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(54) Electric power cable for fire and overload prevention

(57) An electric power cable, comprising means for the detection of an increase in its temperature above a predetermined point. Said cable comprises in combination a power lead (3) and at least one control lead (4) electrically insulated from each other by a low-melting insulating material (2) and enclosed in a common external insulation coating sheath (5) of the known type. The power lead (3) is embedded in a low-melting material (2) which insulates electrically the same from a control lead (4), the latter being coiled on the insulating material (2) so as to establish an electric contact with the power lead (3) when the insulating material (2) melts. As an alternative to the power lead (3) embedded in the low-melting insulating material (2) on which the control lead (4) is coiled, there is provided a power lead (3) surrounded by two or more control leads (4A, 4B, 4C) coated by insulating materials (2A, 2B, 2C), respectively, which melt at different temperatures, the highest of which can be borne by the power cable for its next operation.

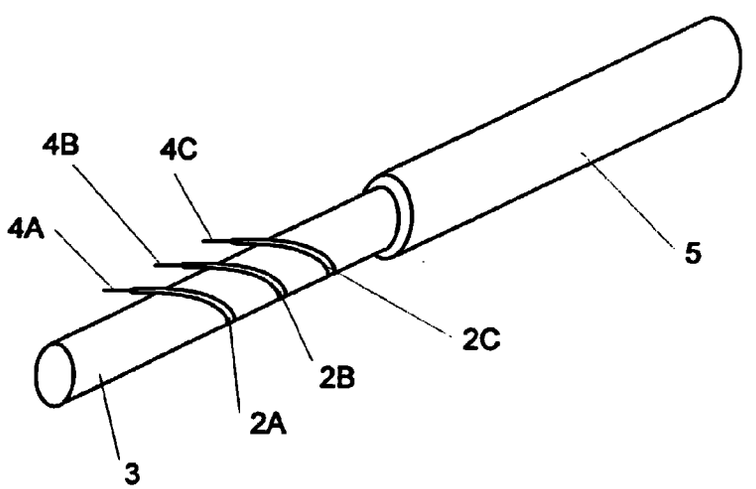

FIG. 3

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Description

[0001] The present invention relates to the safety of the installations and, more particularly, the fire prevention.

[0002] Thermosensitive cables capable of sensing the increase in the temperature of the room and/or the raceway in which they are laid are widely known.

Such cables, which cannot be used as power cables, are essentially formed of two leads electrically insulated from each other by a thermosensitive material which melts at a predetermined temperature and shorts said leads. In other words, such cables act as a switch which closes at a determined temperature, thereby causing an alarm signal to be generated and/or anti-fire devices to be controlled.

A first problem of such thermosensitive cables described above is that they are not able to determine whether the increase in temperature is due to an overload in a power cable or to other causes such as a fire.

A second problem of such thermosensitive cables in case of overload is that it is not possible to detect exactly what power cable is overloaded.

A third problem of the known cables is that the room in the raceways could not be enough to lay a further cable beside the power cables.

[0003] The present invention seeks to overcome the above-mentioned problems of the prior art by providing a power cable which is capable of sensing any increase in its temperature due to either overload or environmental causes.

According to the invention there is provided a cable comprising in combination: a power lead and a control lead insulated from each other by a low-melting insulating material and enclosed in a common external insulation coating.

[0004] A better understanding of the invention will ensue from the following detailed description with reference to the accompanying drawings which show by way of a not limiting example two preferred embodiments. In the drawings:

Fig. 1 shows a thermosensitive cable of the known type;

Fig. 2 shows a power cable according to the invention;

Fig. 3 shows a second embodiment of the power cable according to the invention.

[0005] With reference to Fig. 1 the known thermosensitive control cable has two leads 1 insulated from each other by a low-melting coating 2, the whole assembly being enclosed in a cable sheath.

When the temperature of the raceway and/or the environment including the control cable increases up to the melting point of the low-melting insulating material 2, the two leads 1 contact each other, thereby causing an electric signal to pass from one cable to the other so as to give to an external circuit the information of the high increase in the temperature of the cable.

It is self-evident that the increase in temperature may be caused by both a fire and an overload on one of the power cables enclosed in the raceway where the control cable is laid.

[0006] According to the present invention, however, there is provided a cable, shown in Fig. 2, provided with a power lead 3 embedded in a low-melting material 2 which insulates electrically the same from a control lead 4 coiled on the insulating material 2, the whole assembly being enclosed in an external sheath 5.

In case of overload of a power cable, it should be noted that the overheating will affect only such cable, while the other cables will be only initially subjected or not to a light heating.

In case of fire, however, the whole raceway will be heated so that more than one cable will reach the melting temperature of their own low-melting insulating material 2.

In other words, in case of overload, only one cable will be overheated, while in case of fire several cables will be shorted at the same time, thereby determining what kind of assistance is to be given. The advantages and the possible applications of the invention are substantially stronger than those of the prior art.

