Sept. 4, 1951 E. A. JOERREN 2,566,335

HEAT OR FLAME DETECTING ELEMENT AND ASSEMBLY

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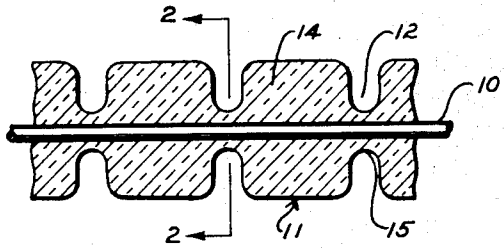


Fig. 1.

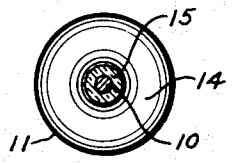


Fig. 2.

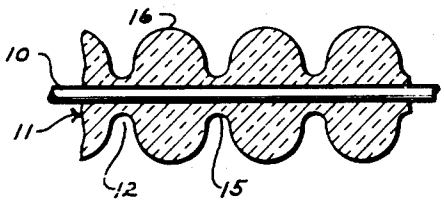


Fig. 3.

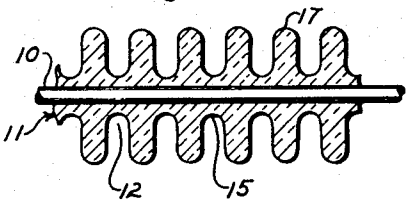


Fig. 4.

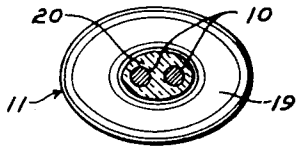


Fig. 5.

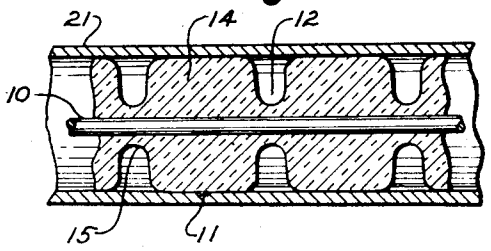


Fig. 6.

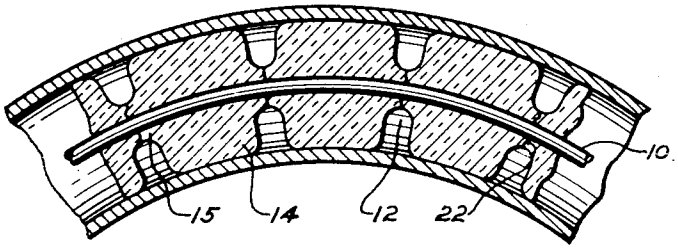


Fig. 7.

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HEAT OR FLAME DETECTING ELEMENT AND ASSEMBLY

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7 Claims. (Cl. 201—63)

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The present invention relates to negative temperature coefficient of resistivity type heat or flame detecting elements, and, more particularly, to improvements in such elements and assemblies embodying the element, wherein a plurality of bead-like sections surround one or more wires and act as insulators at normal temperatures but become conductive at abnormally high temperatures.

Accordingly, an object of the present invention is to provide an element of the foregoing type which is relatively rigid to facilitate insertion into a tube but facilitates bending of the tube when assembled therein.

Another object is to provide such an element which has bead-like sections of substantially uniform size and shape.

Another object is to provide such an element which is adapted to withstand high temperatures.

A further object is to provide such an element which is economical to manufacture.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the invention, the foregoing objects are accomplished by providing an element for use in a heat or flame detecting cable comprising at least one wire, and a continuous mass of material surrounding the wire which acts as an insulator at normal temperatures and is rendered electrically conductive at abnormally high temperatures. The mass has a plurality of longitudinally spaced, peripheral, inwardly extending recesses or grooves which divides the mass into bead-like sections and provides a portion at each groove connecting adjacent sections. The material of which the mass is formed preferably is of the ceramic-type whereby the element can withstand high temperatures. The mass thus provides a substantially rigid structure which facilitates insertion of the element into a tube, and provides for fracture of the connecting portions upon bending of the element and tube assembly.

In the drawing:

Figure 1 is a fragmentary longitudinal sectional view of an element embodying the present invention.

Figure 2 is a sectional view taken along the line 2—2 on Figure 1.

Figure 3 is a fragmentary longitudinal sectional view of another form of element.

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Figure 4 is a fragmentary longitudinal sectional view of still another form of element.

Figure 5 is a transverse sectional view illustrating a modification of the present invention.

Figure 6 is a fragmentary longitudinal sectional view illustrating an element inserted in a tube.

Figure 7 is a view similar to Figure 6 illustrating the tube and element assembly after bending thereof.

Referring to the drawing in detail and more particularly to Figures 1 and 2 thereof, there is shown a heat or flame detecting element comprising a wire 10 of indefinite continuous length which serves as an electrical conductor, and a mass 11 of material surrounding the wire which acts as an insulator at normal temperatures and is rendered conductive at abnormally high temperatures to permit current to flow between the wire 10 and another conductor, such as another wire (Figure 5) or a metallic tube (Figure 6).

