

[54] **LOW COST HIGH VOLTAGE CONNECTOR**

[75] Inventors: **Douglas Wade Glover**, Harrisburg;
Henry Otto Herrmann, Jr., Mt. Joy,
both of Pa.

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

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[58] **Field of Search**..... 339/14, 60, 94

[56] **References Cited**

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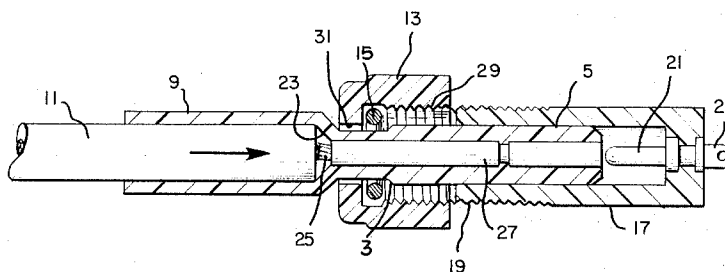
Primary Examiner—Joseph H. McGlynn
Attorney, Agent, or Firm—Gerald K. Kita

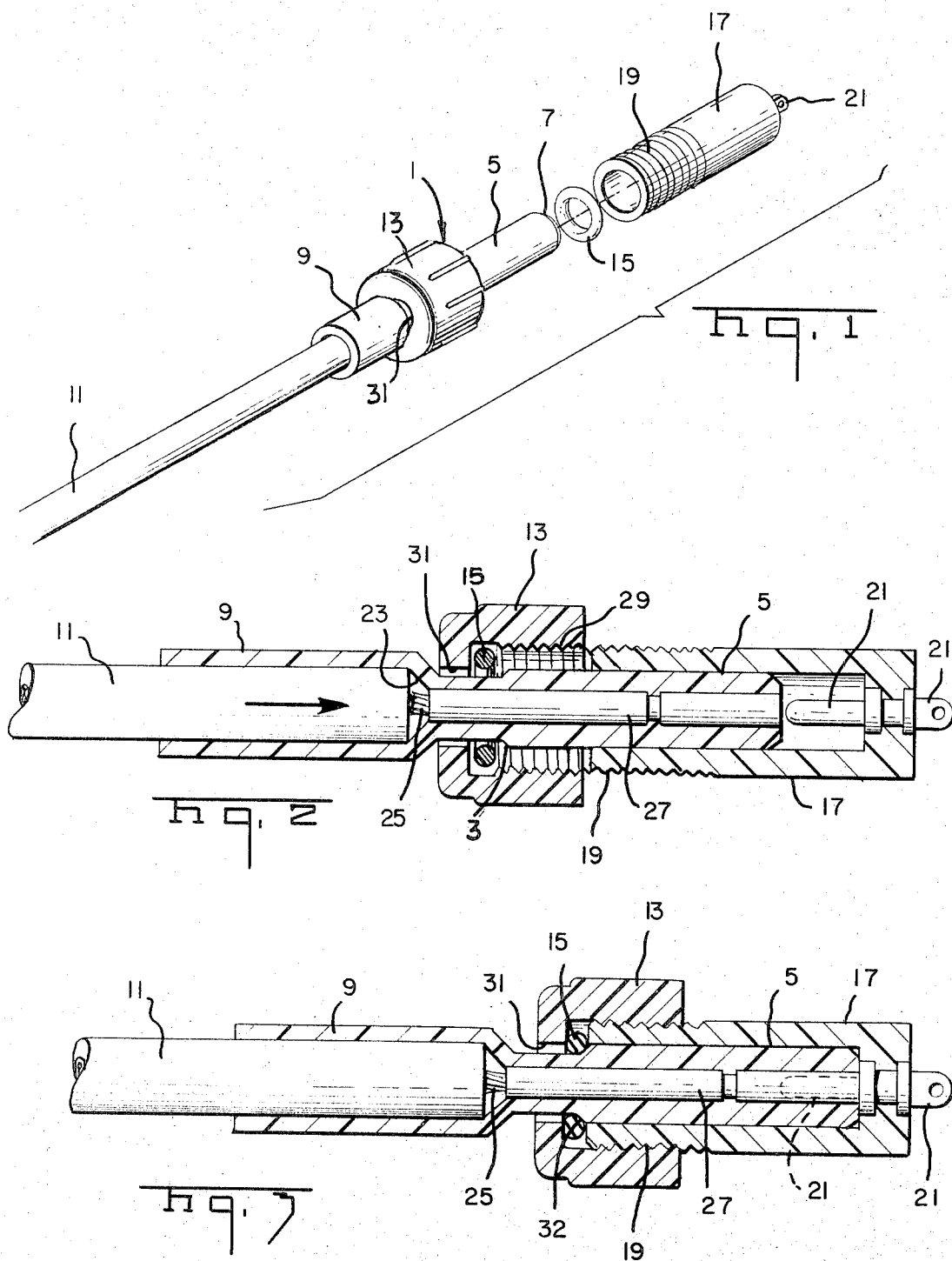
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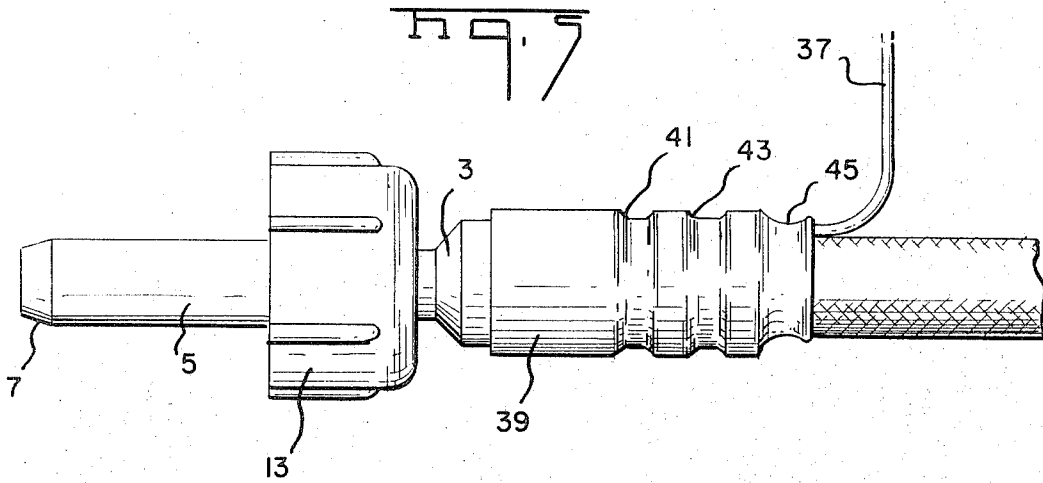
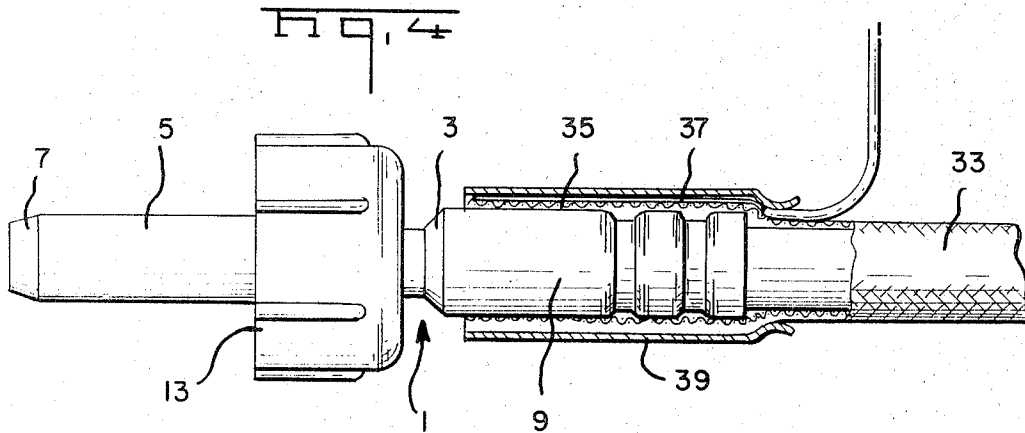
ABSTRACT

