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Glover

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[54] **MULTI-PIN SHIELDED HIGH VOLTAGE CONNECTOR**

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[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

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[52] **U.S. Cl.**..... **339/60 M,** 339/94 M, 339/103 M

[51] **Int. Cl.**..... **H01r 13/52**

[58] **Field of Search** 339/59-63, 339/94, 101, 103

[56] **References Cited**

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[57] **ABSTRACT**

The disclosure relates to a multi-pin high voltage connector which is shielded and field installable and which can be assembled, disassembled and repaired in the field. The connector includes mating plug and receptacle portions, each having a boot which is placed over the wire and contact and fitted into a plastic insert and against a washer wherein the boot makes a seal with the washer under pressure at its rear portion and makes a seal at its forward portion with the plastic insert and boot of the mating member to provide an effectively continuous insulation across the connector members and within the connector around the connection. The connector also includes a continuous metal shield.

4 Claims, 6 Drawing Figures

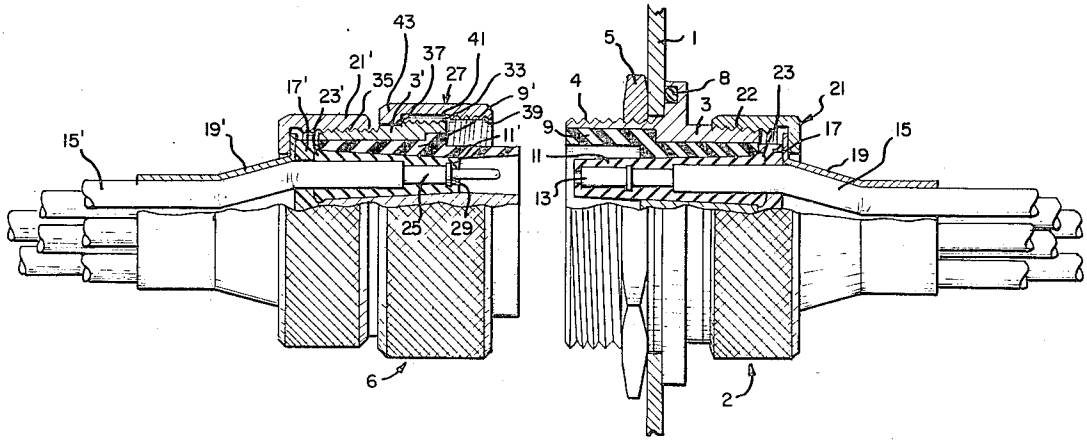


Fig. 1

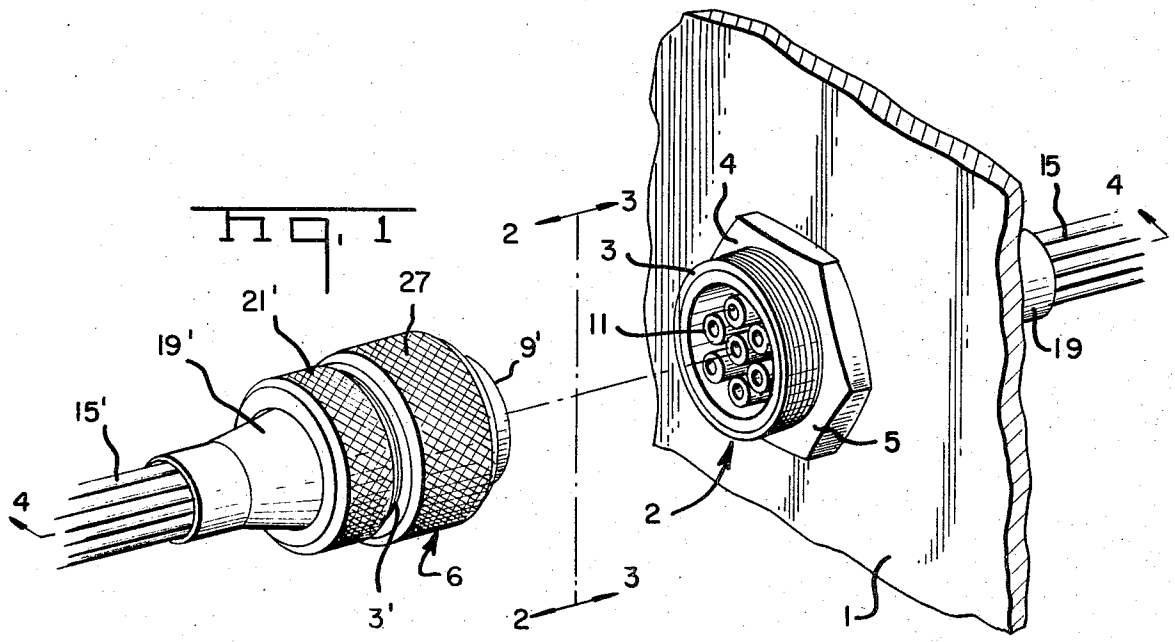
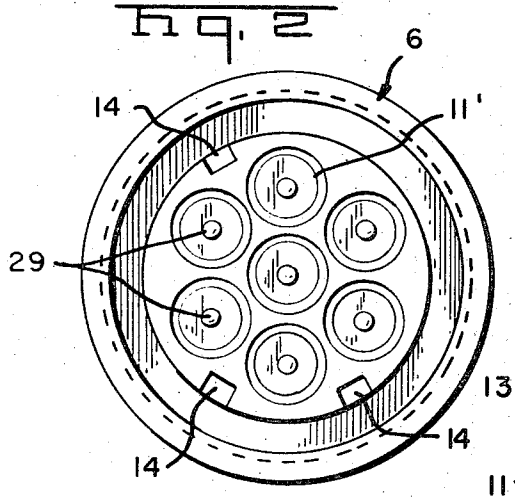


