

United States Patent

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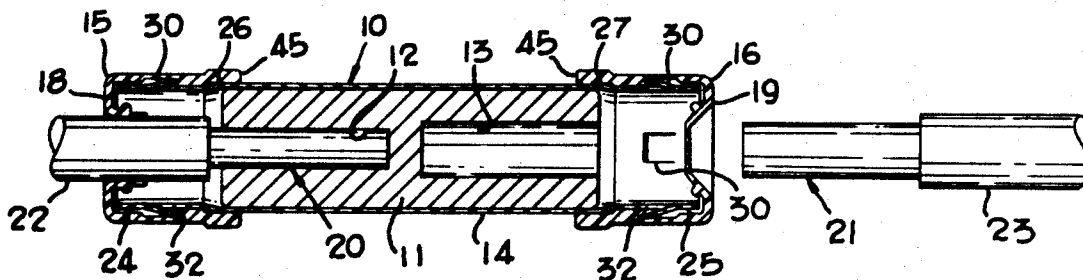
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[54] INSULATED ELECTRICAL CONNECTOR SLEEVE 3 Claims, 4 Drawing Figs.

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 174/84, 174/93, 339/276
 [51] Int. Cl. H01r 11/08
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 276; 174/84.1, 93

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ABSTRACT: The connector includes a cylindrical socketed body embracingly retained within an insulated sleeve, the sleeve including overhanging portions extending beyond each end of the body. Cylindrical end caps are provided which overfit and embrace the sleeve at each end, the sleeve including a groove latchable onto resilient lugs on the sleeve. Each end cap includes a sealing ring portion on its inner surface which engages the sleeve when the end caps are snapped into place. The end caps include a reinforcing ring defining a push out or rupturable portion which seals the conductor relative to the end cap.



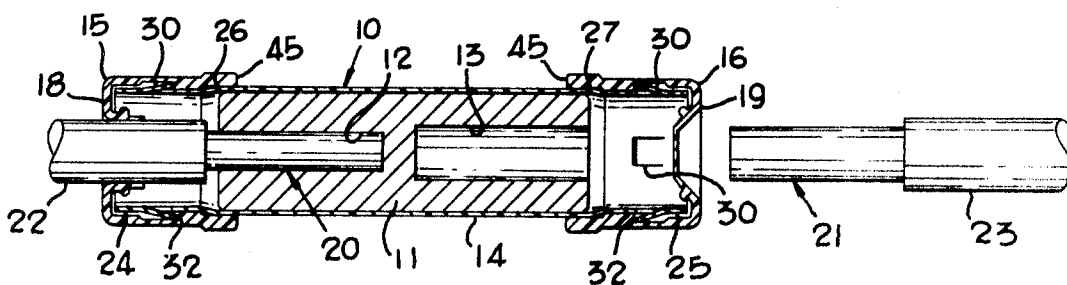


FIG. 1

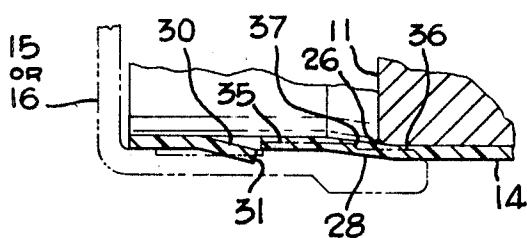


FIG. 3

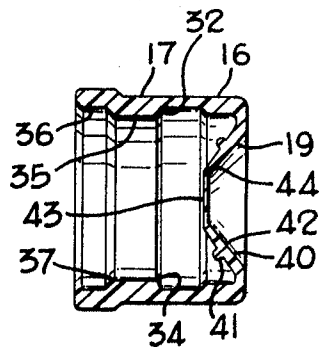


FIG. 2

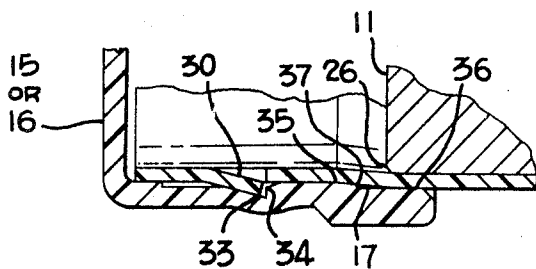


FIG. 4

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INSULATED ELECTRICAL CONNECTOR SLEEVE

BACKGROUND OF THE INVENTION

This invention relates in general to an electrical connector, and in particular, to a compression connector having an insulating sleeve extending between the connected conductors.

