

[54] RESISTIVE THERMAL PROTECTIVE  
DEVICE FOR INDUCTANCES

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[58] Field of Search..... 317/14 R, 40 A, DIG. 6

[56] References Cited

UNITED STATES PATENTS

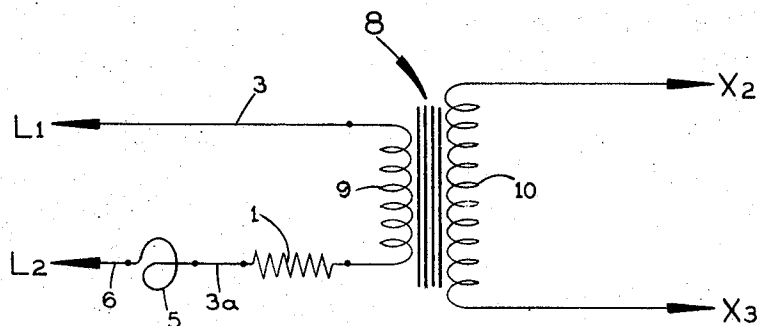
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Attorney, Agent, or Firm—Lloyd J. Andres

[57] ABSTRACT

A resistance device for connection in a power lead of an inductance such as electromagnets, choke coils and transformers. The device is intended to be positioned in close proximity to the inductance and consists of a resistor of predetermined value connected in series with a short eutectic wire having a predetermined melting point positioned in intimate contact with the resistor and terminating in one conductor running to the source of electric energy. When the inductance is overloaded the temperature of the resistor will rise to a predetermined degree and melt the eutectic wire and open the circuit to the inductance.

