Aug. 15, 1950 F. W. JACKSON 2,518,789

HEAT RESPONSIVE CABLE

Filed Sept. 9, 1948

Fig. 1.

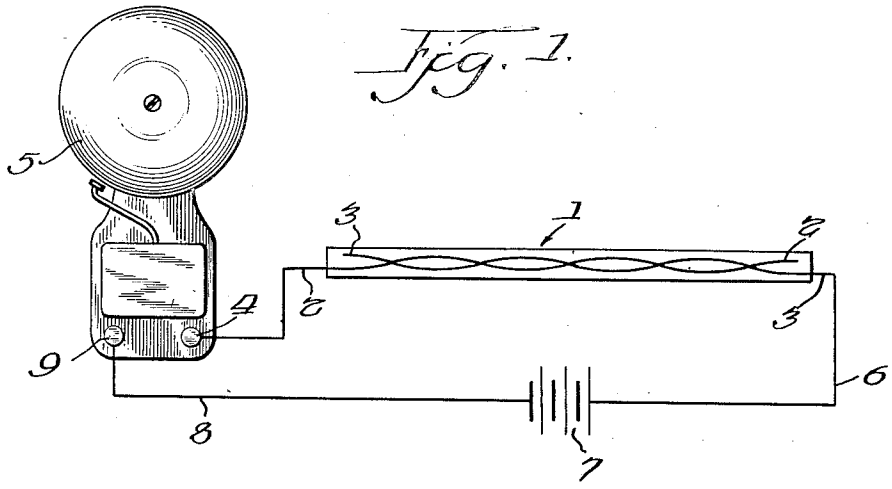
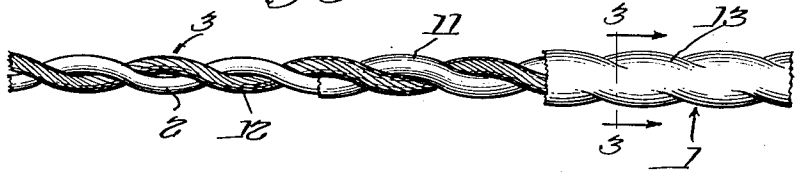


Fig. 2.



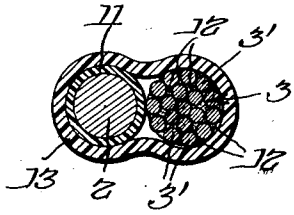


Fig. 3.

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Patented Aug. 15, 1950

2,518,789

UNITED STATES PATENT OFFICE

2,518,789

HEAT RESPONSIVE CABLE

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Application September 9, 1948, Serial No. 48,497

5 Claims. (Cl. 200—143)

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The invention relates generally to electrical cables and more particularly to a heat responsive cable for actuating fire alarm circuits, sprinkler circuits and the like.

The present invention has among its objects, the production of a heat responsive cable in which standard types of wire conductors may be employed in the manufacture thereof, so that the same is relatively inexpensive to manufacture and is very efficient in operation.

Another object of the invention is the production of such a cable in which the number and size of the elements are reduced to a minimum and a substantially uniform cable is produced.

A further object of the invention is the production of such a cable utilizing a fusible electrically conducting material wherein a maximum amount of such material may be employed without increasing the size of the cable and insuring efficient operation of the cable upon the application of heat thereto.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawing, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a diagrammatic view of a simple alarm system utilizing the present invention;

Fig. 2 is a plan view of a cable embodying the present invention with portions of the insulation and other elements broken away to disclose the construction thereof; and

Fig. 3 is a sectional view through the cable illustrated in Fig. 2 taken approximately on the line 3—3 of Fig. 2.

The present invention contemplates the use of two conductors of copper or other suitable material which is relatively flexible, the conductors being electrically insulated from one another by suitable insulating material which is responsive to the application of heat, whereby the insulation will break down, in combination with a fusible electrically conducting material such as solder or the like. Thus, upon the application of heat to the cable, the insulation will break down and the electrically conducting material will fuse to provide a direct electrical connection between the two conductors at the point of the insulation breakdown.

Referring to Fig. 1, 1 indicates generally a section of cable embodying the present invention having two conductors 2 and 3 therein, the conductor 2 for illustrative purposes being connected to one side 4 of an alarm bell 5 or the like, and the conductor 3 operatively connected by a conductor 6 to one side of a battery 7, the opposite side of the battery being connected by a conductor 8 to the other side 9 of the alarm bell 5. Thus, as the conductors 2 and 3 are normally insulated from one another, the bell circuit may be open but upon application of heat to the cable and an electrical connection made between the conductors 2 and 3 thereof, the circuit will be closed to actuate the bell 5. Obviously, the cable illustrated may be used in various circuit applications.

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As illustrated in Figs. 2 and 3, the conductors 2 and 3 of the cable 1 may be twisted together, in which case either one or both may be twisted relative to the other. The solid conductor 2 is provided with a coating of insulation 11, which may be of any suitable electrically nonconducting material having the desired heat characteristics, of which there are numerous types including rubber, cellulose, etc. I have found that cellulose compositions, as for example, ethyl cellulose lacquer is suitable for the purpose, and is coated upon the wire in a sufficient thickness to provide the desired insulation. The conductor 3, as illustrated in Fig. 3, is of the stranded type made up of a plurality of strands 3' and is impregnated by dipping or the like, with a fusible metal solder 12 to form in effect a composite solid conductor, the two conductors 2 and 3 being covered, if desired, by a suitable woven sheath 13.

