

Feb. 5, 1957

A. P. CHARBONNEAU
WIRING TERMINAL CONNECTORS

2,780,704

Filed April 27, 1953

Fig. 1

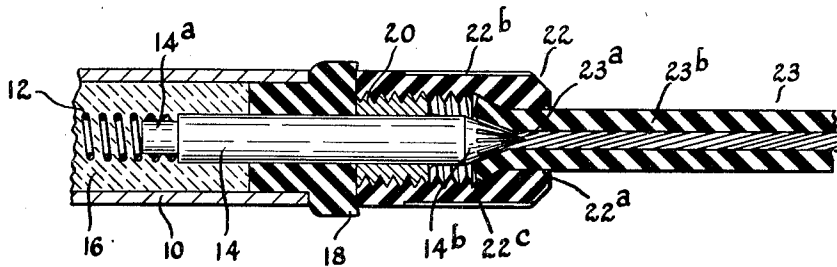


Fig. 2

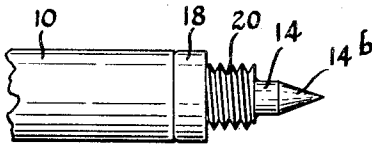


Fig. 3

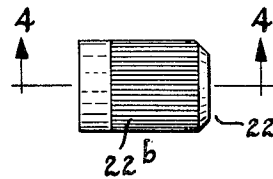
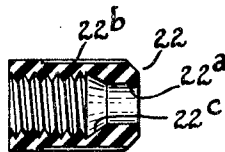


Fig. 4



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1

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WIRING TERMINAL CONNECTORS

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Application April 27, 1953, Serial No. 351,373

11 Claims. (Cl. 201-67)

This invention relates to improvements in wiring terminal connectors and more particularly to improved hermetically sealed wiring terminal connectors for electric heaters.

An object of the present invention is to provide a wiring terminal connector to permit quick and easy connection of an ordinary insulated multiple strand electric conductor to a terminal.

Another object is to provide a wiring terminal connector to effect connection between a terminal and an unskinned insulated multiple strand electric conductor.

Another object is to provide a terminal connector to effect a weatherproof connection between a terminal and an electric conductor of the aforementioned type.

A more specific object is to provide an electric heater with means for quick and easy connection of a terminal thereof to a multiple strand electric conductor and for hermetically sealing such connection.

A further object is to provide a heater having a terminal for inserted engagement within the end of an insulated multiple strand electric conductor and a connector for rigidly maintaining and hermetically sealing such connection.

The novel features which I consider characteristic of my invention are set forth with particularity in the appended claims. The device itself, however, both as to its organization and mode of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, in which,

Figure 1 is a fragmentary sectional view of an electric heater employing the present invention;

Fig. 2 is an elevational view of an electric heater having its terminal adapted to receive a multiple strand electric conductor, and retaining cap;

Fig. 3 is an elevational view of the retaining cap; and

Fig. 4 is a sectional view along line 4-4 of Fig. 3.

Like reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to Fig. 1, it shows a tubular electric heater having a tubular sheath member 10. Such electric heater utilizes a heating element 12 consisting of a helical electrical resistance wire. Said heating element 12 is preferably provided at each end thereof with a terminal 14 formed with a reduced end portion 14^a for attachment to the heating element 12 by crimping, threading, welding, brazing, or by combinations of said operations, to permanently, mechanically and electrically connect said parts to each other. Heating element 12 is centrally disposed within said sheath member 10 and is completely surrounded by granular refractory insulating material 16. Terminal 14 is centrally disposed and surrounded in part by said insulating material 16 within said sheath, and is so formed as to extend beyond the end of said sheath. Said granular insulating material 16 may be of any suitable type, such as magnesium oxide, and is compacted in any well known manner within the sheath

2

to provide a heat conducting electrical insulating mass. Sheath member 10 is not entirely filled with such insulating material 16, thus providing at each end thereof a cavity for reception of a weatherproofing elastic insulation plug 18.

The elastic and heat resistant plugs 18 are inserted into each end cavity of sheath member 10 prior to the above-mentioned compacting of insulating material 16 to permit subsequent swaging of the heater over its entire length to simultaneously effect compacting of said insulating material 16 and anchoring of plug 18 within said sheath member 10.

Each terminal 14 is formed with a tapered end portion 14^b. I prefer that such end portion 14^b be conicaly-shaped, but it will be apparent to those skilled in the art that it could be shaped in any one of several different forms, depending upon the particular type of adjusting or clamping means (hereinafter more fully described) which is utilized. A sleeve 20 is rigidly and permanently attached to terminal 14 as by staking or soldering the former to the latter. Sleeve 20 is provided with an external thread as shown in the drawing.