Fig. 2



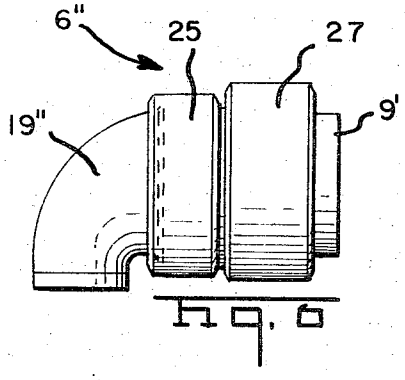
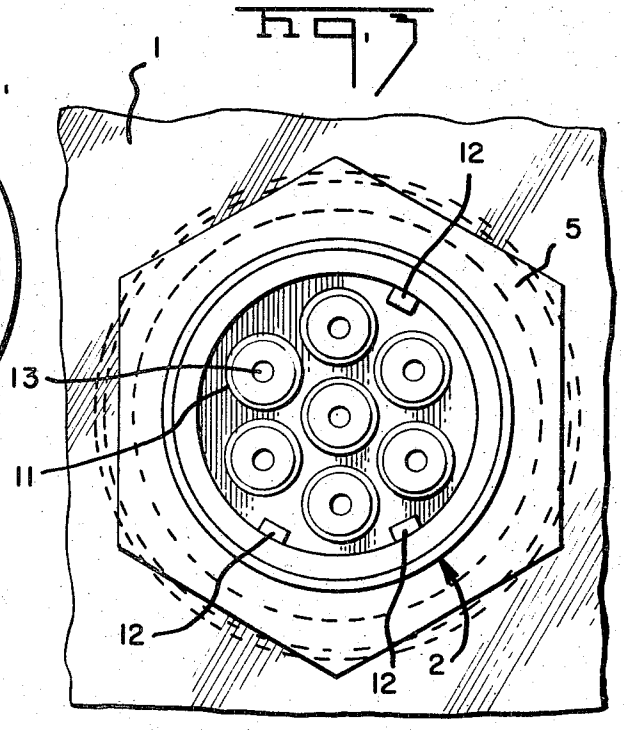