6 Claims, 4 Drawing Figures



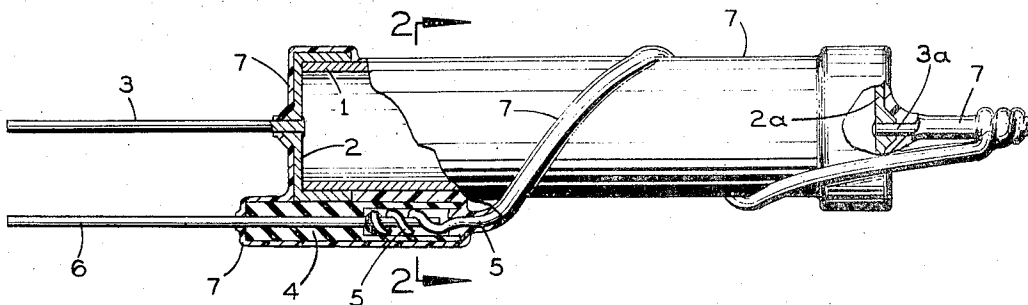


FIG. 1

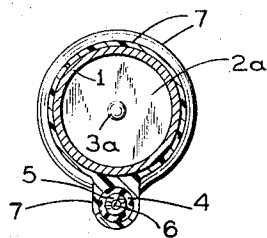


FIG. 2

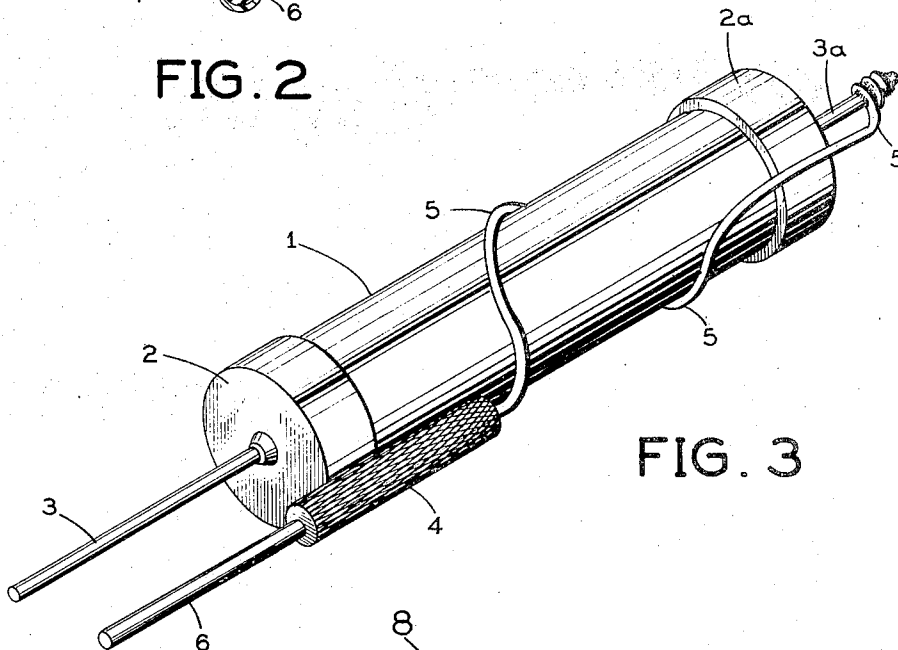


FIG. 3

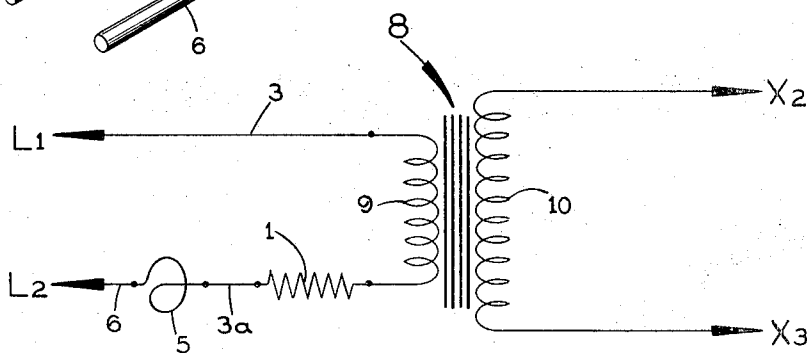


FIG. 4

## RESISTIVE THERMAL PROTECTIVE DEVICE FOR INDUCTANCES

Most inductive devices, such as small transformers, are protected by fuses or other circuit breaker means which are also in circuit with other elements and thus it is possible that a particular inductance or transformer not properly self protected against overloads may be damaged due to overloads protected by a common fuse or circuit breaker that did not respond to the overload.

The present invention involves a protective device applied to and in contact proximity with a particular inductance consisting of a resistor and a eutectic wire connected in series with one power lead of the inductance. When the resistor is subject to overload, the heat transfer to the eutectic wire is rapid and will melt and thus open the circuit and prevent damage to the inductance, the construction of which is the principal object of the invention.

A further object of the invention is the provision of a carbon film type tubular resistor of predetermined value having a eutectic wire wound thereon with the resistor and the eutectic wire connected in series with a power supply conductor connected to the inductance.

Another object of the invention is the provision of a protective unit for a small transformer, which when overloaded or short circuited because of the increased current therein will heat the resistor in a short period of time and melt the eutectic wire and protect not only the transformer but other elements responsive thereto.

A further object of the invention resides in the convenient placement of the device on the inductance for replacement of the eutectic element or the entire device when blown.

These and other objects and advantages in one embodiment of the invention are described and shown in the following specification and drawing, in which:

FIG. 1 is a side elevation in enlarged scale of the thermal resistance unit with a portion thereof broken away.

FIG. 2 is a cross sectional end elevation taken through section line 2—2, FIG. 1.

FIG. 3 is a perspective view of the unit shown in FIG. 1 prior to the dielectric covering.

FIG. 4 is a schematic circuit diagram of the unit shown in FIG. 1 connected in the primary circuit of a typical transformer.

Referring to FIGS. 1, 2, and 3, the latter shows a typical tubular carbon film resistor element 1 retained by and between like caps 2 and 2a with each of said caps having a like coaxial conductor 3a and 6 coaxially projecting therefrom respectively.