Inherent in the provisions of insulation for the compression type of connector is the problem of retaining the insulation sleeve in place, both before and during the crimping process. For example, unless the insulation sleeve is held securely in place before crimping, it may be misaligned when crimping occurs. An attempt has been made to overcome this problem in the past by providing the interior sleeve of the connector body with a groove around its middle part and the insulating sleeve with a compatible rib portion. Obviously, such formations require a special connector and possible, a shaped insulation sleeve and, for this reason, are expensive.

Another aspect of this problem is the tendency of the insulating sleeve and the connector to be deformed unevenly during the crimping process. Uneven deformation tends to break the insulation seal and, even though the electrical insulation may be preserved, the ingress of moisture into the vicinity of the connected parts which may result, is highly undesirable. There is also the likelihood that the insulation sleeve may be distorted into an elliptical configuration during the crimping process, thereby rendering the seal between the insulation sleeve and the conductor less effective.

In the past, expandable, frangible C-rings have been located on the insulation sleeve in compatible grooves formed thereon, in an attempt to provide the necessary alignment means for locating the compression tool used for crimping. The provision of such breakable locating rings and the requisite seating therefor adds an unnecessary complexity to the connection.

SUMMARY OF THE INVENTION

The present insulated connector includes an insulation sleeve which has a substantially constant initial diameter as manufactured. A portion of the sleeve is operatively distended over the connector body.

The insulation sleeve is provided with tightly fitting snap-on end caps which are rupturable to admit the conductors and yet which maintain an effective seal between the conductors and the caps. The configuration of the caps is such that superior sealing is maintained between each cap and the connector sleeve. Further, the caps provide spaced shoulders suitable for aligning the compression tool.

The connector includes a cylindrical connector body having an end-open socket adapted to receive a conductor and an insulating sleeve which includes a portion disposed about the body and a portion overhanging and extending beyond the body.

The insulating sleeve has an initial diameter less than the diameter of the cylindrical body, and the sleeve is thereby operatively retained in distended relation about the body.

Cylindrical end caps overfit and embrace the sleeve, the caps including circumferential sealing means having an initial diameter less than the operative external diameter of the embraced portions of the sleeve.

Snap fastening means interconnects each end cap and the sleeve, each snap fastening means including operatively engaging stop means circumferentially disposed about the sleeve, and abutment means circumferentially disposed about the inner surface of the cap. The stop means includes a plurality of circumferentially disposed resilient lugs, each being cut and bent outwardly from the sleeve.

Each end cap includes an end wall having a concentric reinforcing ring defining a rupturable portion, the rupturable portion including concentric inner and outer portions adapted to be substantially equal in diameter to the conductor and the conductor insulation respectively.

The insulating sleeve includes a circumferential, transition portion extending outwardly and tapered from each end of the body. The cap is held in embracing sealed relation against the transition portion by the snap fastening means.

A circumferential margin defined each end of the body, and the sealing means, associated with each cap, includes sealing ring portions oppositely spaced about the end body margin. The sealing ring portions of each cap has different diameters, the ring portion having the smaller diameter being located on the overhanging portion of the sleeve.

BRIEF DESCRIPTION OF THE DRAWING:

FIG. 1 is a cross-sectional view of the connector assembly before crimping, with one conductor in place and one conductor about to be placed;

FIG. 2 is an enlarged cross-sectional view of an end cap before emplacement;

FIG. 3 is an enlarged fragmentary detail illustrating the diametrical relationship between the sleeve and end cap before the sleeve is placed, and

FIG. 4 is a view similar to FIG. 3, showing the connector and end cap after emplacement of the end cap.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now by characters of reference to the drawing, and first to FIG. 1, it will be understood that the connector generally indicated by numeral 10 includes a metal cylindrical body 11 having opposing sockets 12 and 13, and an insulating sleeve 14. Cylindrical end caps 15 and 16 are provided at opposed ends of the connector assembly.

The connector 10, as indicated in the drawing, is primarily intended as an adapter connecting conductors 20 and 21. To further this end, the sockets 12 and 13 are of a size sufficient to permit the conductors 20 and 21 respectively, to be received therein by a push fit.