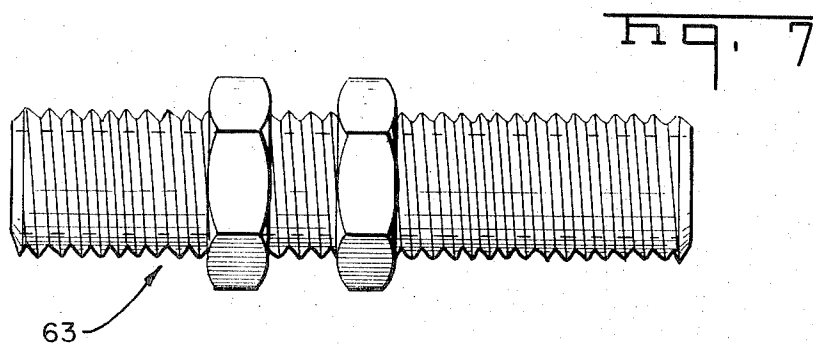
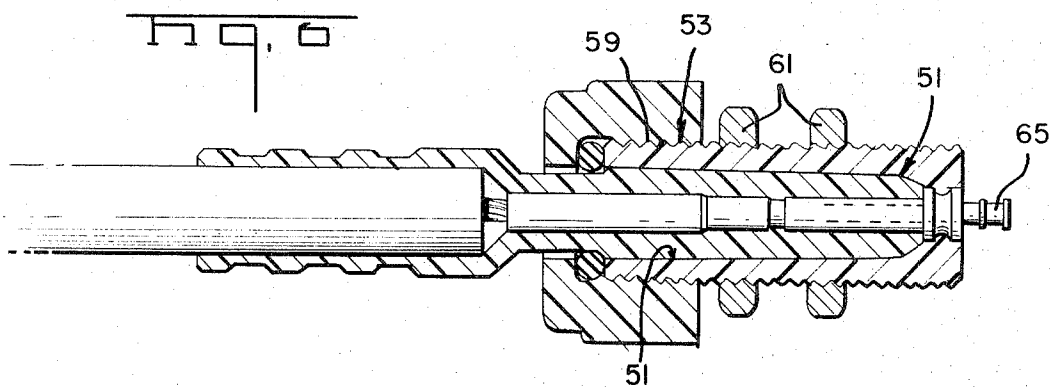
The disclosure relates to low cost high voltage connectors for use in about the 8KV AC range and 20 KV DC range. The connectors display relatively high physical strength and a removable cap, thereby eliminating the need for a separate dust cover since pressure sensitive tape can be placed over the hole in the cap.

10 Claims, 7 Drawing Figures









LOW COST HIGH VOLTAGE CONNECTOR

The disclosure relates to a high voltage connector and, more specifically to a relatively inexpensive high voltage connector which can be field assembled without special tooling and provides the properties of the more expensive known connectors.

High quality high voltage connectors are relatively expensive due to the problems inherent in handling high voltages. Due to corona discharges, it is necessary that high voltage connectors be well made so that breakdown does not take place through the connector material. In addition, it is necessary that each of the mating connector portions provide minimal path via air for corona discharge. This is accomplished in the prior art by accurate molding of parts to provide a seal devoid of air around the connection. Another prior art method of avoiding corona discharge is to provide a long path from connector pin to the exterior of the connector. Proper attainment of the desired result by the above methods has been relatively expensive.