A eutectic wire 5 of predetermined diameter and length, such as well known solder having an alloy of 60% tin and 40% lead, is wound in one turn around the body of the resistor element 1. One terminal of the primary winding 9 of the transformer 8 is connected by conductor 3 and is for connection to a source of electric energy  $L_1$ . The remaining terminal of the primary winding 9 is connected to one terminal of the resistor element 1 and the remaining terminal of the resistor element 1 is connected to one terminal of the eutectic wire 5 and the remaining terminal of the eutectic wire is connected to conductor 6 for connection to the remaining source of power  $L_2$ .

The secondary winding 10 of transformer 8 is connected to a load  $X_2$  and  $X_3$ .

The particular arrangement of elements shown provides a compact device with the one turn end of the eutectic wire joined to conductor 6, covered with a heat resistant cloth tube 4 preferably made from fiberglass. It is apparent that the fiberglass tube may be replaced by a ceramic tube with equivalent results.

The entire assembly, as shown in FIG. 1, is covered with a heat shrinkable P.V.C. tubing 7 or equivalent insulation, as shown in FIG. 1. It is apparent that the entire body of the device may also be insulated by immersion in well known self curing liquid insulation material.

In operation and under the assumption that the assembly shown in FIG. 1 is positioned in contact with or removable relation to the transformer assembly 8, the normal load imposed by the secondary  $X_2$  and  $X_3$  will raise the temperature of the transformer a normal degree. However, any partial or complete short circuit of the transformer or in the output circuit thereof will raise the temperature of the eutectic wire 5 to its predetermined melting point. This occurs as a result of the higher current through resistor element 1 and a corresponding temperature rise thereto to a predetermined melting point of the eutectic wire, which melting will open the electric power circuit and protect the transfer from damage or burn-out.

It is obvious that other mechanical forms of resistors with a eutectic wire in contact thereof will serve the same purpose and not to exclude a miniature type threaded device which may be replaced without the use of tools.

It is to be noted that those skilled in this art are competent to provide proper resistance for the resistor element 1, as well as the physical characteristics of the eutectic wire in relation to the inductance with which it is used, since an overload current in a wide range of inductances will also vary and require matching characteristics with the resistance and the eutectic wire.

It is to be understood that certain modifications in construction are intended to come within the teachings and scope of the above specification.

Having described my invention, I claim:

1. A device for preventing damage or burn-out of an electric inductance means comprising a resistor of predetermined ohmic resistance and wattage having terminals at opposite ends thereof,

a first conductor connecting one terminal of said resistor connected to one terminal of said inductance means and the opposite end of said inductance means for connection to one side of a source of electric energy,

a eutectic wire of predetermined diameter and melting point with one end thereof connected to the remaining terminal of said resistor with the opposite end thereof connected to a second conductor for connection to the second side of said source of electric energy,

a heat resistant insulating sleeve positioned over said connection of said eutectic wire and said second conductor for insulating same from a said resistor terminal,

the entire resistor and eutectic wire and terminals and the heat resistant sleeve encased with a dielectric plastic material of substantially uniform thickness and positioned in contact with said inductance

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means whereby when said inductance is connected to a source of energy and a current above normal predetermined value is conducted through said inductance means the temperature of said resistor will raise to a predetermined degree sufficient to melt said eutectic wire and open the inductance circuit and prevent overload damage to said inductance.

2. The construction recited in claim 1 whereby said resistor is of the carbon film type having calibrated resistance.

3. The construction recited in claim 1 wherein the eutectic wire is an alloy of predetermined percentage of lead and tin and having a uniform predetermined diameter.

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4. The construction recited in claim 1 wherein said insulating sleeve is made of woven fiberglass tubing of predetermined diameter and length.

5. The construction recited in claim 1 wherein said insulating sleeve is made of heat resistant ceramic tubing of predetermined diameter and length.

6. The construction recited in claim 1 whereby the assembly of the said resistor and the eutectic wire and the heat resistant insulation sleeve are covered with a length of P.V.C. heat shrinkable tubing of predetermined diameter and length and shrunk to close fit over all the elements of the device when predetermined heat is applied to the tubing.

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