Fig. 6

Fig. 7



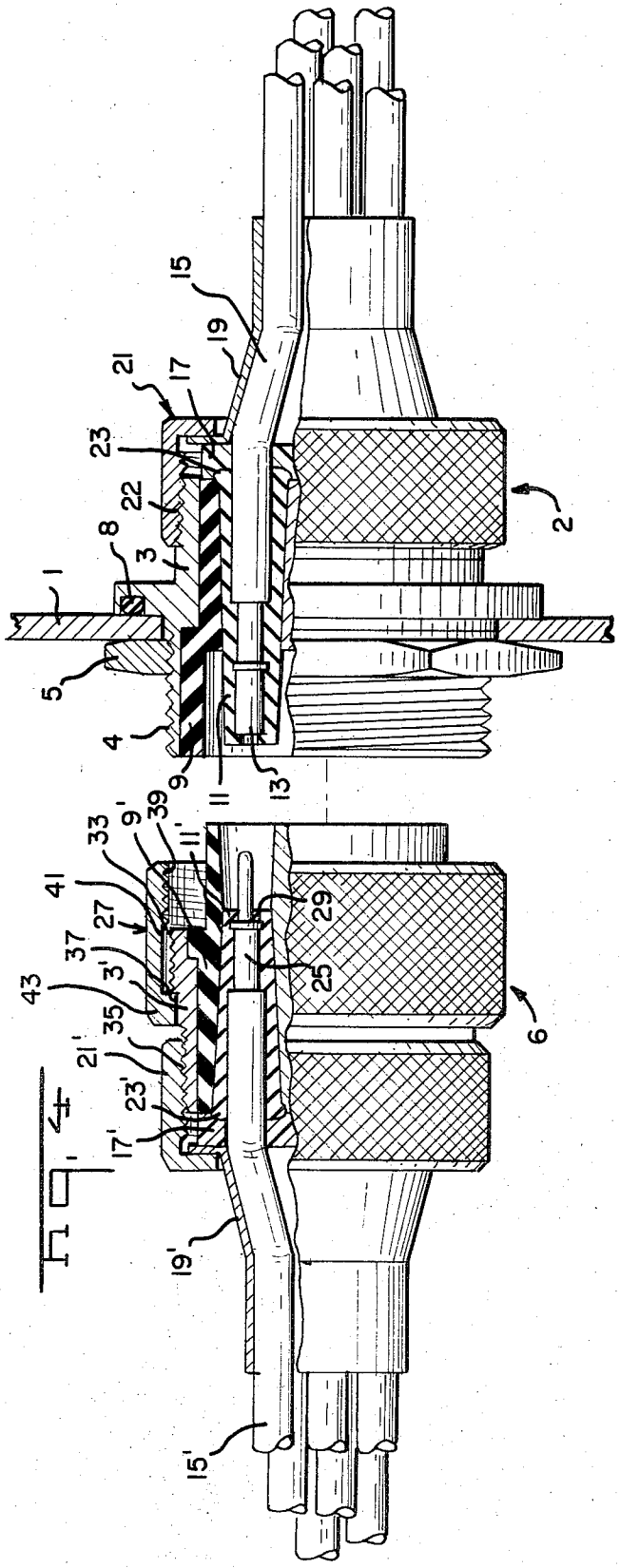

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23'

FIG. 4

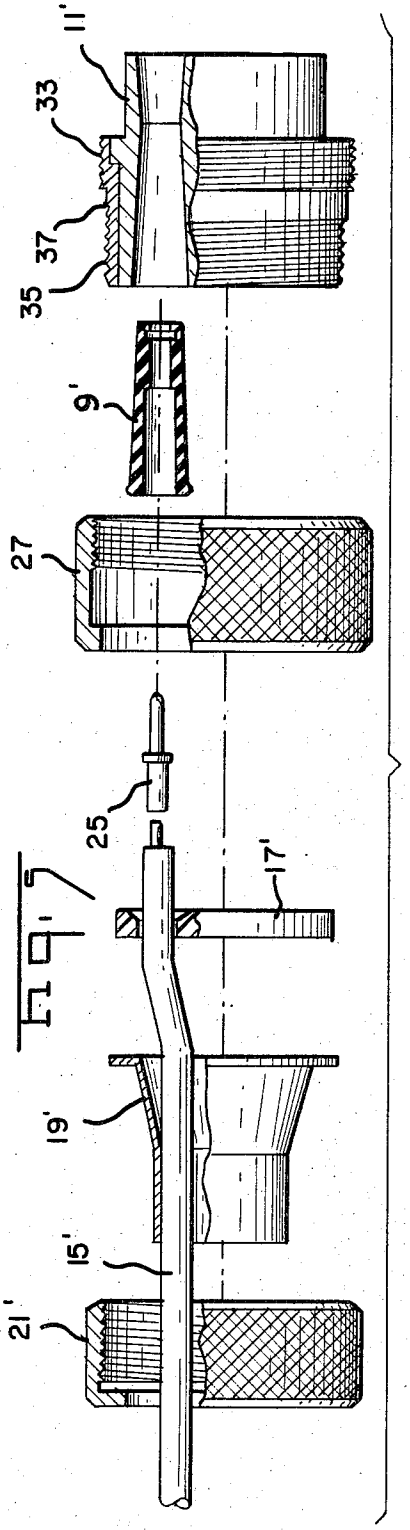

11'
33
37
35
9'
27
25
17'
19'
15'
21'

FIG. 5

MULTI-PIN SHIELDED HIGH VOLTAGE CONNECTOR

This invention relates to a shielded multi-pin high voltage connector and, more specifically to a multi-pin high voltage shielded connector which is field installable and which can be assembled, disassembled and repaired in the field.

