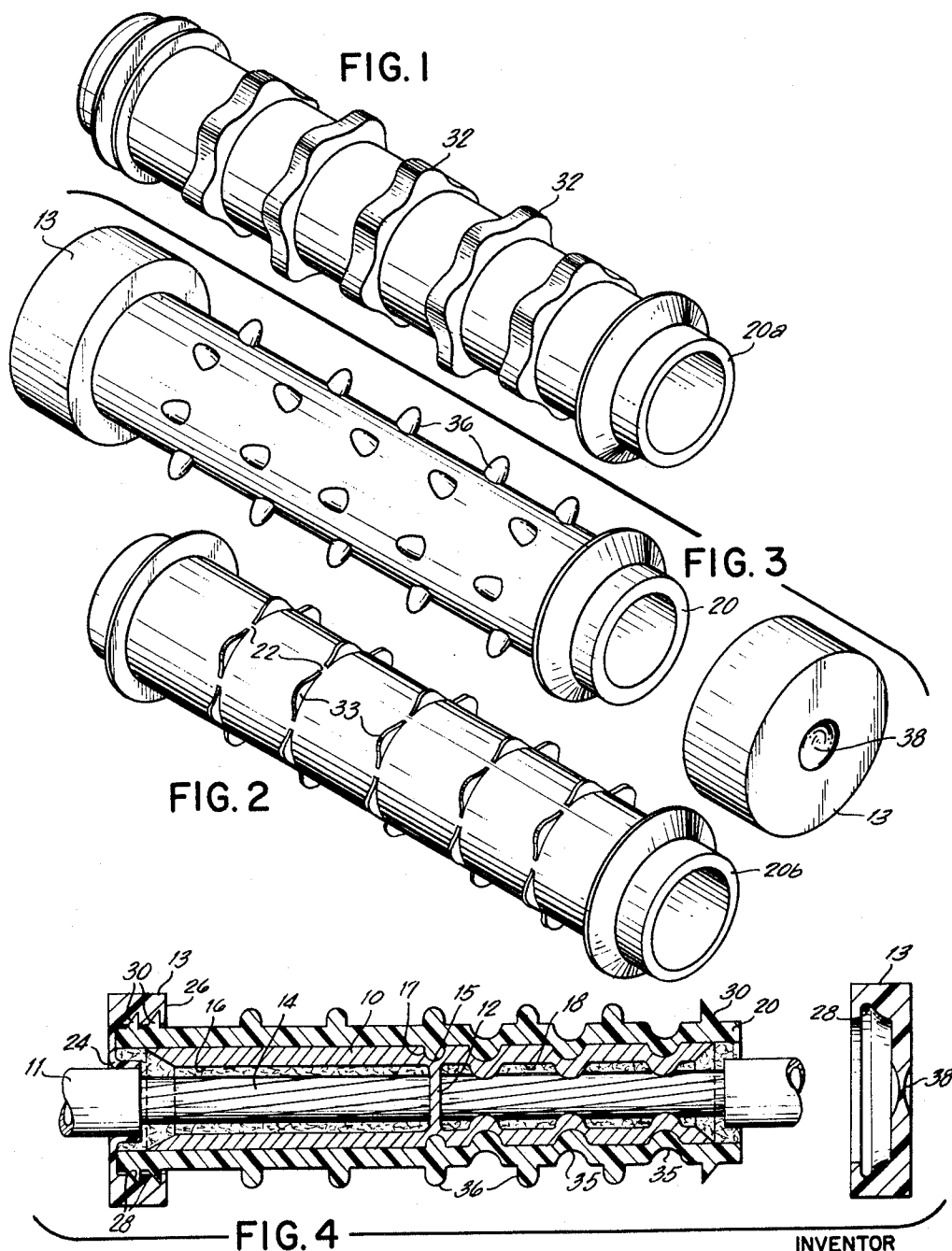


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CRIMPABLE INSULATED CONNECTOR WITH CRIMPING
TOOL LOCATING MEANS
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CRIMPABLE INSULATED CONNECTOR WITH CRIMPING TOOL LOCATING MEANS

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

In connectors of this type in which a number of longitudinally spaced crimps are successively formed, it is desirable that the crimps be uniformly spaced apart. Uniform spacing avoids overlapping or excessive spacing between adjacent crimps, both of which tend to reduce the strength of the crimped connection and also may overstress and tear or puncture the insulating sleeve.

An insulated connector of this type is known in which the insulating sleeve is provided with a plurality of peripheral ridges for positioning and spacing the successive crimps. The ridged sleeve fully performs its stated functions, namely guiding and positioning the crimping tool, inhibiting longitudinal cracking and tearing of the sleeve during crimping, and increasing the strength of the tube to preserve its circular cross-section during storage independent of the inner metal tube. But it has been learned that with some insulating materials used in this configuration, transverse cracks are produced at the base of the ridges on the sleeve during crimping.

Accordingly it is a principal object of this invention to provide an insulated electrical connector having improved means for positioning a crimping tool while inhibiting longitudinal and transverse cracking of the insulating cover.

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

FIGURE 1 is a perspective view of an electrical connector having crimping guides formed in accordance with this invention;

FIGURE 2 is a perspective view of an insulated electrical connector showing another embodiment of the invention;

FIGURE 3 is a similar perspective view showing yet another embodiment; and

FIGURE 4 is a longitudinal cross-sectional view of the connector of FIGURE 3 with conductors inserted, showing its condition before and after crimping.

