March 10, 1942. W. J. TURENNE 2,275,873

FIRE DETECTOR CABLE

Filed April 19, 1941

Fig. 1.

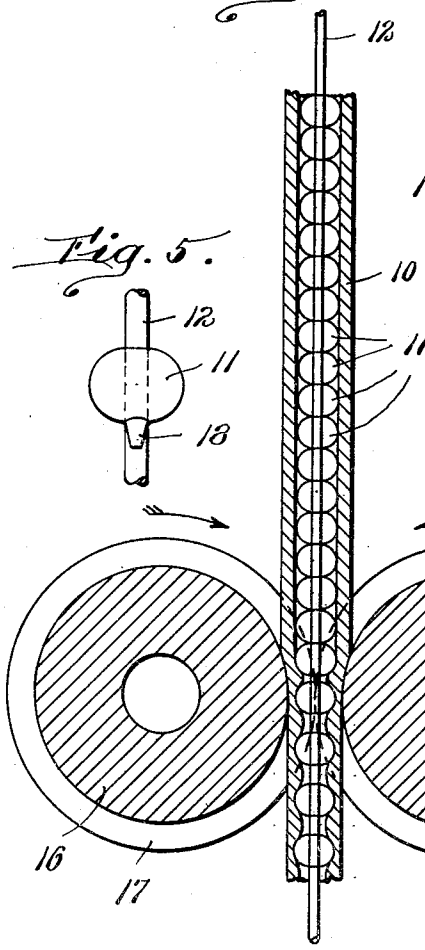


Fig. 4.

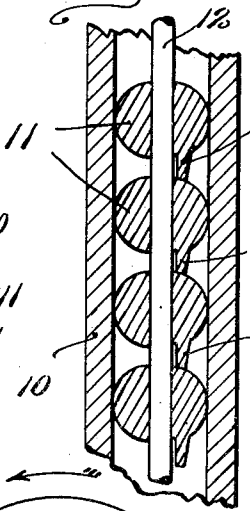


Fig. 5.

Fig. 2.

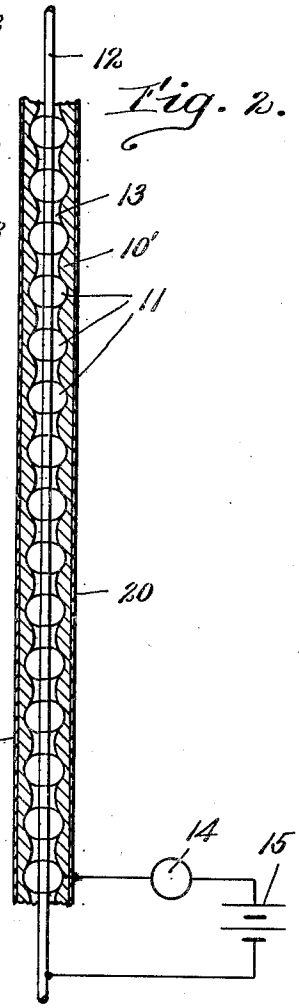
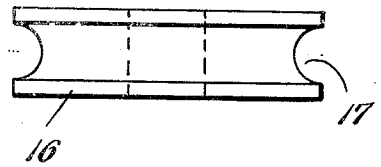


Fig. 3.



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UNITED STATES PATENT OFFICE

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FIRE DETECTOR CABLE

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Application April 19, 1941, Serial No. 389,399

11 Claims. (Cl. 200—143)

This invention relates to a fire detector cable whereby a circuit may be closed when an undue rise in temperature at any point in the protected area causes the fusion of one of two concentric electrically conductive members and hence brings such members into electrical contact, and to a method of making the same.

The object of the invention is to provide a fire detector cable that may be manufactured economically, that will have high sensitivity to a rise in temperature, that may be subjected for an indefinite period without deterioration to temperatures that would destroy a detector cable including in its construction insulating material of organic matter, and that will be immune to injury by vibration of the most excessive character.

In the preferred form of my invention, a tube of easily fusible material encloses a conductor formed of a metal having a relatively high point of fusion, such as copper, on which are placed spaced insulating elements which are maintained in position by any suitable means whereby air spaces are provided between the tube and the conductor and each pair of insulating elements, into which space the molten metal of the tube will flow when the temperature of the air surrounding the tube, or the temperature of the object against which it is placed, exceeds the fusion point thereof. Any suitable detecting device may be connected electrically to the tube and conductor enclosed therein, preferably to the respective ends thereof.

In the drawing accompanying and forming a part of this specification,

Figure 1 is a longitudinal central section, somewhat diagrammatic in nature, representing one way in which my improved fire detector cable may be made.

Fig. 2 is a longitudinal section of a fire detector cable embodying my invention.

Fig. 3 is an end view of one of the grooved rolls shown in Fig. 1.

Fig. 4 is a longitudinal central section on an enlarged scale of a modification.

Fig. 5 is a plan view of the insulating bead shown in Fig. 4.

In the particular drawing selected for more fully disclosing the principle of my invention, 10 is a cylindrical conductor of easily fusible metal or alloy of any suitable character enclosing a number of longitudinally spaced insulating elements 11, which may be beads formed of glass or any other suitable material, said elements being apertured and the conductor 12 of copper or other suitable material passing through the apertures therein.

While any suitable means may be employed for maintaining the spacing of the beads, I prefer, as illustrated, to have the same partially imbedded in the inner wall of the tube 10.