Prior art high voltage shielded multi-pin connectors are normally potted, this potting requiring the use of apparatus not found in the field or readily usable in the field. It has therefore been necessary that connection to such connectors be performed away from the situs of the end use of the connector, this requiring a great deal of time as well as the special potting equipment. Such prior art high voltage electrical connectors, due to the potting, are also not readily assembled, disassembled or repaired in the field. All of this requires that high voltage connections made in the field or repaired in the field be costly and time consuming.

In accordance with the present invention, there is provided a shielded high voltage multi-pin shielded electrical connector which is relatively compact, field installable and capable of assembly, disassembly and repair in the field. This is accomplished by providing a shielded connector which does not require potting. Briefly, in accordance with the present invention, there is provided a multi-pin high voltage connector which is shielded and field installable and which can be assembled and disassembled and repaired in the field. The connector includes mating plug and receptacle portions, each having a boot which is placed over the wire and contact and fitted into a plastic insert and against a washer wherein the boot makes a seal with the washer under pressure at its rear portion and makes a seal at its forward portion with the plastic insert and boot of the mating member to provide an effectively continuous insulation across the connector member and within the connector around the connection. The connector also includes a continuous metal shield.

It is therefore an object of this invention to provide a multi-pin high voltage connector which is installable, assemblable, disassemblable and repairable in the field without special tooling.

It is a further object of this invention to provide a multi-pin high voltage connector composed of plural interfitting and unconnected parts.

It is a yet further object of this invention to provide a multi-pin high voltage connector having a substantially continuous body of insulation formed by plural interfitting and unconnected components.

The above objects and still further objects of the invention will become immediately apparent to those skilled in the art after consideration of the following preferred embodiments thereof, which are provided by way of example and not by way of limitation, wherein:

FIG. 1 is an isometric view of the assembled multi-pin high voltage electrical cOnnector of the present invention with half of the mated connector pair mounted in a bulkhead held therein by a lock nut;

FIG. 2 is a view taken along the line 2—2 of FIG. 1;

FIG. 3 is a view taken along the line 3—3 of FIG. 1;

FIG. 4 is a cross-section view of the electrical connector in accordance with the present invention;

FIG. 5 is an exploded view of the socket portion of the electrical connector of FIG. 4; and

FIG. 6 is an isometric view of a second embodiment of the present invention.

Referring first to FIG. 1, there is shown an isometric view of the shielded, multi-pin high voltage connector in accordance with the present invention. The receptacle 2 is secured in a bulkhead 1 by means of a lock nut 5 threaded onto threads 4 of a metal shell 3. Rubber boots 11 having contacts 13 (shown in FIG. 4) therein are secured within shell 3 as will be explained in detail hereinbelow. A portion of ferrule 19 with leads 15 extending therefrom is also shown.

The socket connector portion 6 also includes wire 15', a ferrule 19', a back cap 21' threaded onto a metal shell 3' onto which is mounted a metal cap 27 which threads onto the threads 4 of receptacle 2 in a manner to be described in detail hereinbelow. Also shown is the forward portion of a plastic insert 9'.

The receptacle 2 and socket 6 front ends are shown in FIGS. 2 and 3, the receptacle 2 including a recess in which one of the boots 11 with contact element 13 therein is shown. The receptacle 2 also includes flanges 12 therein which mate with depressions 14 of socket 6 to provide proper polarization. The socket 6 also includes boots 11' through which pins 29 extend from mating with contacts 11.