Referring now more particularly to the drawings, reference numeral 10 indicates a malleable metal tube having an axial obstruction or partition 12, which limits the extent of insertion of a conductor such as 14 into the tube, and, in the embodiment illustrated, forms a pair of conductor receiving sockets 16 and 18. Coaxial about the tube 10 is an insulating sleeve 20 extending over the full length of the tube, the tube and sleeve in combination forming an insulated electrical connector for use with a compression tool.

The tube may be provided with an external groove 15 adapted to engage an internal bead 17 on the sleeve to hold the two together, although other interlocking or fastening means may be used. An oxide inhibiting compound may be disposed within the tube to insure good electrical connections, and a pair of end caps 13 provided to retain the compound. The end caps may be made of an insulating, resilient material so that an internal groove or grooves 28 may be snapped into place over a peripheral

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bead or beads 30 on the sleeve ends to lock the caps thereto, and so that the conductors to be inserted into the sockets may be inserted through the caps as will be described below. The insulating sleeve may be of any well known material, such as nylon, which is adapted to transmit compressive crimping forces without rupturing.

The outer surface of the sleeve 20a bears a series of integrally molded, substantially uniformly spaced apart, sets of radial projections such as the peripherally scalloped ridges or beads 32, shown in FIGURE 1. In the embodiment shown in FIGURE 2, the low points or valleys 22 between the fin-shaped projections or scallops 33 on the surface of sleeve 20b, are made flush with the outer sleeve surface, producing in effect, a series of axially spaced rings of independent radial projections. FIGURE 3 represents a still further modification, in which the radial projections are in the form of roughly conically-shaped nubs 36.

The projections function as tactile guides for positioning the crimping tool on the sleeve. They may be made of sufficient height so as to prevent their being accommodated within the jaws of the tool, to insure engagement of the jaws on the sleeve in between adjacent sets of projections only. To enhance their positioning operation, the projections may also be made with tapered or sloped transverse side surfaces as in FIGURES 2 and 3, so that adjacent projections form a guide for affirmatively positioning the jaws of a crimping tool between them. The projections thus insure that each succeeding crimp will be properly spaced from the preceding one.

By providing sleeve portions of increased cross-sectional area, i.e., the inner diameter of the sleeve is substantially uniform while the outer diameter is increased in the area of the projections, the projections act to prevent the spreading or propagation of longitudinal cracks, such as are caused by crimping, by in effect providing reinforced obstructions spaced along the sleeve surface, and by providing additional material which may be drawn into compressed and weakened areas by cold plastic flow. Prevention of the spreading of longitudinal cracks is further improved by arranging alternate sets of projections in alternating angular position as in FIGURE 1, so that no unobstructed longitudinal path extends along the sleeve for more than the distance between two adjacent sets of projections.

The uniformly shaped peripheral ridges previously known, however, tend to produce stress concentrations at their juncture with the sleeve surface during crimping which often result in transverse cracks in the sleeve. This invention, by substantially reducing, or eliminating entirely, the cross sectional area of the ridges at circumferentially spaced apart points, reduces the build-up of longitudinally aligned stresses and has been found to substantially eliminate transverse cracking.

As indicated in FIGURE 4, the end caps 13 may be interlocked to the sleeve 20 so that the annular face 26 of the cap is spaced from the end-most set of projections in position to receive a crimping tool therebetween and to externally and tactilely delimit the length of the socket into which crimps are to be made. An area of reduced thickness 38, adapted to be punctured by the conductor 14 inserted therethrough, is molded into the face of each end cap. Due to its resilient characteristics, the cap material surrounding the punctured opening grips and retains the insulating jacket 11 of the inserted conductor 14, as at 24, and forms moisture-proof insulating seal. The connector is installed after the end caps have been placed on the ends of the sleeve so that the grooves 28 interlock with the beads 30. A conductor, with a bare end portion of proper length, is inserted through the reduced cross-sectional area 38 of each end cap until the end of the conductor abuts against the axial obstruction 12. A crimping tool

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is then applied between adjacent sets of projections to produce successive indentations 35. The successive crimps permanently deform the malleable tube 10 into engagement with each of the conductors to produce a secure, fully insulated electrical and mechanical connection.

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; therefore, the right is broadly claimed to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which objects of this 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.

I claim:

1. An insulated electrical connector for use with a compression tool, comprising:
 - a malleable metal tube forming a conductor receiving socket in the interior thereof;
 - a sleeve of insulating material circumjacent the outer surface of said tube;
 - said sleeve including a plurality of longitudinally spaced apart transverse cross-sectional areas having portions of increased wall thickness forming integral radial projections on the outer surface thereof for positioning the jaws of a compression tool applied thereto;

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said portions of increased thickness in each of said cross-sectional areas being peripherally spaced about the circumference of said tube and being separated by portions of less than said increased wall thickness to relieve the build-up of longitudinally aligned stresses which are otherwise caused by portions of increased thickness during crimping.

2. The electrical connector of claim 1 wherein the transversely aligned surfaces of said projections taper inwardly toward the outer ends thereof.

3. The electrical connector of claim 1 wherein each cross-sectional area defines a peripheral rib formed on the outer surface of the tube, having a scallop-shaped outer periphery.

4. The electrical connector of claim 1, wherein the projections in alternate ones of said cross-sectional areas are longitudinally aligned with each other intermediate the projections of each adjacent area.

5. The electrical connector of claim 1, wherein each of said cross-sectional areas includes a plurality of individual, elongate fin-shaped members separately positioned on the outer surface of said sleeve.

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