Whatever may be the means used for maintaining the longitudinal spacing of the beads, there will be an air space 13 between each pair of beads, the interior wall of the tube and said conductor, which space will be filled, or partially filled, with the metal of the tube when a portion of the latter is melted by a sufficient rise in temperature in the vicinity thereof, and thereby a circuit, including said tube, conductor, indicating device 14 and electrical source 15 will be closed.

Although suitable for general fire detecting use, my invention is particularly applicable to use in aeroplanes, and in such case, the cable may be located on the outer edge of the fire wall behind the engine. In such location, the cable will be subject to a relatively high air pressure caused by the travel of the plane at high speed, and as such air pressure would be likely to blow the molten metal of the tube away from the inner conductor without making electrical contact therewith, I have found it desirable to provide the outer wall of the tube with a thin plating 20 of a metal having a fusion point higher than that of the metal or alloy of the tube, such, for example, as nickel. It has been found that a layer of nickel not more than .003" will suffice for this purpose.

While it is highly desirable that the outside conductor 10 be made of fusible metal, from the viewpoint of extreme sensitivity to undesirable and dangerous temperature increases, it is nevertheless feasible to make the inner conductor 12 of a metal or an alloy having a relatively low point of fusion, and the outside conductor of a metal having a relatively high fusion point.

It will be manifest that continuous fire detectors are highly advantageous, as compared to thermo switches, thermocouples, and the like, which are local in their action, for a detector of the continuous type, such as described herein, would indicate a small fire at any point in the area in which the cable is placed.

A convenient and efficient way of making my improved fire detector, consists in stringing a number of apertured elements, such as the glass beads 11, on the central conductor 12 and then enclosing such string within a metallic tube 10, the inner diameter of which is substantially equal to, or preferably slightly larger than, that of said beads, as shown in Fig. 1. The diameter of the tube is then reduced by passing the tube through grooved drawing rolls 16, the groove 17 of which has, of course, a diameter somewhat smaller than that of said tube, so that after the tube passes through the rolls, the diameter will be that of the tube 10', for example, shown in Fig. 2.

The drawing operation causes the beads to spread longitudinally each from the other, so that between each pair of beads there will be an air space 13, heretofore referred to. At the same

time, the peripheral portions of the beads contiguous to the inner walls of the tube will be partially imbedded therein and the longitudinal spacing of the beads will be maintained.

The spreading of the beads, if effected in the manner above described, will be facilitated by providing means for giving them an initial separation, for example, by forming each bead with a projection, such as shown at 18 (Figs. 4 and 5), extending in the general direction of central aperture therein. Where beads of such form are used, the reduction of the diameter of the tube in the manner herein described will result in the further spreading of the beads from one another longitudinally and in partially imbedding them in the inner wall of the tube. Alternatively, by means of the projections 18, the desired spacing and separation of the beads, or other insulating elements, may be effected and maintained without drawing down the tube after the string of initially spaced insulating elements has been placed therein.

It is to be understood that my invention and method are not to be confined to the illustrative embodiments herein shown and described, for both are subject to a wide range of variation within the purview of the appended claims.

I claim:

1. As an article of manufacture, a tube of fusible metal, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

2. As an article of manufacture, a tube of fusible metal, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube and partially imbedded within the inner wall thereof, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

3. As an article of manufacture, a tube of fusible metal, a plurality of longitudinally spaced apertured beads of insulating material enclosed within said tube and disposed substantially coaxially therewith and a metallic conductor passing through the apertures in said beads and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said beads.

4. As an article of manufacture, a tube of metal having a relatively low point of fusion, the outer wall of which is plated with a thin layer of a metal having a fusion point higher than that of the metal of said tube, a plurality of longitudinally spaced apertured insulating elements enclosed within said tube, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

5. As an article of manufacture, a metallic tube, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube and partially imbedded within the inner wall thereof, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated by said elements from said tube and having a point of fusion substantially different therefrom.

6. As an article of manufacture, a metallic tube, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube, a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, and means for maintaining the spacing of said insulating elements longitudinally of said conductor, said conductor being electrically insulated by said elements from said tube and having a point of fusion substantially different therefrom.

7. As an article of manufacture, a tube of fusible metal, a plurality of apertured elements of insulating material enclosed within said tube, each provided with a projecting portion extending in the direction of the aperture therein and contacting one of the elements next adjacent thereto, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

8. As an article of manufacture, a tube of fusible metal, the outer wall of which is plated with a thin layer of a metal having a fusion point higher than that of the metal of said tube, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

9. As an article of manufacture, a tube of fusible metal, the outer wall of which is plated with a thin layer of a metal having a fusion point higher than that of the metal of said tube, a plurality of longitudinally spaced apertured elements of insulating material enclosed within said tube and partially imbedded within the inner wall thereof, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

10. As an article of manufacture, a tube of fusible metal, the outer wall of which is plated with a thin layer of a metal having a fusion point higher than that of the metal of said tube, a plurality of longitudinally spaced apertured beads of insulating material enclosed within said tube and disposed substantially coaxially therewith and a metallic conductor passing through the apertures in said beads and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said beads.

11. As an article of manufacture, a tube of fusible metal, the outer wall of which is plated with a thin layer of a metal having a fusion point higher than that of the metal of said tube, a plurality of apertured elements of insulating material enclosed within said tube, each provided with a projecting portion extending in the direction of the aperture therein and contacting one of the elements next adjacent thereto, and a metallic conductor passing through the apertures in said elements and extending throughout the length of said tube, said conductor being electrically insulated from said tube by said elements.

WILFRED J. TURENNE.