A cap 22, preferably of a suitable molded insulating material, such as "Bakelite," is provided with internal threads for engagement with said sleeve 20, and is adapted to effect hermetic sealing of the connection and to maintain rigid and proper conductive engagement of terminal 14 with a multiple strand conductor 23 of a known form of rubber-covered, or plastic-covered, conducting strands 23^a, when the parts are assembled as shown in Fig. 1. Cap 22 is formed with a surface 22^c which is complementary to the conically-shaped tapered end portion 14^b of terminal 14 to insure and maintain such rigid engagement.

The novel terminal connector is utilized by inserting the electric conductor 23 through opening 22^a of cap 22, and forcing the multiple strand conductor over the tapered end portion 14^b of terminal 14 as shown in Fig. 1. Thereafter cap 22 is threaded onto sleeve 20 until it is tightly seated against the outer end of elastic plug 18, while at the same time tightly gripping the inner end portion of the rubber or plastic cover 23^b of said insulated conductor 23. There is thus provided a hermetic seal between said cap 22 and plug 18, and between the inner end of insulating cover 23^b of the conductor 23 and said cap 22. Such positioning of cap 22 also rigidly holds the strands 23^a in good electrical contact with the tapered end portion 14^b of terminal 14 thus maintaining proper electrical conductivity therebetween.

It will be further noted that when cap 22 firmly engages the inner end portion of the insulating cover 23^a of the conductor 23 as shown in the drawing, an annular flare or enlargement of said insulation is formed to provide and maintain the desired retaining force on said conductor in the assembled position of the parts. In order to facilitate manual tightening of cap 22 on sleeve 20, said cap 22 is peripherally fluted, as shown at 22^b; or the same may be knurled or otherwise roughened.

As illustrated, the tapered end portion 14^b of terminal 14 is preferably conically-shaped, so that cap 22 may be adjustable by the threaded connection or other means which require rotational movement of the cap to effect the desired force upon the conductor. It is to be understood that said tapered end portion 14^b need not be conical in shape, but may be formed with a pointed end while having something other than a circular lateral cross-section; in which event, the complementary surface on cap 22 would prevent the use of adjusting means requiring rotational movement of said cap relative to the tapered end portion 14^b. In this event the adjusting means could be, for example, a set screw (not shown) threadedly mounted within the side of said cap 22 and movable to

3

engage the side of said sleeve 20 or the side of said terminal 14 to effect fastening of said cap relative to said terminal. This and other similar constructions are considered to be within the purview of the present invention.

The connector herein disclosed thus provides a firm and hermetically sealed connection between the terminal 14 and the conductor 23. Moreover, the connection may be quickly and easily made in the manner aforescribed.

Although I have shown and described a specific embodiment of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim:

1. A hermetically sealed electrical connector comprising, in combination, an apertured member, an electrically conductive terminal member in spaced relation to said apertured member and having a tapered projection for insertion within the unskinned end of an elastic insulated electric conductor, an elastic plug member within said aperture and surrounding said terminal member intermediate the ends of the latter, and an insulating cap member adjustably mounted on said terminal member and having means integral therewith for rigidly holding the conductive portion of said conductor in electrical contact with said terminal member and for holding the inner end of said cap in hermetically sealed engagement with said elastic plug member.

2. A hermetically sealed electrical connector comprising, in combination, an apertured member, a terminal member extending through said aperture and formed with a tapered projection for insertion within an unskinned end of an insulated electric conductor, an elastic plug member compressed within said aperture and surrounding said terminal member intermediate the ends of the latter, and an insulating cap member mounted on said terminal member and formed with means for engaging the insulated periphery of said conductor to effect a hermetic seal between said terminal member and said conductor and to effect rigid engagement of said projection with the conductive portion of said conductor, and the inner end of said insulating cap being simultaneously engaged with said elastic plug member to afford a hermetic seal therebetween.

3. A hermetically sealed electrical connector comprising, in combination, an apertured member, a terminal member in coaxial relation with said aperture and formed with a tapered portion for insertion within the unskinned end of an elastic insulated conductor, an elastic plug member sealing said aperture and surrounding said terminal member intermediate the ends of the latter, and an insulating cap member adjustably mounted on said terminal member and having a complementary conical surface cooperatively arranged with respect to said tapered portion to provide for flaring said end of said conductor and hermetically sealed engagement of the latter with said terminal member as an incident to inward movement of said cap with respect to said terminal member.