In accordance with the present invention, there is provided a highly reliable high voltage connector which is relatively inexpensive and is field repairable and installable without requiring special tooling not normally carried in the field. Briefly, the above is accomplished by providing a housing of electrically insulating material having an annular recess or saddle for retaining a cap and O-ring which are held in the saddle and provide a seal with a threaded mating member. In accordance with a second embodiment of the invention for use with braided cable, a brass can is placed over the braid to the rear of the saddle and crimped thereover, a ground wire strap optionally extending from beneath the can externally of the can for external connection.

It is therefore an object of this invention to provide a high voltage electrical connector which is relatively inexpensive to produce.

It is a further object of this invention to provide a high voltage electrical connector which has greater physical strength relative to prior art equivalent cost high voltage connectors.

It is a still further object of this invention to provide a low cost high voltage connector having a removable cap.

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 embodiment thereof, which is provided by way of example and not by way of limitation, wherein:

FIG. 1 is an exploded view of a first embodiment of a high voltage connector in accordance with the present invention;

FIG. 2 is a cross-section of the connector of FIG. 1 prior to assembly;

FIG. 3 is a cross-section of the connector of FIG. 1 after assembly;

FIG. 4 is a view, partly in cross-section, of a second embodiment of the present invention prior to crimping;

FIG. 5 is a view as in FIG. 4 after crimping;

FIG. 6 is a cross-section view of a third embodiment of the invention; and

FIG. 7 is a third type of housing.

Referring now to FIG. 1, there is shown an electrical connector in accordance with the present invention. The connector includes a barrel 1 having an annular groove or saddle 3, a region of reduced diameter 5 having a chamfer 7 at one end and an area of enlarged diameter 9. The barrel is formed from a semi-rigid electrically insulating material of well known type. The barrel 1 includes an aperture extending therethrough, the diameter of the aperture within the area 9 being greater than beneath the saddle 3 and the area 5. A wire 11 extends into the barrel 1, the connector also including an internally threaded cap 13 of semi-rigid plastic having an aperture 31 therein, an O-ring 15 and a housing 17 of rigid material having threads 19 and a connector pin therein.

Referring now to FIG. 2, the electrical connector is shown in the assembled state. The wire 11 includes insulation which is of slightly smaller diameter than the aperture within area 9 to provide a clearance fit therewith. The wire 11 is forced into the barrel 1 until the insulation abuts the inner shoulder 23, the wire 25, which has been crimped to a receptacle 27 extending into the aperture portion within the saddle 3 and area 5. The cap 13 via aperture 31 is forced into the saddle 3 along with the O-ring 15 and the aperture portion of the housing 17 which extends outwardly within the threaded region 19 is forced over the chamfer 7. The diameter of the aperture in housing 17 is about the same or slightly smaller than the outside diameter of area 5 to provide a tight fit therewith. The area 5, being of slightly larger diameter than the interior diameter of O-ring 15 allows the shoulder 32 to snap in place past the O-ring when the cap 13 is loose and there is no pressure on the O-ring 15.

The connector is assembled as shown in FIG. 3 by threading the threads 29 of the cap 13 over the threads 19 of the housing 17. This forces the housing 17 along the area 5 until the leading edge of housing 17 abuts the O-ring 15. This places the O-ring 15 into compression between the cap 13 and housing 17 to provide a seal. The O-ring 15 moves up and down to fill the space due to deformation thereof to lock against shoulder 32 and prevent removal of the barrel. The barrel can be inserted or removed by loosening the cap 13 enough to remove the pressure from the O-ring 15. During this operation, the pin 21 enters the receptacle 27 and makes contact therewith. It can be seen that good sealing takes place between the area 5 and housing 17 as well as at the O-ring 15 and between the wire 11 and area 9 to provide a large tracking distance and prevent leakage.

Referring now to FIGS. 4 and 5 there is shown a second embodiment of the invention wherein like character references depict the same structure as in FIGS. 1 to 3. The embodiment of FIGS. 4 and 5 is designed for use with braided cable and includes the same barrel 1 and cap 13 with O-ring 15 (not shown). The wire 33 includes a braid 35. The wire insulation is stripped off at the end of wire 33 to expose the braid 35 as shown and a ground wire 37 is positioned over the braid, a metal can 39 such as one of brass being positioned over the braid and ground wire. The can 39 is then crimped over the ground wire 37 and braid 35 as shown by the crimp 41, 43 and 45 in FIG. 3 to secure the ground wire and braid therein and provide good electrical connection. The device of FIGS. 4 and 5 is then assembled with a

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housing 17 in the same manner as described with respect to the embodiment of FIGS. 1 to 3.