The coating of insulation 11, on the conductor 2, and the fusible metal 12, on the conductor 3, are both so selected that their heat responsive characteristics are approximately the same whereby the insulation material will break down and expose the conductor 2 at substantially the same temperature that the conducting material 12 will fuse and flow between the two conductors, thus electrically connecting the same and closing the alarm or other circuit. Thus, by proper selection of these materials, cables of various critical heat responsive characteristics may be obtained, whereby the circuits may be closed, for example, at 160° to 212°, etc. It will be noted that while the electrical connection between the two conductors may be by contact, a direct connection is made by the flowing of the fusible metal between the two conductors, consequently, such connection is not dependent upon inherent resiliency of the conductors.

While the cable will function very satisfactorily without an additional sheath 13 enclosing the two conductors, I prefer to employ the sheath 13, making the same from a suitable material having greater heat resistance than the insulating material 11, or the conducting material 12, so that the sheath will withstand higher temperatures than that required for breaking down of the insulating material and fusing of the conducting material, whereby the sheath will securely hold the conductors in position as well as forming a receptacle for the fused conducting material, and retain the same adjacent the two conductors and maintain the electrical connection therebetween.

It will be apparent that the interstices between the twisted strands 3' forming the conductor 3 will retain a considerable amount of solder, whereby a stranded conductor carrying the fusible material will carry several times the amount of solder that could be applied to the surface of a solid conductor such as the conductor 2, and assuming that the conductors 2 and 3 are of approximately equal current capacity, the stranded conductor 3 will be slightly larger in overall diameter than the conductor 2. Thus, referring to Fig. 3, it will be noted that the overall diameter of the conductor 2, and coating of insulation 11 is approximately equal to the overall diameter of the stranded conductor 3, whereby the finished cable will be substantially uniform in construction and easily bent as desired.

It will also be noted that the present invention embodies only three separate elements, namely, the conductor 2 and its coating of insulation, the conductor 3 carrying the fusible material, and the sheath 13. Similarly, as standard electrical wire may be employed for both of the conductors, a substantially standard sized cable may be produced employing standard machinery and equipment in the fabrication thereof.

I am aware that there have been in the past, numerous cables employing a pair of conductors in combination with a fusible material, and an insulation material normally separating the two conductors. However, all of these cables have generally contemplated the use of concentric conductors, with both the insulation and fusible material concentrically arranged therebetween, or embodying separate fusible strips in conjunction with two insulated conductors. Obviously, such types of cables must be manufactured on special machines and special techniques employed to apply the fusible material and the insulation material to the same conductor particularly if the fusible and insulation materials have similar breakdown temperatures. In contrast to this, is the present construction wherein the insulation material may be readily applied to the solid conductor and the fusible material readily applied to the stranded conductor by simple methods after which the conductors may be twisted and the sheath applied with standard equipment for performing these operations.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a heat responsive cable, the combination of a pair of relatively soft, pliable conductors, at least one of said conductors being twisted around the other, one of said conductors being composed of a plurality of twisted strands and having a fusible electrical conducting material filling the interstices between such strands to form a substantially cylindrical, solid conductor, a coating of insulation on the other conductor electrically insulating the latter from said stranded conductor, said insulation being formed of a material which will break down in response to heat, to permit said fusible conducting material to flow between the conductors and electrically connect the same, and a sheath enclosing said conductors formed from a material requiring greater temperatures for breakdown than said insulation or fusible conducting material.

2. In a heat responsive cable, the combination of a pair of relatively soft, pliable conductors, one of said conductors being composed of a plurality of twisted strands and having a fusible electrical conducting material filling the interstices between such strands to form a substantially cylindrical, solid conductor, and a coating of insulation on the other conductor electrically insulating the latter from said stranded conductor, said insulation being formed of a material which will break down in response to heat, to permit said fusible conducting material to flow between the conductors and electrically connect the same.

3. In a heat responsive cable, the combination of a pair of relatively soft, pliable conductors, at least one of said conductors being twisted around the other, one of said conductors being composed of a plurality of twisted strands and having a fusible electrical conducting material filling the interstices between such strands to form a substantially cylindrical, solid conductor, and a coating of insulation on the other conductor electrically insulating the latter from said stranded conductor, said insulation being formed of a material which will break down in response to heat, to permit said fusible conducting material to flow between the conductors and electrically connect the same.

4. In a heat responsive cable, the combination of a pair of relatively soft, pliable conductors, at least one of said conductors being twisted around the other, one of said conductors being composed of a plurality of twisted strands and having a fusible electrical conducting material filling the interstices between such strands to form a substantially cylindrical, solid conductor, a relatively thin coating of insulation on the other conductor electrically insulating the latter from said stranded conductor, the over-all diameter of the insulated conductor being approximately equal to the diameter of the solid conductor formed by said strands and fusible material, said insulation being formed of a material which will break down in response to heat, to permit said fusible conducting material to flow between the conductors and electrically connect the same, and a sheath enclosing said conductors formed from a material requiring greater temperatures for breakdown than said insulation or fusible conducting material.

5. In a heat responsive cable, the combination of a pair of relatively soft, pliable conductors of approximately equal current capacity, at least one of said conductors twisted around the other, one of said conductors being composed of a plurality of twisted strands and having a fusible electrical conducting material filling the interstices between such strands to form a substan-

tially cylindrical, solid conductor, the other conductor being solid and having a coating of insulation thereon electrically insulating such solid conductor from said stranded conductor, the over-all diameter of the insulated conductor being approximately equal to the diameter of the solid conductor formed by said strands and fusible material, said insulation being formed of a material which will break down in response to heat, to permit said fusible conducting material to flow between the conductors and electrically connect the same, and a sheath enclosing said conductors formed from a material requiring

greater temperatures for breakdown than said insulation or fusible conducting material.

FRANK W. JACKSON.

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