The material of which the mass is composed preferably is of the ceramic-type, for example, the material may be a composition of glass, refractory or other ceramic material. Such compositions are readily formed into desired shapes about the wire and provide a substantially rigid structure. Such materials and compositions have negative temperature coefficients of resistivity and may be modified by incorporating therein thermistor-like materials to give the mass desired temperature-resistivity characteristics.

The mass as shown in Figures 1 and 2 has a generally circular cross-section and the wire is positioned at the center thereof. The mass is formed with a plurality of longitudinally spaced peripheral or annular inwardly extending grooves 12 which divide the mass into a plurality of bead-like cylindrical sections 14. By reason of the grooves 12, a relatively thin annular portion 15 of the mass is provided at each groove which portion surrounds the wire and connects adjacent sections 14.

In Figures 3 and 4, elements are illustrated having bead-like sections of modified forms. In Figure 3, generally spherically sections 16 are shown, and, in Figure 4, disc-like sections 17 are shown. In each instance, the sections are divided by grooves 12 and are connected by portions 15. It will therefore be appreciated that these sections may be provided in many shapes and forms.

In Figure 5, an element is illustrated wherein two wires 10 are surrounded by a mass of material having a generally elliptical cross-section divided into bead-like sections 19 which are connected by thin elliptical portions 20. This serves

to illustrate that the element may have any desired number of wires serving as conductors in a circuit which is rendered effective upon subjecting the mass to high temperature, and that the element may have any suitable cross-section which usually depends on the tube or housing in which it is to be assembled.

In Figure 6, an element such as illustrated in Figures 1 and 2 is shown assembled in a tube 21, which, when a single wire is surrounded by the mass, serves as a conductor. By reason of the connecting portions 15, the element is continuous and is sufficiently rigid to facilitate insertion thereof in the tube, either manually or by automatic machinery.

In Figure 7, the assembly illustrated in Figure 6 is shown after being bent into circular form as might be required when the assembly is installed for detecting heat or flame. Upon initial bending of the assembly, the portions 15 are adapted to fracture, for example, at 22, whereby the bead-like sections 14 are separated into individual members and the rigidity of the element is reduced to facilitate further bending of the assembly. The grooves 12 and the relatively thin portions 15 provide for the foregoing without damage to the bead-like sections. Also, by the uniform spacing of the grooves and connecting portions, the assembly offers a uniformly distributed resistance to bending, which resistance is uniformly reduced upon fracture of the connecting portions whereby the assembly may be shaped into arcuate or circular forms having an even and regular contour without collapsing of the tube 21.

The elements in accordance with the invention may be manufactured by various methods, for example, by press molding the mass about the wire or wires, by forming lengths of the mass and then inserting the wires, or by extruding and shaping the mass about the wire or wires as described in my copending application for United States Letters Patent, Serial No. 162,360, filed May 16, 1950.

It will be appreciated that several forms of bead-like elements may be embodied in a single strip in any desired pattern or arrangement. Also, the peripheral grooves and connecting portions need not extend completely around the wire or wires in order to derive the advantages of the present invention.

From the foregoing description, it will be seen that the present invention provides useful and economical heat or flame detecting elements and cable assemblies embodying the same which are of a new and improved design to facilitate assembly and installation thereof.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. An element for use in a heat or flame detecting cable comprising at least one wire, and a continuous mass of material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced peripheral inwardly extending grooves therein dividing said mass into bead-like sections and having a portion at each groove connecting adjacent sections.

2. An element for use in a heat or flame detecting cable comprising at least one wire, and a continuous mass of material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced annular inwardly extending grooves therein dividing said mass into bead-like sections and having an annular portion at each groove and surrounding said wire and connecting adjacent sections.

3. An element for use in a heat or flame detecting cable comprising at least one wire, and a continuous generally cylindrical mass of material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced annular inwardly extending grooves therein dividing said mass into cylindrical bead-like sections and having an annular portion at each groove and surrounding said wire and connecting adjacent sections.

4. An element for use in a heat or flame detecting cable comprising at least one wire, and a continuous substantially rigid mass of ceramic-like material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced peripheral relatively deep inwardly extending grooves therein dividing said mass into bead-like sections and having a relatively thin portion at each groove and surrounding said wire and connecting adjacent sections, said portion being adapted to fracture upon bending the element to separate adjacent sections and facilitate further bending of the element.

5. An element for use in a heat or flame detecting cable comprising at least one wire, and a continuous mass of material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced spherical bead-like sections and having relatively thin annular portions surrounding said wire and connecting adjacent sections.

6. A heat or flame detecting element assembly comprising at least one wire, a continuous mass of material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced peripheral inwardly extending grooves therein dividing said mass into bead-like sections and having a portion at each groove and surrounding said wire and connecting adjacent sections, and a tube surrounding said mass.

7. A heat or flame detecting cable comprising at least one wire, a continuous substantially rigid mass of ceramic-like material surrounding said wire acting as an insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures, said mass having a plurality of longitudinally spaced peripheral relatively deep inwardly extending grooves therein dividing said mass into bead-like sections and having a relatively thin portion at each groove and surrounding said wire and connecting adjacent sections, and a bendable

tube surrounding said mass, said portion being adapted to fracture upon bending said tube to separate adjacent sections and facilitate further bending of the cable.

ERNEST A. JOERREN.

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