Referring now to FIG. 6 there is shown a third embodiment of the invention. Here like reference numerals refer to the same elements as in the prior embodiments. Here the barrel 51 is tapered towards its nose and the housing 53 has a similar taper in its central aperture to provide a clearance fit with the barrel 51. The cap 55 is internally threaded the entire length of its interior region with threads 57. The taper allows room for the O-ring to be positioned and be deformed upon tightening of cap 55. The extra room required for the O-ring 15 is necessitated by the extension of threads 57 along the entire interior of the cap, thereby taking up some of available space present in the embodiment of FIGS. 1 to 3.

The housing 53 has threads 59 along its entire outer surface to permit the threading of a pair of nuts 61 thereon as well as the cap 55. The nuts 61 permit securing of the housing or receptacle 53 into a bulkhead (not shown) positioned between the nuts.

Referring now to FIG. 7, there is shown a further embodiment of a housing 63 similar to that of FIG. 6 except that the pin 65 has been removed and the aperture 67 opens at both ends of the housing. This is utilized for interconnection of cables in the bulkhead. One of the nuts 61 can be fixed in place rather than threadable. Also, the nuts 61 are preferably formed from a material which will break before the housing or receptacle 53 or 63 when a force is applied thereto to protect the housing. A phenolic plastic has been an acceptable material.

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 high voltage electrical connector which comprises, in combination,
 - a. a barrel of electrically insulating material, said barrel including a central groove and a hollow interior, said hollow interior including sections of differing cross-section and a shoulder therebetween,
 - b. a threaded cap having an aperture positioned in said groove,
 - c. an O-ring positioned in said groove within said cap and

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d. a threaded housing positioned over said barrel and threadable with said cap to place said O-ring in compression between said cap and said housing.

2. A high voltage electrical connector as set forth in claim 1 wherein said barrel and said cap are of semi-rigid material and said housing is of rigid material, said housing making an air-tight fit with said barrel.

3. A high voltage electrical connector as set forth in claim 1 further including a cable having insulation and a wire therein, said cable being positioned within said barrel, said insulation abutting said shoulder and the wire extending farther into said barrel, and an electrical terminal secured to said wire, said insulation making an air tight fit with said barrel.

4. A high voltage electrical connector as set forth in claim 2 further including a cable having insulation and a wire therein, said cable being positioned within said barrel, said insulation abutting said shoulder and the wire extending farther into said barrel, and an electrical terminal secured to said wire, said insulation making an air tight fit with said barrel.

5. A high voltage electrical connector as set forth in claim 3 wherein said cross-section of the interior of said barrel is greater in the region housing the insulation than in the region housing said wire and terminal.

6. A high voltage electrical connector as set forth in claim 4 wherein said cross-section of the interior of said barrel is greater in the region housing the insulation than in the region housing said wire and terminal.

7. A high voltage electrical connector as set forth in claim 3 wherein said cable further includes a braid surrounding said insulation, a ground wire strap positioned over said braid and a metal can crimped over said strap and braid.

8. A high voltage electrical connector as set forth in claim 4 wherein said cable further includes a braid surrounding said insulation, a ground wire strap positioned over said braid and a metal can crimped over said strap and braid.

9. A high voltage electrical connector as set forth in claim 5 wherein said cable further includes a braid surrounding said insulation, a ground wire strap positioned over said braid and a metal can crimped over said strap and braid.

10. A high voltage electrical connector as set forth in claim 6 wherein said cable further includes a braid surrounding said insulation, a ground wire strap positioned over said braid and a metal can crimped over said strap and braid.

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