In case of fire, the control station will receive at the same time several signals of electric contact between power leads 3 and control lead 4 relative to the same raceway or a group of cables. It is then possible to establish what is the cause of the overheating.

In case of overload, however, the electric contact signals between power cables 3 and control cables 4 will come only from the cable(s) under such irregular operation condition. It is then possible to decide whether the overloaded cable should be de-energized or one or more loads connected thereto should be disconnected.

The possibility of knowing exactly what power cables are overloaded is particularly important for controlling the electrical installations as well as for preventing fire and/or the melting of the cables. Advantageously it is also possible to automatically control such operations so as to check continuously the operative conditions of the installations.

With regard to this, it should be appreciated that the control lead can be connected to a "release" device, such as a relay, which disconnects the power lead 3 whenever the latter contacts the control lead 4. In this case, the electric current flowing in the power lead 3 also supplies such relay through the control lead 4 when the latter contacts the power lead 3.

The electric current flowing in such control lead 4 can also activate an even remote acoustic and/or visual alarm as well as send a signal to a control exchange which records all useful data such as time and day as well as the conditions of all of the controlled cables, etc.

Furthermore, while the control leads of the prior art cannot be used any longer after the overheating, a second embodiment of the invention, shown in Fig. 3, consists of a power cable provided with a power lead 3 surrounded by two or more control leads 4A, 4B, 4C coated by insulating materials 2A, 2B, 2C, respectively. Such insulating materials melt at different temperatures, the highest of which can be borne by the power cable for its next operation.

After the first overload which is detected by the electric contact between power lead 3 and control lead 4 due to the melting of the insulating material 2A having the lowest melting point, it is possible to make use of the power cable again after having removed the cause of the overload and having insulated or disconnected the control lead 4A, the insulating material 2A of which has melted. The next increase in temperature will be detected by the melting of the insulating material 2B of the control lead 4B having a melting point slightly higher than that of the previously melted insulating material 2A. This event is very significant since the power cable may be used several times without the need of replacing it after each overload detection, thereby saving time and money and controlling continuously the operation of the cable.

The power cable according to the invention further allows separate, additional cables (control cables) to be avoided, thus reducing the "crowding" of the raceways. It is evident that the power lead 3 has a section greater than that of any control lead 4, 4A, 4B, 4C.

In the preferred embodiments each control lead 4, 4A, 4B, 4C is coiled on the power lead 3 so that the melting of the coating of each control lead causes the electric contact between the latter and the power lead itself.

The present invention has been described and illustrated according to preferred embodiments thereof, however, it should be understood that those skilled in the art can make modifications and/or equivalent replacements without departing from the scope of the present industrial invention.

Claims

1. An electric power cable, comprising means for the detection of an increase in its temperature above a predetermined point.

2. The electric power cable of claim 1, comprising in combination a power lead (3) and at least one control lead (4) electrically insulated from each other by a low-melting insulating material (2) and enclosed in a common external insulation coating sheath (5).

3. The electric power cable of the preceding claims, wherein the power lead (3) is embedded in a low-melting material (2) which insulates electrically the same from a control lead (4), the latter being coiled on the insulating material (2) so as to establish an electric contact with the power lead (3) when the insulating material (2) melts.

4. The electric power cable of the preceding claims, wherein the control lead (4) is connected to a "release" device, such as a relay, which disconnects the power lead (3) whenever the melting of the insulating material (2) causes power lead (3) and control lead (4) to contact each other.

5. The electric power cable of the preceding claims, wherein the electric current flowing in the power lead (3) also supplies said "release" device through the control lead (4) when the latter contacts the power lead (3).

6. The electric power cable of the preceding claims, wherein the electric current flowing in such control lead (4) activates an acoustic and/or visual alarm.

7. The electric power cable of the preceding claims, wherein the signal flowing in the control lead (4) is fed to a control exchange which records all useful data such as time and day as well as the conditions of all of the controlled cables, etc.

8. The electric power cable of the preceding claims, wherein as an alternative to the power lead (3) embedded in the low-melting insulating material (2) on which the control lead (4) is coiled, there is provided a power lead (3) surrounded by two or more control leads (4A, 4B, 4C) coated by insulating materials (2A, 2B, 2C), respectively, which melt at different temperatures, the highest of which can be borne by the power cable for its next operation.

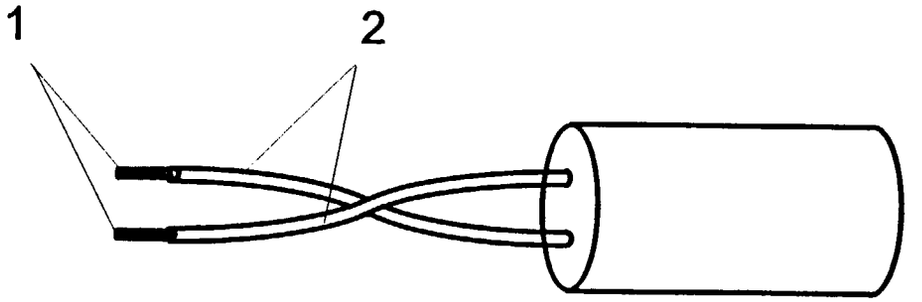
9. The electric power cable of the preceding claims, wherein the power cable may be used again after the first overload which has melt the insulating material (2A) having the lowest melting point by disconnecting the control lead (4A) and removing the cause of the overload, the next increase in temperature being detected by the melting of the insulating material (2B) of the control lead (4B) having a melting point slightly higher than that of the previously melted insulating material (2A).

