

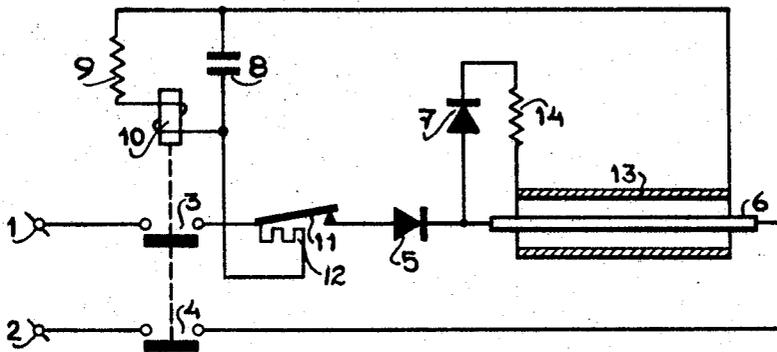
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SAFETY SYSTEM FOR AN ELECTRICALLY HEATED BLANKET

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1

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**SAFETY SYSTEM FOR AN ELECTRICALLY HEATED BLANKET**

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3 Claims

**ABSTRACT OF THE DISCLOSURE**

A heater cable is connected to a source of electrical supply through a first diode which connection includes the contacts of a safety relay. The safety relay is connected across the first diode through a second diode, dissimilar connections of the two diodes being connected to one another so that the second diode is effectively supplied with voltage from the supply source when the first diode is non-conducting and in this way sufficient voltage is supplied to the safety relay to maintain the coil thereof energized. If there is an interruption of the heater cable, voltage across the first diode disappears completely and further an interruption of conduction of the first diode of course will open the safety switch. Refinements on the system are made by including a safety sheath around the heating cable and including the safety sheath in the second diode and safety relay coil series circuit so that any short circuit between the safety sheath and the heater cable will likewise cause the safety relay to open as the second diode is short-circuited.

The invention relates to an electrically heated blanket with a heater cable which through the normally open contacts of a safety relay is connected to the supply source.

The safety relay serves for ensuring that the supply to the blanket is disconnected upon the occurrence of a fault which might cause a hazard to the user. Such a possible fault is an interruption of the heater cable, which could give rise to the occurrence of sparks and consequent incendiary risk.

The invention aims at providing a safety circuit which with simple means provides a perfect safeguarding of the blanket.

For that purpose, it is a feature of a blanket according to the invention that in series with the heater cable a first diode is connected, whilst the coil of the safety relay, which is bridged with a capacitor, is through a second diode connected across the first diode, dissimilar connections of the two diodes being connected to one another.

In normal operation, the first diode during alternate half-cycles of the supply alternating voltage passes current to the heater cable. During these half-cycles no appreciable voltage drop across the first diode occurs. During the other half-cycles of the supply alternating voltages, however, substantially the full mains voltage is present across the first diode, which voltage is rectified by the second diode and is supplied to the capacitor, whereby the relay coil is energized.

Due to the presence of the capacitor, this energization is also maintained during the half-cycles in which no appreciable voltage exists across the first diode. If, however, an interruption of the heater cable occurs, the voltage across the first diode disappears completely, so that the capacitor is no longer charged and the energization of the relay coil is terminated after a short time, so that the normally open contacts of the relay are opened and the supply voltage of the blanket is disconnected.

2

The invention is further elucidated below with reference to the drawing, which represents a circuit diagram of an embodiment of a blanket according to the invention.

The supply terminals 1 and 2 are through the normally open contacts 3 and 4 of the safety relay connected to a diode 5 in series with the heater cable 6. As long as the normally open contacts 3 and 4 are closed, the heater cable 6 is therefore supplied by alternate half-cycles of the supply voltage, i.e. those periods during which the supply terminal 1 is positive with respect to the supply terminal 2. During these half-cycles, the diodes 5 has only a very small effective resistance, so that no appreciable voltage drop occurs in this diode. During the other half-cycles, however, the diode 5 is non-conducting, so that it passes no appreciable current to the heater cable 6, whereby substantially the full supply voltage is present across the diode 5. This voltage is rectified by a second diode 7 and is supplied to a smoothing capacitor 8, to which the coil 10 of the safety relay is connected through a series resistor 9.

The relay is therefore energized, so that the normally open contacts 3 and 4 are kept closed. The capacitor 8 ensures that the relay remains also energized during the half-cycles in which no appreciable voltage is present across the diode 5.

For making it possible to switch the blanket on when it is put in use, it is sufficient to momentarily close the normally open contacts 3 and 4 by hand, after which they are kept closed by the relay coil 10, or the normally open contacts 3 and 4 can be bridged momentarily by means of a spring-biased starting switch.

If an interruption of the heater cable 6 occurs, no voltage can be generated across the diode 5, so that the safety relay becomes de-energized after a short time and the supply to the blanket is disconnected.

The automatic temperature control can be effected by incorporating a bimetal switch 11 with a heater winding 12 in series with the diode 5. The duty-cycle during which this switch is closed, is larger as the ambient temperature is lower, so that the mean heat delivered by the heater cable 6 is larger as the ambient temperature is lower, which is, what is really intended. For ensuring that energization of the coil 10 of the safety relay remains possible during the intervals in which the bimetal switch 11 is opened, the energization circuit of the relay coil 10 is connected across the diode 5 in series with the bimetal switch 11.

A dangerous situation might arise upon breakdown of the diode 5, since in that case the double power would be applied to the heater cable 6. However, in that case no appreciable voltage can be generated across the diode 5, so that the supply is disconnected by the normally open contacts 3 and 4 of the safety relay. An interruption of the diodes 5 can obviously not lead to a dangerous situation, since in that case the supply to the heater cable 6 is inherently disrupted.

For preventing that the user can enter into contact with the heater cable 6, which carries the full mains voltage, if the user should stick a pin into the blanket, this heater cable can advantageously be provided with a safety sheath 13 such as disclosed in my Patent 3,330,936. If a pin is stuck through the safety sheath 13 and touches the heater cable 6, this necessarily causes a short-circuit between the heater cable 6 and the safety sheath 13. The diode 7 is short-circuited thereby, so that energization of the relay coil becomes impossible and the supply is disconnected.

Although the safety sheath 13 is also connected to the supply voltage, touching this safety sheath cannot give rise to hazards since the circuit can be designed in such a way that touching this sheath also causes termination of the energization of the relay coil 10. For that purpose, a

3

resistor 14 is connected in series with the diode 7. In a practical embodiment, intended for a supply voltage of 220 v. and 50 c./s. the relay coil 10 has a resistance of 30 kilohms, the resistor 9 has a value of 100 kilohms and the resistor 14 has a value of 15 kilohms.

The capacitor 8 has a value of 68 nf. The circuit is completely safe with respect to an interruption of any of the components and a short-circuit of any component except the resistors. The safety with respect to a short-circuit of the heater cable 6 can be obtained by means of a fuse (not shown).

What I claim is:

1. A safety system for an electrically heated blanket comprising a heater cable, a safety relay having at least a normally open contact and an actuating coil a capacitor connected across said coil, an electrical supply source, a first diode connected in series with the heater cable and said contact to said supply source, thermostatic switch means connected in series with the heater cable, a second diode, a series connection of said coil and said second diode connected across the first diode, dissimilar terminals of the two diodes being connected to one another.

2. A safety system as in claim 1 including an electrically conductive safety sheath surrounding the heater cable,

4

said safety sheath connected in the series circuit including said second diode.

3. A safety system as in claim 2 wherein said safety sheath is connected to one terminal of the second diode through a resistor.

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