

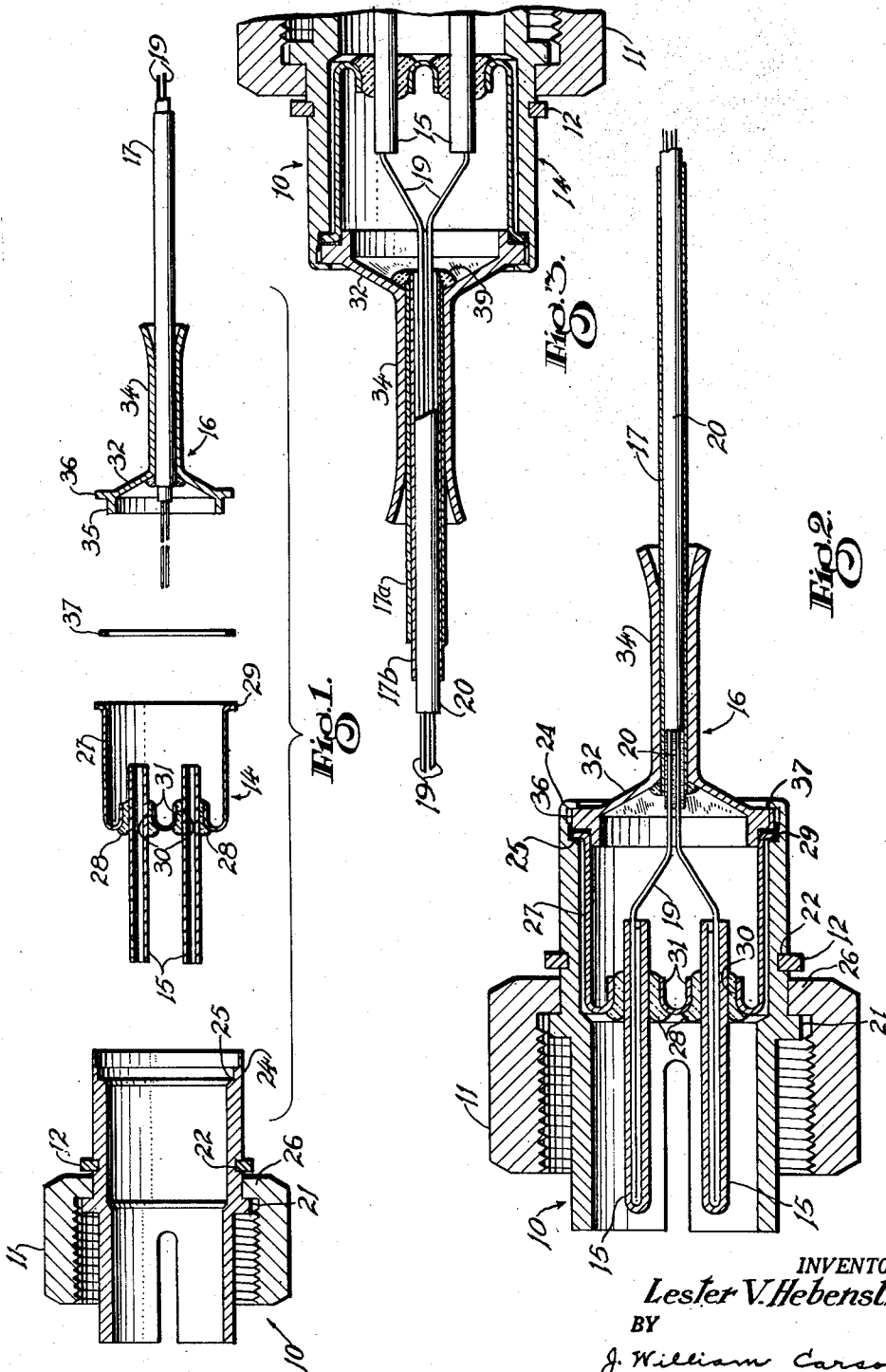
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HEAT DETECTOR AND CONNECTOR ASSEMBLY

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HEAT DETECTOR AND CONNECTOR
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The present invention relates to heat and flame detecting devices; and, more particularly, is concerned with heat detector and connector assemblies of the continuous cable type wherein a pair of electrically conductive wires are separated by a mass of material which acts as an insulator at normal temperatures but is rendered electrically conductive at abnormally high temperatures and wherein the ends of the wires are electrically connected to equipment for detecting the flow of current therethrough, the material being of the type having negative temperature coefficient of resistivity characteristics permitting repeated use thereof.