The insulating sleeve 14 is preferably extruded from a weather resistant nylon material and has an initial, internal diameter less than the diameter of the connector body 11 so that when the connector body 11 is pushed inside of the insulating sleeve 14, the insulating sleeve 14 is distended, or stretched about the body 11. The body 11 is shorter than sleeve 14 so that the sleeve 14 has overhanging end portions 24 and 25. The overhanging end portions 24 and 25 of the sleeve 14 through which the connector body 11 is initially pushed returns substantially to its original diameter. The connector body 11 is retained within the sleeve 14 because of the stretching of the sleeve 14 disposed about the body 11 and also because of the tapered step in the sleeve 14 which is formed outwardly of the end of the body 11 in the vicinity of the circumferential margins 26 and 27 defining each end of the connector body 11. It will be noted that the end margins 26 and 27 are chamfered in order to facilitate the insertion of body 11 into the insulating sleeve 14.

It will be further noted that the connector body 11 has a constant external diameter throughout its length and that the initial diameter of the insulating sleeve 14 is likewise of a constant diameter throughout its length. This feature produces a connector 10 of unique simplicity and reduces the cost of parts to a minimum.

Each end cap 15 and 16 is held in place on the connector 10 by a snap fastening means provided between each cap and the associated overhanging end portions 24 and 25 of the sleeve 14 respectively. The cylindrical sidewalls 17 of the end caps 15 and 16 are substantially similar and coaxial with the sleeve 14 in a substantially identical fashion, and for this reason, the same reference numerals are used to denote similar parts. The end walls 18 and 19, on the other hand, are different to the extent that they are adapted to receive a different size conductor, as will be described later.

Each snap fastening means includes a stop means provided on the sleeve 14, and an abutment means formed on the inside surface of the end caps 15 and 16. (See FIGS. 3 and 4). The

stop means includes a plurality of circumferentially disposed resilient lugs 30 cut and bent outwardly from the sleeve 14. Each lug 30 is attached to the sleeve 14 at one end and includes a free end 31 which projects outward from the center longitudinal axis of the connector 10, and is disposed a greater distance from the end of the sleeve 14 than the attached end of the lug 30, thereby resulting in an outwardly and inwardly inclined lug 30. Each end cap 15 and 16 includes a circumferential shoulder 32, constituting the abutment means coacting with the lugs 30 to snap fasten each cap 15 or 16 to the sleeve 14.

In the operative position, the outer diameter of the circumscribing circle defining the lugs 30 is greater than the inner diameter of the circle defining the shoulder 32, said circles being concentric and operatively disposed in overlapping relation. The respective concentric circles are indicated by points 33 and 34 respectively, of FIG. 4. It will be understood that the overlapping relationship of these circles, together with the resilience of the lugs 30, permits each end cap 15 or 16 to overfit and embrace the sleeve 14. Once in place, the caps 15 and 16 are securely retained on the sleeve 14 and cannot be inadvertently removed.

Each of the cylindrical end caps 15 and 16 is overfitted on the sleeve 14 in sealed relation therewith. The structural relation between the sidewalls 17 of each end cap 15 or 16 and the insulation sleeve 14 is illustrated in FIGS. 3 and 4 as read in conjunction with FIG. 2. FIG. 3 illustrated, in phantom outline, the initial form of the sidewall 17 superimposed on the insulation sleeve 14. It will be understood that the overhanging end portions 24 and 25 of each sleeve 14 have substantially the manufactured, initial diameter. Thus, between the overhanging end portions 24 and 25 and the stretched portion of the sleeve 14, there are tapered steps 28 and 29 representing a transition between these two different size portions of the insulation sleeve 14.

The inner face of each end cap 15 or 16 includes a ring portion 36 disposed adjacent to and inwardly of the lugs 30 relative to the end of the sleeve 14. Another ring portion 36 is provided adjacent each ring portion 35 and conjoined to it by means of an annular shoulder 37. Both of the ring portions 35 and 36 have a smaller diameter than the corresponding diameter of the associated sleeve portions embraced by the ring portions 35 and 36. This relationship results in a tight seal between the sleeve 14 and the end caps 15 and 16 because of the nature of the material employed. The materials are preferably polyethylene for the caps 15 and 16 and nylon for the sleeve 14.