10. The electric power cable of the preceding claims, wherein there are provided several control leads electrically insulated from the power lead (3) by several low-melting materials having different melting points in order to allow the power cable to be used again after following overloads.

11. The electric power cable of the preceding claims, wherein, because of the suppression of separate control cables beside the necessary power cables, the number of cables within the raceway is reduced.

12. The electric power cable of the preceding claims, wherein the diameter of the power lead (3) is greater than those of the control leads (4, 4A, 4B, 4C).

13. The electric power cable of the preceding claims, wherein each control lead (4, 4A, 4B, 4C) is coiled on the power lead (3).



TECNICA NOTA

FIG. 1

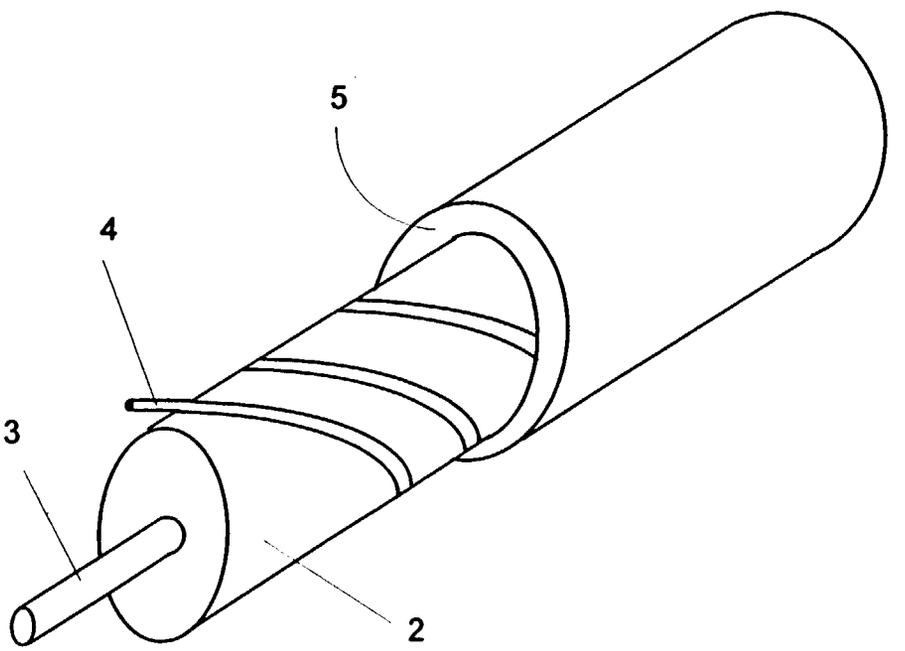


FIG. 2

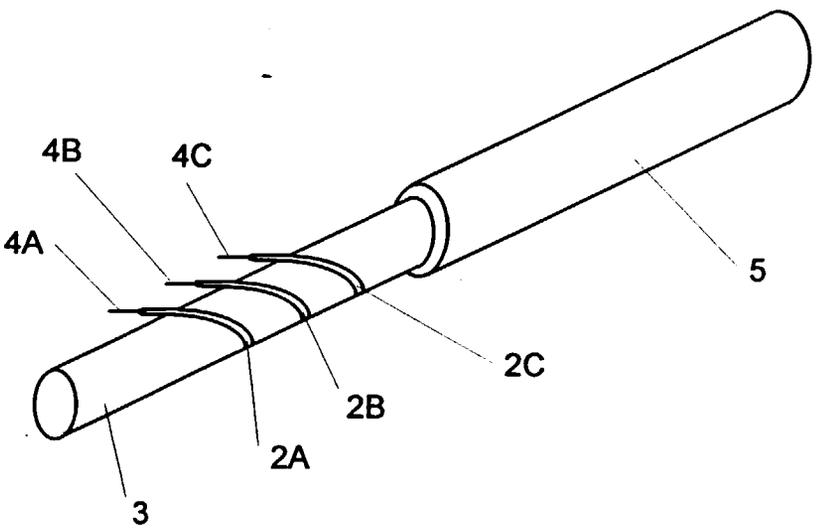


FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 83 0409

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.6)
X	US 5 633 775 A (SCARELLI) * column 1, line 61 - column 4, line 8; figures 2-4 *	1,2,6	H01B7/32
X	US 3 375 477 A (TOSHINOBU KAWAZOE) * column 2, line 24 - column 4, line 73; figures 1-18 *	1-4,12, 13	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 December 1997	Demolder, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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