In constructing such assemblies, it is customary to arrange the wires and the so-called thermistor material in a thin heat conductive metallic tube and to attach the connectors to the ends of the tube with the wires electrically connected to the connectors. One of the difficulties encountered in connection with such assemblies is that moisture may be trapped in or enter the tube, and that such moisture makes the operating characteristics of the heat detecting elements unreliable. For example, under one condition of moisture content current flow may be indicated at a given temperature whereas under another condition of moisture content current flow may be indicated at a much different temperature. Thus, a given assembly may vary from time to time to respond at different temperatures, and there is no assurance that any two assemblies will respond at the same temperature.

Attempts have been made to control the moisture content, preferably by excluding moisture, to duplicate operating characteristics and to standardize the temperature at which assemblies of identical construction will indicate a flow of current, but such attempts have been unsuccessful.

Accordingly, an object of the present invention is to provide assemblies of the type indicated herein which are not subject to the foregoing disadvantages.

Another object is to provide such assemblies which are constructed in a manner to eliminate moisture and to exclude moisture thereafter.

Another object is to provide such assemblies which are reliable in operation and maintain their operating characteristics during the life thereof even if repeatedly subjected to abnormally high temperatures and intermittent normal temperatures.

A further object is to accomplish the fore-

going in a simple, practical and economical manner.

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.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

Fig. 1 is an exploded longitudinal sectional view illustrating the elements of an assembly in accordance with the invention prior to securing thereof.

Fig. 2 is an enlarged longitudinal sectional view illustrating the elements shown in Fig. 1 in their finally assembled relation to provide a heat detector and connector assembly in accordance with the invention.

Fig. 3 is a fragmentary sectional view illustrating a modification of the invention.

Referring to the drawing in detail and more particularly to Figs. 1 and 2 thereof, there is shown a heat detector and connector assembly generally comprising a sleeve 10, a nut 11, a split ring 12, a header 14 including a pair of terminal tubes 15, a closure 16, a metallic tube 17, and a heat sensitive element in the tube 17 including a pair of electrically conductive wires 19 and a mass of material 20 separating the wires.

The sleeve 10 is slotted longitudinally at one end thereof to render the same sufficiently resilient to facilitate insertion into an electrical socket structure (not shown), and has a circumferential shoulder or flange 21 at about the middle thereof and an annular groove 22 adjacent the shoulder. The opposite end of the sleeve has a cylindrical section 24 of reduced thickness providing an outwardly facing annular shoulder 25.

The nut 11 has an inwardly extending flange 26 adapted to engage the shoulder 21, and the ring 12 is sprung into the groove 22 to rotatably retain the nut on the sleeve 10. The nut cooperates with a threaded section of the socket structure (not shown) to secure the sleeve thereto.

The header 14 comprises a cup-shaped metallic shell 27 having an open end formed with an outwardly extending annular flange 29 adapted to

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seat on the shoulder 25 of the sleeve and having a closed end wall at the end opposite the open end forming a pair of apertures 30 for receiving the terminal tubes 15 which are hermetically sealed therein by a bead 28 formed of a glass or other material which is electrically nonconductive and heat resistant. Preferably, the apertures are defined by tubular sections 31 stamped out of the closed end wall and extending inwardly into the shell to facilitate securement of the terminal tubes and an effective seal between the header and these tubes.

The closure 16 comprises a somewhat conical cover portion 32 having a central tubular portion 34 extending outwardly therefrom through which the heat sensitive element containing tube 17 extends, a cylindrical skirt section 35 adapted to extend into the open end of the header shell in close fitting relation, and an outwardly extending annular flange 36 adapted to face the flange 29 of the header. Preferably, the free end of the tubular portion 34 is flared outwardly to facilitate passing the end of the tube 17 there-through.

The tube 17 and the wires 19 are formed of alloys such as those now known as "Monel" and "Inconel." The tube 17 has an inner diameter of about fifty thousandths of an inch, and has a wall thickness of about five thousandths of an inch to facilitate bending thereof. The wires 19 have a diameter of about ten thousandths of an inch.

The mass of material 20 may be in accordance with that disclosed in United States Patent No. 2,495,867.

In constructing the heat detector and connector unit shown in Fig. 2, the nut 11 and the ring 12 are arranged on the sleeve as shown in Fig. 1; the header shell 27 and the terminal tubes 15 are secured; and the tube 17 is inserted into the neck portion and is secured therein by brazing or welding to form a hermetic seal between the tube and the neck portion. The core consisting of the wires 19 and the mass of material 20 is placed in the tube 17, with ends of the wires separated and the material 20 removed therefrom. A copper ring-shaped gasket 37 is placed on the flange 36 of the closure, and the closure 16 and shell 27 are put together, with the gasket between the flanges 29 and 36 and with the wires 19 extended through the terminal tubes 15. Preferably, the wires are pulled tight and are folded over.

