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PREINSULATED ELECTRICAL CONNECTOR

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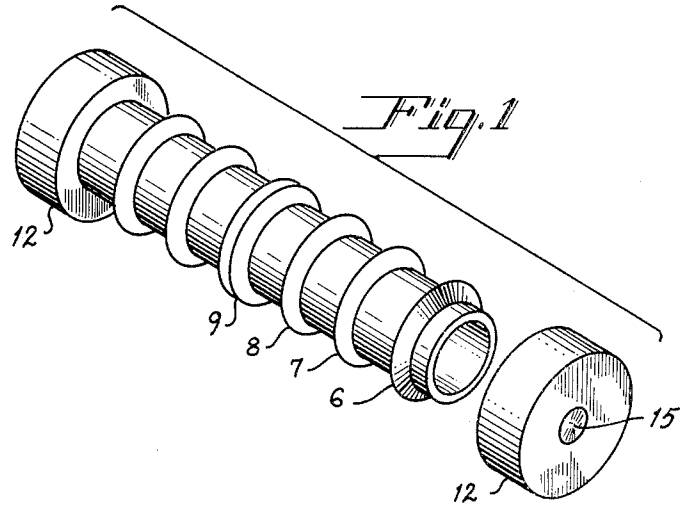

Fig. 1

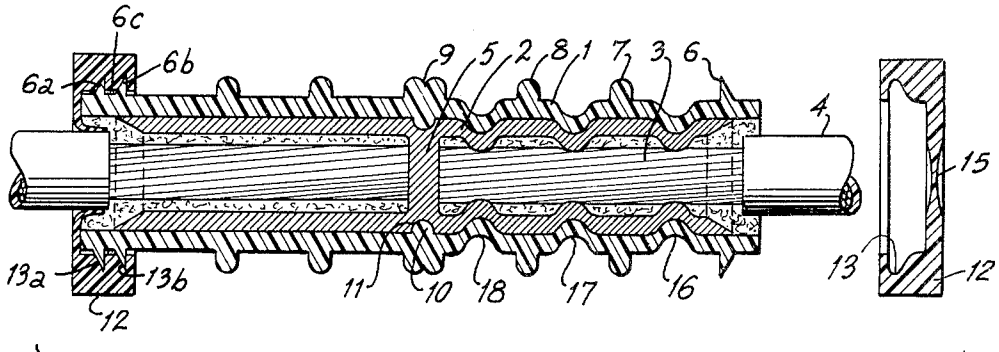

Fig 2

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PREINSULATED ELECTRICAL CONNECTOR

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Continuation of application Ser. No. 107,220, May 2, 1961. This application May 2, 1963, Ser. No. 283,131
4 Claims. (Cl. 174—84)

This application is a continuation of application Serial No. 107,220, filed May 2, 1961, now abandoned.

This invention relates to electrical connectors having tubular malleable metal bodies and coaxially disposed insulating sleeves and, more particularly, electrical connectors of the type in which the tubular body is indented or crimped to a wire through the insulating material.

These devices customarily have the metal body divided by constriction or a septum, commonly called a wire stop, into two sockets. Each socket is adapted to receive a wire therein, and the wall of the socket to be indented or crimped into the wire. Proper installation requires that a given number of crimps be made within the coextensive length of the socket and wire. If too few a number of crimps are made, then the connection will not obtain the proper pull-out value. By pull-out value is meant: the force necessary to pull the wire out of the socket. It is desirable that the given number of crimps be equally spaced apart, so as to insure their not overlapping. Overlapping would reduce the pull-out value by reducing the effective number of crimps; and would also tend to over-stress and perforate the insulating sleeve. If the sleeve is perforated, then frequently the crack tends to continue, splitting the sleeve.

In order that the given number of crimps be made in a coextensive length of socket and wire, it is necessary that the bared end of the insulated wire be initially inserted into the full length of the socket and be maintained therein throughout the crimping operation. This is customarily accomplished by stripping a measured length of insulation off the wire and inserting the wire into the socket as far as it will go. However, if an initial crimp is erroneously made over the wire stop, rather than over the coextensive length of socket and wire, a portion of the inner end of the socket will be constricted by the crimp and the wire will be pushed out of the socket, like toothpaste out of a squeezed tube. Then, even though the given number of crimps is made into the socket, the number of useful crimps into the coextensive length of socket and wire will be less than the given number, reducing the pull-out value.