Referring now to FIG. 4, there is shown a cross-section of the connector in accordance with the present invention in greater detail. The receptacle 2 is shown mounted in a bulkhead 1 by means of electrically conducting metal shell 3 and lock nut 5 threaded onto threads 4 of shell 3. Shell 3 also includes an O-ring groove containing and O-ring 8 whereby application of pressure via lock nut 5 accomplishes a seal between the O-ring 8 and the bulkhead 1. Within the shell 3 is a plastic insert 9 having seven apertures therethrough to accommodate the seven incoming wires. The shell 9 is tapered to accommodate tapered boot 11. Positioned within each of the seven apertures is a rubber boot 11 into which an electrical contact 13 is positioned, the contact 13 being attached to lead or wire 15. The lead 15 is electrically connected to contact 13 externally and then inserted into boot 11, the boot with lead and contact therein then being inserted into the aperture in insert 9, this being done for each of the seven wires. A plastic washer 17 with seven apertures therein through which leads 15 pass is positioned at the rear end of the boots 11 between the boots and the metal, electrically conducting ferrule 19. The ferrule 19 applies pressure against the washer 17 by force applied thereto by metal back cap 21 which is threaded onto threads 22 of shell 3.

The ferrule 19 and back cap 21 apply pressure to washer 17 which squeezes the molded shoulder at the rear portion of boot 11 and provides a seal at interface 23. The boot 11 is made with its internal cavity smaller than contact 13 and wire 15 so that the boot is squeezed outwardly and causes evacuation of air to form the seal at interface 23, thereby closing off the outside of the system at the rear of the connector and carrying the insulation back in a continuous manner through the interface point 23.

The plug portion 6 as shown in FIGS. 4 and 5 has many of the same or similar elements as the receptacle 2 and such elements are provided with the same primed character reference. The plug 6 includes a metallic

electrically conducting shell 3' within which is a plastic insert 11' which mates with plastic insert 9. The shell 3' includes a threaded shoulder 33 and a rear threaded portion 35 of smaller cross-section than portion 35 with a flat land portion 37 therebetween of the same cross section as portion 35. The plug 6 also includes a back cap 21' threaded onto threads 35 and forcing ferrule 19' against washer 17' which makes a seal at interface 23' with the rear portion of boot 11'. The wire 15' extends through the apertures in washer 17' and is connected to pin 25 in the manner previously described. The cap 27 includes threads 39, a raised portion 41 and a flange portion 43. The cap 27 is threaded over the threads 33 and continues to move to the right until the threads no longer mate and the cap 27 is freely rotatable and held in the position shown in FIG. 4 by the flange 43 which extends to the land 37, the raised portion 41 being longer than the threads 33. This construction of cap 27 with a partial thread provides for space saving.

The connector portions 2 and 6 are interconnected by threading the threads 39 onto threads 4 to pull the plug 6 and receptacle 2 together and form a second interface between the boots 11 and 11' at the interface 29 with concomitant air evacuation to form an area seal at the interface 29 as well as between the boot 9 or 9' and insert 11 or 11'.

Referring now to FIG. 6, there is shown a second embodiment of the invention wherein a plug 6'' is shown though it should be understood that this embodiment can also apply to the receptacle portion. Here it is desired to provide an angular bend to the wire at the rear of the plug. This is accomplished by providing a ferrule 19'' having an angular bend therein. The remaining elements are the same as those shown in FIG. 1.

It can be seen that there has been provided a high voltage electrical connector which is readily installed, assembled, disassembled or repaired and which includes electrical shielding as provided by the continuous electrically conducting elements 19', 21', 3' and 27 of the plug 6 and 3, 19 and 21 of the receptacle 2.

Though the invention has been described with respect to specific preferred embodiments thereof, many variations and modifications will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. A multi-pin high voltage electrical connector, which comprises:
   a. an electrically conductive shell,
   b. an electrically insulating insert positioned within said shell and mating with said shell, said insert having plural tapered apertures extending therethrough and a washer positioned at the rear of said insert,
   c. a tapered boot of electrically insulating material positioned in each of said apertures and in intimate contact with said insert, said boot having forward and rearward ends,
   d. means applying a force against said rearward end of said boot to form a seal therewith,
   e. a mating member forming a pressure seal at the forward end of said boot, leads extending through said means applying a force and terminating within each said boot and in intimate contact with each said boot, wherein said means applying a force further includes a ferrule positioned between said washer and said pressure applying means, said leads extending outwardly through said ferrule.

2. A multi-pin high voltage connector as set forth in claim 1 wherein said insert, said boot and said means applying a force form a substantially continuous insulator.

3. A multi-pin high voltage connector as set forth in claim 1 wherein the axis of said ferrule has a bend therein,

4. A multi-pin high voltage connector as set forth in claim 1 wherein the axis of said ferrule has a bend therein.

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