The header shell flange 29 and the closure flange 36 are then brazed together to form a hermetic seal therebetween while cooling the terminal tube end of the header to prevent softening of the seal between the terminal tubes and the tubular sections 31 in which they are secured.

The header and closure unit is next dried at a temperature of about 600° F. to drive out all traces of moisture while introducing dry gaseous nitrogen at about ten pounds per square inch and maintaining the flow of nitrogen during the cooling period.

A desiccating unit is applied to the terminal end of the header to maintain the same in its dry condition, and the terminal tube tips are now welded to hermetically seal the same and to secure the ends of the wire in electrical connection therewith.

The header is thereafter inserted into the sleeve as shown in Fig. 2 with the header flange 29 resting on the sleeve shoulder 25, and the

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section 24 is crimped over the closure flange 36 to secure these parts in assembled relation.

While the heat detector is shown herein with a connector only at one end thereof for convenience of illustration, the apparatus in accordance with the present invention as used includes a similar connector at the other end of the heat detector to enable both of the wires 19 to be connected in an electrical circuit including elements for indicating the detection of abnormal temperatures when the mass 20 becomes conductive and current flows between the wires.

The advantages of the heat detector and connector unit in accordance with this invention are:

1. The length of the header permits copper brazing to form a hermetic seal between the shell 27 and the closure 16 without excessively heating the beads 28 whereby softening thereof is prevented.

2. The sleeve 10 and the closure 16 are crimped together to form a second seal around the shell 27 in addition to forming a secure connection and safe joint between these parts.

3. The connector is so constructed that it fits standardized sockets and that it meets Army and Navy specifications relating to electrical plug and socket connections.

4. The connector is readily assembled in its construction and can be made on a mass production basis.

In Fig. 3, a modified unit is illustrated wherein a double walled tube 17 is utilized which comprises an outer tube 17^a and an inner tube 17^b coaxially arranged in the outer tube in close fitting relation. A brazed joint 39 is provided within the shell 27 at the junction of its cover portion 32 and its tubular portion 34 which forms a hermetic seal between the ends of the tubes 17^a and 17^b and between the outer tube 17^a and the tubular portion 34.

This construction further minimizes leakage of moisture into the sealed unit. For example, even if the outer tube is damaged in a manner to form an opening therein, the inner tube is effective to maintain the hermetic seal about the mass 20, whereby the useful life of the unit is prolonged.

From the foregoing description, it will be seen that the present invention provides an improved heat detector and connector assembly of the type indicated herein which is simple, durable and economical in construction and is practical and effective in operation and has a long useful life.

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 interpreted as illustrative and not in any limiting sense.

I claim:

1. A connector for a metallic tube containing a heat sensing element of the class described comprising a metallic cup-shaped member having an open end and having an aperture in the wall facing the open end; a metallic terminal tube extending through said aperture; means hermetically sealing said tube in said aperture; and a metallic closure member united with said cup-shaped member at its open end to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member adapted to be united with the tube containing the heat sensing element to form a hermetic seal therebetween.

2. A connector for a metallic tube containing

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a heat sensing element of the class described comprising a metallic cup-shaped member of a length at least as great as its diameter having an open end and having collar means formed with an aperture in the wall facing the open end; a metallic terminal tube extending through said aperture; a mass of heat resistive material hermetically sealing said tube in said collar means; and a metallic closure member united with said cup-shaped member at its open end to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member adapted to be united with the tube containing the heat sensing element to form a hermetic seal therebetween.

3. A connector for a metallic tube containing a heat sensing element of the class described comprising a metallic cup-shaped member having a flange at its open end and having an aperture in the wall facing the open end; a metallic terminal tube extending through said aperture; means hermetically sealing said tube in said aperture; and a metallic closure member having means extending into said cup-shaped member to facilitate assembly of said members having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween, and having an elongate tubular portion extending axially outwardly from said cup-shaped member adapted to be united with the tube containing the heat sensing element to form a hermetic seal therebetween, said tubular portion being flared outwardly at the free end thereof.