It will be observed by comparing FIGS. 3 and 4, that the sealing means between each cap 15 or 16 and its associated embraced end portions 24 or 25 of the sleeve 14 includes circumferentially disposed sealing ring portions 35 and 36. One of the ring portions 35 seals an overhanging end portion 24 or 25 of the sleeve 14. The other of the ring portions 36 seals the distended portion of the sleeve 14. The sealing ring portions 35 and 36 are longitudinally spaced and disposed on opposite sides of the circumferential margins 26 or 27.

It will be understood that the plurality of lugs 30 which coact with the abutment 32 operatively retain the caps 15 and 16 in a substantially fixed position relative to the sleeve 14. Further, the step between the ring portion 35 and the ring portion 36 provides an annular shoulder 37 which tends to ride up the tapered step 28 between the stretched and unstretched portions of the sleeve 14. The net result of this arrangement is that the annular shoulder 37 tends to be urged in a radial direction away from the longitudinal axis of the connector 10, and also forwardly into the tapered transition step 28. At the location indicated by numeral 37 in FIG. 4, there is a particular high concentration of pressure both transversely and longitudinally of the sleeve 14.

As has been discussed above, the ends caps 15 and 16 have substantially similar sidewall construction. The configuration of each end wall 18 and 19 is substantially similar although dimensionally different. The reason for the dimensional dis-

similarity is, that in the preferred embodiment, each of the caps 15 or 16 is adapted to suit a different conductor 20 or 21 respectively. For this reason, the description of the end wall structure will be confined to end cap 16, this cap being illustrated in enlarged detail in FIG. 2, and will suffice for the other cap 15.

The end wall 19 includes an inwardly formed frustoconical portion 40. On the interior face of the frustoconical portion 40 is a concentric reinforcing ring 41 defining a rupturable portion 42, which includes concentric inner and outer portions 43 and 44 respectively. The inner rupturable portion 43 is comparatively thinner than the outer portion 44 and has a diameter substantially equal to the diameter of the associated conductor 21 to be received within the socket 13. The outer rupturable portion 44 extends substantially to the inner margin of the reinforcing ring 41 and has a diameter substantially equal to the diameter of the conductor insulation 23. Thus in the operative position (as shown at the left of FIG. 1,) the conductor insulation is substantially sealed by the end wall, further rupturing of the end wall being limited by the thickened reinforcing ring 41.

It is thought that the functional advantages of this connector have become fully apparent from the foregoing description of parts, but for completeness of disclosure the installation of the connector will be briefly described.

The connector body 11 is pushed inside the insulating sleeve 14 and substantially centralized longitudinally within the sleeve 14. Because the connector body 11 has a greater diameter than the internal diameter of the sleeve 14, the sleeve is stretched and tends to hug the connector body 11. This stretched relationship causes the connector 11 to be retained within the sleeve 14 and moreover, the retention is enhanced because the overhanging end portions 24 and 25 of the sleeve 14 are maintained at substantially their initial diameter. Thus, any tendency for the connector body 11 to move within the sleeve 14, is positively curtailed by the stepped transition 28 between the stressed and unstressed portions of the sleeve 14.

Each end cap 15 and 16 is pushed onto its associated end portion 24 or 25 of the sleeve 14, sufficient to bring the snap fastening means into play. When the end caps 15 and 16 are pushed into position, the comparative diameters of the embracing parts of the end caps are such that the end caps 15 and 16 are tightly sealed to the sleeve. Specifically, when the snap fastening means come into play, the circumferential shoulder 37 rides up the tapered transition step 28 to provide particularly tight sealing.

The connector 10 is now ready for use and in fact is preferably supplied to the ultimate consumer with the end caps 15 and 16 in place. The conductors 20 and 21, which have their ends bared of insulation material may now be installed. As shown at the right-hand side of FIG. 1, the diameter of the conductor 21 is substantially equal to the inner rupturable portion 43 of the end wall 19. This inner portion 43 is relatively weak and may be pushed through without difficulty to permit the conductor 21 to be inserted within the socket 13. When this insertion is completed, the rupturable portion 42 is widened still further by the insulation 23 up to the boundary of the reinforcing ring 41. When the complete insertion is achieved, the reinforcing ring 41 tends to act as a sealing ring and it is slightly expanded by the insulation 23.

