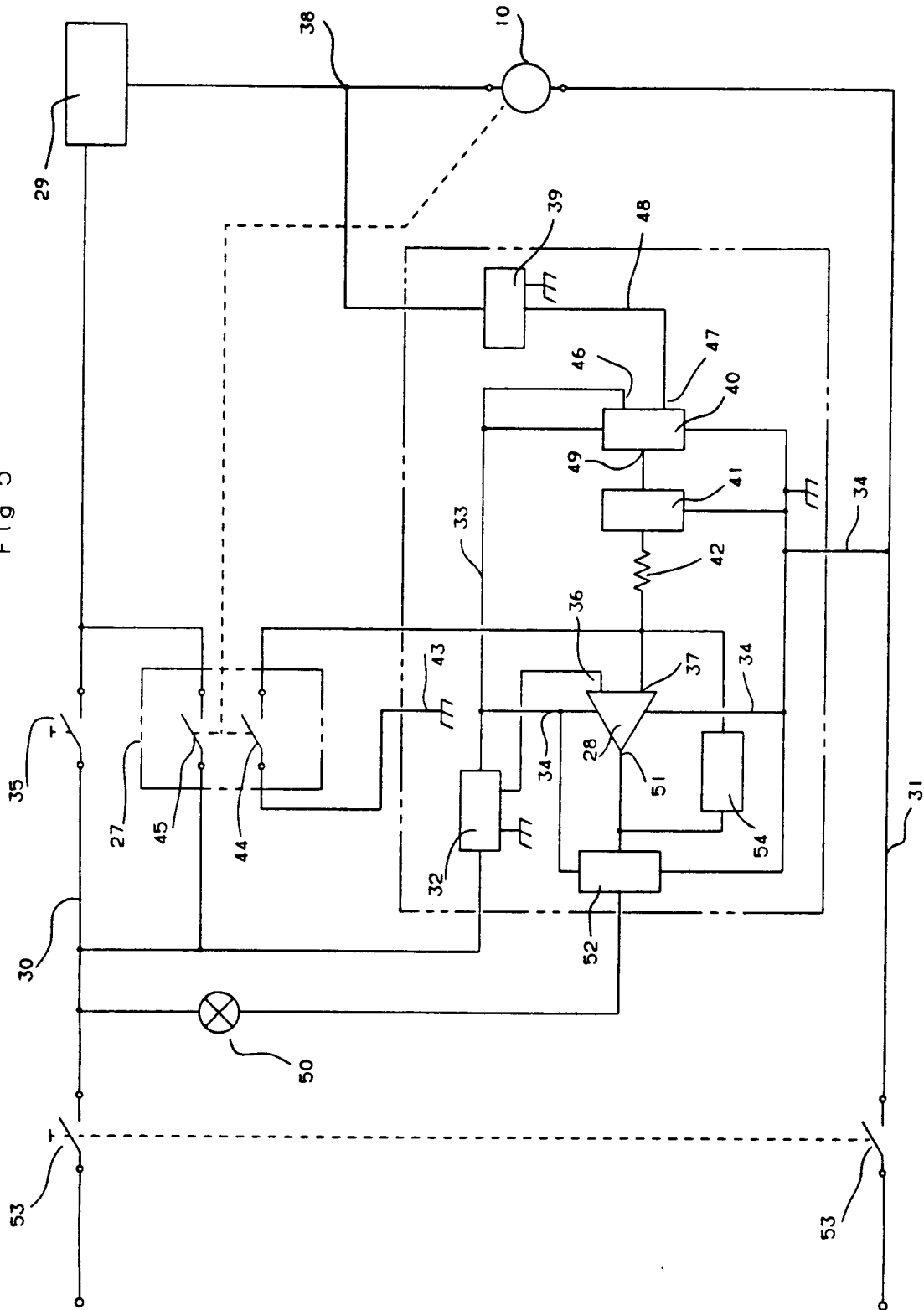


Fig 6