4. A connector for a metallic tube containing a heat sensing element of the class described comprising a metallic cup-shaped member of a length at least as great as its diameter having a flange at its open end and having an apertured inwardly extending collar section on the wall facing the open end; a metallic terminal tube extending through said collar section; a mass of glass hermetically sealing said tube in said collar section; and a metallic closure member having an annular rim extending into said cup-shaped member, having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween, and having an elongate tubular portion extending axially outwardly from said cup-shaped member adapted to be united with the tube containing the heat sensing element to form a hermetic seal therebetween, said tubular portion being flared outwardly at the free end thereof.

5. A connector for a metallic tube containing a heat sensing element of the class described comprising a metallic cup-shaped member having a flange at its open end and having an aperture in the wall facing the open end; a metallic terminal tube extending through said aperture; means hermetically sealing said tube in said aperture; a metallic closure member having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member adapted to be united with the tube containing the heat sensing element to form a hermetic seal therebetween; a sleeve enclosing said cup-shaped member having a shoulder engaged by the flange of said cup-shaped member and having an inwardly extending zone engaging the flange of said closure member; and coupling means mounted on said sleeve.

6. A heat detector and connector assembly comprising a metallic tube; a heat sensitive ele-

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ment in said tube including a pair of electrically conductive wires and a mass of material separating said wires acting as an electrical insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures; a metallic cup-shaped member of a length at least as great as its diameter having a flange at its open end and having a pair of apertures in the wall facing the open end; a metallic terminal tube extending through each of said apertures and each having a wire of said heat sensitive element united thereto and being hermetically sealed at the end extending outwardly of said cup-shaped member; means hermetically sealing each of said terminal tubes in their respective apertures; and a metallic closure member having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member through which said first mentioned tube extends and is united to form a hermetic seal therebetween.

7. A heat detector and connector assembly comprising a metallic tube; a heat sensitive element in said tube including a pair of electrically conductive wires and a mass of material separating said wires acting as an electrical insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures; a metallic cup-shaped member of a length at least as great as its diameter having a flange at its open end and having a pair of apertured inwardly extending collar sections on the wall facing the open end; a metallic terminal tube extending through each of said collar sections and each having a wire of said heat sensitive element extending therein and united thereto and being hermetically sealed at the end extending outwardly of said cup-shaped member; a mass of glass hermetically sealing each of said terminal tubes in their respective collar sections; and a metallic closure member having an annular rim extending into said cup-shaped member, having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween, and having an elongate tubular portion extending outwardly from said cup-shaped member through which said first mentioned tube extends and is united to form a hermetic seal therebetween, said tubular portion being flared outwardly at the free end thereof.

8. A heat detector and connector assembly comprising a metallic tube; a heat sensitive element in said tube including a pair of electrically conductive wires and a mass of material separating said wires acting as an electrical insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures; a metallic cup-shaped member of a length at least as great as its diameter having a flange at its open end and having a pair of apertures in the wall facing the open end; a metallic terminal tube extending through each of said apertures and each having a wire of said heat sensitive element united thereto and being hermetically sealed at the end extending outwardly of said cup-shaped member; means hermetically sealing each of said terminal tubes in their respective apertures; a metallic closure member having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member through which said first mentioned tube ex-

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tends and is united to form a hermetic seal therebetween; a sleeve enclosing said cup-shaped member having a shoulder engaged by the flange of said cup-shaped member and having an inwardly extending zone engaging the flange of said closure member; and coupling means mounted on said sleeve.

9. A heat detector and connector assembly comprising an outer metallic tube; an inner metallic tube coaxially arranged in said outer tube in close fitting relation; a heat sensitive element in said inner tube including a pair of electrically conductive wires and a mass of material separating said wires acting as an electrical insulator at normal temperatures and being adapted to be rendered electrically conductive at abnormally high temperatures; a metallic cup-shaped member of a length at least as great as its diameter having a flange at its open end and having a pair of apertures in the wall facing the open end; a metallic terminal tube extending through each of said apertures and each having a wire of said heat sensitive element united thereto and being hermetically sealed at the end extending

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outwardly of said cup-shaped member; means hermetically sealing each of said terminal tubes in their respective apertures; a metallic closure member having a flange united with said flange of said cup-shaped member to form a hermetic seal therebetween and having a tubular portion extending outwardly from said cup-shaped member through which said outer tube and said inner tube extend and to which said outer tube is united to form a hermetic seal therebetween; and means at the interior of said cup-shaped member forming a hermetic seal between the ends of said inner and outer tubes.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,282,476	Simon	Oct. 22, 1918
2,476,099	Knudsen	July 12, 1949
2,495,867	Peters	Jan. 31, 1950
2,586,252	Peters	Feb. 19, 1952
2,594,921	Hansard	Apr. 29, 1952