The complete operative insertion of a conductor is illustrated at the left-hand side of FIG. 1 and the parallel disposition of the formerly frustoconical portion of the end wall 18 indicates that good sealing is achieved between the conductor insulation 22 and the end cap 15.

When each of the conductors 20 and 21 is installed, the connector is ready for crimping by means of a suitable compression tool. The secure emplacement of the end caps 15 and 16 provides a pair of spaced shoulders 45 which may be utilized to align the compression tool during the crimping operation.

I claim:

1.

- A connector sleeve for insulated electrical conductors comprising:
- a. a cylindrical body including a socket at one end adapted to receive a conductor wire,
 - b. an insulating sleeve including
 - 1. a portion disposed in retained relation on the body, and
 - 2. an overhanging portion extending beyond the body,
 - c. a cylindrical end cap overfitting and embracing a portion of the sleeve and including a circumferential sealing means having an initial, internal diameter less than the operative external diameter of the embraced portion of the sleeve,
 - d. snap fastening means interconnecting the end cap and the sleeve to preclude longitudinal withdrawal of the cap from the sleeve, the snap fastening means including operatively engaging stop means and abutment means, one of said operatively engaging means being disposed about the outer surface of the sleeve and the other of said operatively engaging means being disposed about the inner surface of the cap,
 - e. the stop means including a plurality of circumferentially disposed lugs cut and bent outwardly from the sleeve,
 - f. the cap including an inner circumferentially disposed groove providing the abutment means, and
 - g. the lugs and groove defining circumscribing concentric circles disposed in operatively overlapping relation.
2. A connector sleeve for insulated electrical conductors comprising:
- a. a cylindrical body including a socket at one end adapted to receive a conductor wire,
 - b. an insulating sleeve including:
 - 1. a portion disposed in retained relation on the body, and
 - 2. an overhanging portion extending beyond the body,
 - c. a cylindrical end cap overfitting and embracing a portion of the sleeve and including a circumferential sealing means having an initial, internal diameter less than the operative external diameter of the embraced portion of the sleeve,
 - d. snap fastening means interconnecting the end cap and the sleeve to preclude longitudinal withdrawal of the cap from the sleeve, the snap fastening means including operatively engaging stop means and abutment means, one of said operatively engaging means being disposed about the outer surface of the sleeve and the other of said operatively engaging means being disposed about the inner surface of the cap,
 - e. the snap fastening means being operatively disposed in

- spaced relation from the end of the sleeve, and
 - f. the circumferential sealing means being disposed inwardly of the snap fastening means relative to the end of the sleeve, and including longitudinally spaced, circumferentially disposed sealing ring portions, one of said ring portions sealing an undistended overhanging portion of the sleeve and the other of said ring portions sealing a distended portion of the sleeve, the diameters of said sealing ring portions being initially less than the operative diameters of said associated and sealed sleeve portions.
3. A connector sleeve for insulated electrical conductors comprising:
- a. a cylindrical body including a socket at one end adapted to receive a conductor wire,
 - b. an insulating sleeve including:
 - 1. a portion disposed in retained relation on the body, and
 - 2. an overhanging portion extending beyond the body,
 - c. a cylindrical end cap overfitting and embracing a portion of the sleeve and including a circumferential sealing means having an initial, internal diameter less than the operative external diameter of the embraced portion of the sleeve,
 - d. the cylindrical body including opposed sockets at each end,
 - e. the insulating sleeve having an initial diameter less than the diameter of the cylindrical body to retain the sleeve about the body and including overhanging portions extending beyond each end of the body,
 - f. a cylindrical end cap overfitting the sleeve in embracing relation at each end, each cap including a circumferential sealing means, each of said sealing means having an initial, internal diameter less than the operative, external diameter of the associated, embraced portion of the sleeve,
 - g. snap fastening means interconnecting each end cap and the sleeve, each snap fastening means including operatively engaging stop means circumferentially disposed about the sleeve and abutment means circumferentially disposed about the inner surface of the cap,
 - h. the stop means at each end of the sleeve including a plurality of circumferentially disposed, resilient lugs, each lug being cut and bent outwardly from the sleeve, and each lug having an attached end and a free end, the attached lug end being closer to the end of the sleeve and closer to the longitudinal center axis of the sleeve than the free end, and
 - i. the abutment means of each end cap being provided by a circumferential shoulder.

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