4. In combination with a tubular heater comprising an open end sheath and a terminal member located in spaced relation to said sheath and extending beyond said open end thereof, of an elastic plug within the end of said sheath and in engagement with said terminal member and said sheath, said terminal member having a tapered end portion adapted for insertion into the end of an insulated conductor, and a cap adjustably mounted on said terminal member to rigidly hold said tapered end portion thereof in engagement with said conductor and to engage said elastic plug to hermetically seal said sheath and said terminal member.

5. The combination with a tubular heater comprising an open end sheath and a terminal member in spaced relation to said sheath and extending beyond said open end thereof, of an elastic plug within the open end of said sheath and in engagement with said terminal member and

4

said sheath, said terminal member having a thread formed thereon and having a tapered end portion for insertion into the end of an insulated conductor, and a cap internally threaded for cooperation with the thread aforementioned, said cap having a surface cooperating with said tapered end portion to insure a good electrical connection between said terminal member and said conductor.

6. In combination, a sheath formed with an opening, a heating element positioned within said sheath and having a terminal member extending beyond said sheath, granular refractory insulating material surrounding said heating element within said sheath and affording with said opening an end cavity in said sheath, a perforated elastic plug formed of heat resistant material compressed in situ to tightly engage said sheath and said terminal member within said end cavity, said terminal member having a tapered projection for insertion within the end of an insulated electric conductor, and a cap adjustably mounted on said terminal member to retain said conductor in good electrical contact with said terminal member.

7. In combination, a sheath formed with an opening, a heating element positioned within said sheath and having a terminal member extending beyond said sheath, granular refractory insulating material surrounding said heating element within said sheath and affording with said opening an end cavity in said sheath, a perforated elastic plug formed of heat resistant material compressed in situ to tightly engage said sheath and said terminal member in said end cavity, said terminal member having a tapered projection for insertion within the end of an insulated electric conductor, and a cap adjustably mounted on said terminal member to engage said elastic plug and the periphery of said conductor to hermetically seal said tapered projection.

8. In combination, a sheath formed with an opening, a heating element positioned within said sheath and having a terminal member extending beyond said sheath, granular refractory insulating material surrounding said heating element within said sheath and affording with said opening an end cavity in said sheath, a perforated elastic plug formed of heat resistant material compressed in situ to tightly engage said sheath and said terminal member within said end cavity, said terminal member having a tapered projection for insertion within the end of an insulated electric conductor, and a cap adjustably mounted on said terminal member to engage said elastic plug and the periphery of said conductor to hermetically seal said tapered projection and to retain said conductor and said projection in good electrical contact.

9. In combination, a sheath formed with an opening, a heating element positioned within said sheath and formed with a terminal member extending beyond said opening, granular refractory insulating material surrounding said heating element within said sheath and affording with the opening an end cavity in said sheath member, a perforated elastic plug formed of heat resistant material compressed in situ to tightly engage said sheath and said terminal member within said cavity, said terminal having a tapered projection for insertion within the end of an insulated electric conductor, and a manually adjustable insulating cap having threaded engagement with said terminal member and having a surface cooperating with said tapered projection to engage said elastic plug and the periphery of said conductor to provide a hermetic seal between said tapered projection and said conductor and to insure a good electrical connection between said projection and said conductor.

10. An article of manufacture comprising an electric heater of the tubular type having an end cavity and a terminal member extending beyond said end cavity, an elastic plug within said end cavity and compressed in situ to tightly fit within said end cavity, said terminal member having an external thread intermediate its ends and having its outer end of conical form, an insulation covered electric conductor having its inner end pressed

5

over said conical end, and a cap threadedly engaging said terminal member to compress said elastic plug against said sheath and to engage the insulation on said conductor to retain said conductor in good electrical contact with said projection.

11. An article of manufacture comprising an electric heater of the tubular type having a sheath, a heating element within said sheath and surrounded by granular refractory insulating material, and a terminal member attached at its inner end to said heating element and extending beyond said sheath, said insulating material only partly filling said sheath to thereby provide an end cavity therein, an elastic plug within said end cavity and compressed in situ to tightly engage said sheath and said terminal member, said terminal member having

6

an external thread intermediate its ends and having its outer end of conical form, an insulation covered electric conductor having its inner end pressed over said conical end, and a cap threadedly engaging said terminal member to compress said elastic plug against said sheath and to engage the insulation of said conductor to retain said conductor in good electrical contact with said projection.

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