The insulating sleeves are customarily made with an internal cross section which is congruent to the cross section of the barrel onto which they are to be fitted. During storage, however, the cross section of the sleeves is often distorted, which makes the eventual automatic machine assembly of the sleeve to the barrel very inconvenient.

End caps have been put on prior art connectors for various purposes: to retain an oxide inhibiting compound; to provide a water-tight joint with the wire; and to retain the wire within the connector when crimping. The caps have generally been cemented to the sleeves or force fitted in, or on the sleeve. In the first case the cap will generally disengage from the sleeve before the wire will pull out of the cap; while in the second case the strength of the cap-to-sleeve-joint is unknown, being dependent on the cement used, and on the extent to which it is applied.

An object of this invention, therefore, is to provide a tacile means of preventing a crimp from being made directly over the connector cable stop.

Another object of this invention is to provide a tactile means of externally delimiting the length of the socket into which crimps are to be made.

Yet another object is to provide a means to reinforce the sleeve to keep its cross section from deformation before the sleeves are assembled to the metal barrel; and to prevent the spread of cracks and the splitting of the sleeve.

Still another object is to provide a means to secure an end cap to the sleeve with a given pull-off value.

A feature of this invention is an electrical connector having a malleable metal barrel divided by a wire stop into two sockets, an insulating sleeve coaxial and interlocked thereto, and an end cap at each end of the sleeve; wherein an external annular bead or beads are provided on the sleeve over the wire stop to prevent crimping therein and to cooperate with the end caps to delimit the length of socket to be crimped; a plurality of external, integral, annular beads are provided substantially uniformly over the length of the sleeve to reinforce the cross section of the sleeve and bar the spreading of cracks through the length of the sleeve; and a pair of interlocking beads and grooves are provided on the cap and sleeve which serve to delimit the area of application of adhesive and prevent the loss of the adhesive during assembly.

These and other features and objects of the invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a pre-insulated electrical connector having end caps in accordance with the principles of this invention; and

FIG. 2 is a cross sectional view of the connector and its associated end caps, with the one portion shown in a crimped condition while the other portion is shown prior to crimping the connector to an inserted conductor.

In the drawings, reference character **2** indicates a malleable metal barrel having a wire stop **5** which limits the penetration of the wire into the barrel and forms a pair of wire receiving sockets. Coaxial about the barrel **2** is an insulating sleeve **1** which extends beyond the ends of the barrel **2** and has an internal bead **10** which is accommodated by a groove **11** in the barrel. During assembly the sleeve is slipped onto the barrel and the bead snaps into the groove. The bead and groove thus serve to locate and lock the barrel and sleeve together. Obviously, other locating and locking schemes might be used. Oxide inhibiting compound may be disposed within the barrel and end caps **12** are provided to retain the compound. The end caps may be made of an insulative, resilient material so as to grip the sleeve and wires as will be shown herein below. The insulative sleeve may be of any well known material, such as nylon, which has the physical characteristics of transmitting the compressive forces of crimping.

The sleeve has molded integrally therewith a substantially uniformly spaced apart series of circumferential beads or ridges, as at **6**, **7**, **8** and **9**. The beads act as a reinforcement for the sleeves when they are in loose storage and prevent them from developing a deformed cross section. By providing sleeve portions of increased cross section, these beads also effectively prevent the spreading or propagation of cracks in the sleeve caused by puncturing the sleeve during the crimping operation. Obviously separate circumferential rings, internal or external to the sleeve, may be used to reinforce the sleeve against deformation, although such nonintegral beads would not be effective as crack barriers.

The beads also function as tactile guides for the crimping tool during the crimping operation; and may be made of such height as to prevent their being accommodated

by the crimping tool. They may ayso be made with a rounded or sloped surface so that if the tool is applied to the side wall of the bead it will slide down into the valley between adjacent beads. Thus only one crimp will be made between the beads, and proper pull-out strength will be maintained. Should, somehow, an overlap of crimps occur, breakdown of the insulating sleeve material may be avoided by material of the bead flowing to reinforce the thin sleeve portion.

The bead 6 adjacent to each end of the sleeve may be of triangular cross section to interlock with a groove 13 in the end caps 12, as shown in the right hand portion of FIGURE 2. A preferred modification is shown in the lefthand portion of FIGURE 2, having two grooves 13*a* and 13*b*, and two beads 6*a* and 6*b*. A film of adhesive is conveniently applied between the two beads, as at 6*c*. This arrangement permits the application of a uniform quantity of adhesive and permits the cap to be attached without squeezing the adhesive out of the joint area. Obviously different cross sections may be used, and the groove and bead may be reversed. The cap is thereby locked in place with a pull-out strength which is a predetermined function of the height and cross section of the bead and the type and applied area of the adhesive; and a water-proof seal is made wtih the sleeve.

The annular bead or beads 9, which is provided over the wire stop 5, serves as tactile means of preventing a crimp from being made in the wire stop, which would constrict the adjacent end of the socket and would thereby push the wire out of the socket, reducing the coextensive elngth of the socket and wire.

As shown in FIG. 2, the end cap 12 is interlocked to the end of the sleeve 1 so that the face of the end cap directed towards the center of the connector is coplanar with the end of the uniformly thick wall portion of the socket. Thus, the annular bead 9 and the bead proximate face of the end cap serve to externally and tactilely delimit the length of the socket into which crimps are to be made.

An area of reduced thickness 15 is molded into each end cap 12, through which is disposed an insulated wire 4 having a bare end 3. Due to its resilient characteristic, the cap material surrounding the wire grips and retains the wire and forms a water-proof seal therewith.

The connector is installed by first placing the end caps 12 on the ends of the sleeve 1 so that groove 13 interlocks with bead 6. Wire 4 with bare end 3 of a proper length is disposed through the reduced cross sectional area 15 of the cap, the end of the wire 3 abutting the wire stop 5. The crimping tool is then applied between adjacent beads 7, 8 and 9. It should be noted that the edge of cap 12, directed towards the center of the connector also acts as a bead for guiding the crimping tool with respect to adjacent bead 7. Crimps at 16, 17 and 18 join the wire to the connector.

Although, in FIG. 2, it will be seen that the bead 6 is not spaced exactly the same distance from bead 7 as bead 8, so as to allow the face of the end cap 12 to be identically spaced from bead 7 as bead 8, for the purpose of providing tactile means to guide the crimping tool or operator; for the purposes of providing cross sectional reinforcement of the sleeve, and preventing the propagation of cracks in the sleeves, applicants consider beads 7, 8 and 9 as a plurality of substantially uniformly spaced beads over substantially the full length of the wire receiving socket portions of the sleeve.

The invention has thus been described, but it is desired to be understood that it is not confined to the particular forms or usages shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of the invention and, therefore, the right is broadly claimed to employ all equivalent instrumentalities coming within the scope of the appendant claims, and by means of which objects of the invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to obtain these objects and accomplish these results.

We claim:

1. An electrical connector for use with a crimping tool, comprising: a malleable metal barrel having a medial wire stop therein, said wire stop dividing said barrel into two conductor receiving sockets, an insulating sleeve external and coaxial with said barrel, and an annular bead on the exterior surface of said sleeve disposed substantially in the same transverse plane as said wire stop.

2. A connector according to claim 1 wherein said annular bead is formed integrally with said sleeve.

3. An electrical connector comprising: a malleable metal barrel; an insulating sleeve external and coaxial therewith; and an insulating cap for each end of said sleeve; a mating pair of beads and grooves on each said sleeve and endcap, and a layer of adhesive material disposed between the beads of each said pair of beads whereby said caps are joined to said sleeve to protect said barrel.

4. An electrical connector for use with a crimping tool, comprising: a malleable metal barrel member having a wire stop therein, said wire stop dividing said barrel member into two wire conductor receiving socket portions; an insulating sleeve member of given sleeve wall thickness disposed circumjacent the outer surface of said barrel member in substantially fixed relation thereto, said sleeve having a plurality of substantially uniformly spaced apart integral peripheral beads on the outer surface thereof spaced to receive the jaws of a crimping tool therebetween, said beads forming portions of wall thickness greater than said given thickness and extending over an area of said sleeve coextensive with substantially the full length of each of said receiving socket portions; and a pair of substantially cup-shaped end caps having the opposite ends of said insulating sleeve member inserted therein and secured thereto, wherein said plurality of uniformly spaced beads includes a pair of endmost beads located proximate the opposite ends of said barrel member, and each cap includes an annular end rim surface disposed in a substantially radial plane spaced from the proximate endmost bead a distance substantially equal to the spacing distance between said uniformly spaced beads.

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