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ELECTRICAL CONNECTOR
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2,997,522

FIG. 1

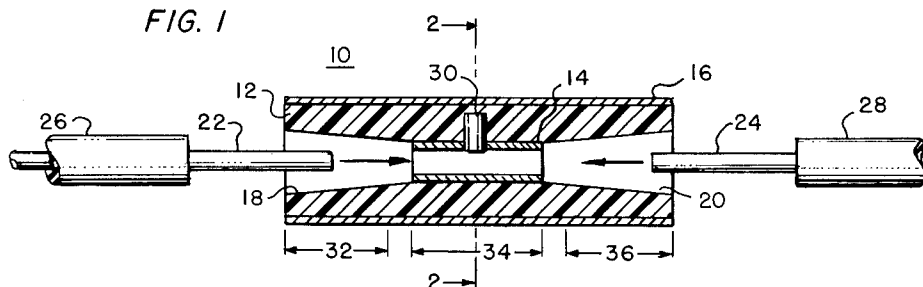


FIG. 2

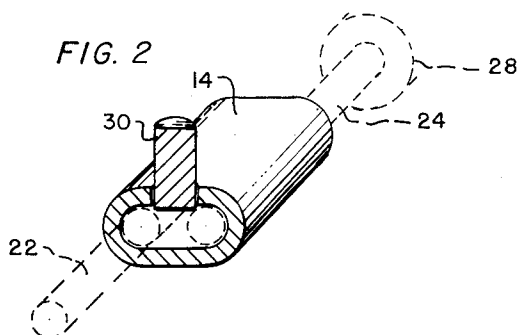


FIG. 3

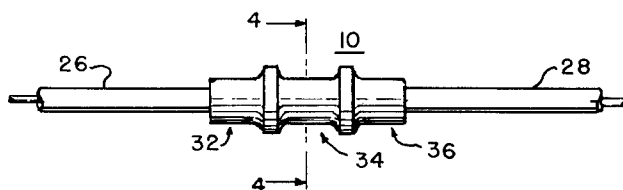


FIG. 4

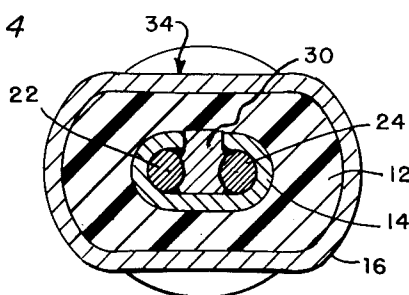
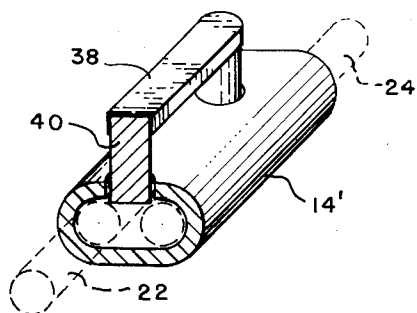


FIG. 5



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ELECTRICAL CONNECTOR

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3 Claims. (Cl. 174-84)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

This invention relates to solderless connectors of the type used for joining the ends of electrical conductors to provide an electrical conductive joint therebetween. More particularly the invention relates to a novel pre-insulated connector which is adapted to receive the stripped ends of insulated conductors and to be crimped to provide a joint that has good electrical conductivity and is substantially water-tight.

In military field operation, it is frequently necessary to make a large number of electrical connections between the conductors of cables, coupling telephones and the like. Such work necessarily requires a relatively simple and certain method of making connections between conductors under adverse environmental conditions, and still provide the desired electrical connection.

It is an object of the present invention to provide a simple and effective connector that is operative to produce a joint of good electrical conductivity under a wide variety of environmental conditions.

It is also an object of this invention to provide an electrical connector which is crimped to make connection and which crimp does not recover sufficiently when the crimping force is removed whereby the contact resistance remains stable.

For a more detailed description of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, wherein;

FIG. 1 is a longitudinal section through a connector, embodying principles of this invention, applied as a coupling to a pair of conductors;

FIG. 2 is a perspective view, on an enlarged scale, illustrating the ferrule of the uncrimped connector of FIG. 1, with a cross-section area as cut at line 2-2 of FIG. 1;

FIG. 3 is a side elevation of a crimped connector;

FIG. 4 is a sectional view, on an enlarged scale, taken on line 4-4 of FIG. 3; and

FIG. 5 is a perspective view of a modification of the contact making feature of the connector.

Referring now to the drawing, FIG. 1 shows a connector 10 comprising a plastic tube 12 molded over and around a ferrule 14 made of an electrically conductive metal. The tube 12 is preferably made of an insulating material, such as nylon, in order to secure the desired physical crimping characteristics when the tube is crimped. A seamless malleable copper sleeve 16, co-extensive with tube 12, forms the outer casing for connector 10. Ferrule 14, shown in detail in FIG. 2, is in the form of a seamless tube having a generally oval cross-section and is made of a material which combines good conductivity and high strength. One example of a suitable material is a high copper alloy.

The inner periphery of tube 12 is provided at each end with tapered entrances 18 and 20 having their widest portion at the end terminals of connector 10. The tapered entrances 18 and 20 serve to guide the stripped ends 22 and 24 of a pair of similar insulated conductors 26 and 28, respectively, into opposite ends of ferrule 14 so that

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the stripped ends are positioned in spaced relationship therein.

A contact making member comprising a copper stud 30 is embedded in tube 12 and projects through ferrule 14, near the center thereof, and extends towards the stripped ends 22 and 24 positioned therein. Stud 30 is normally spaced from the stripped ends 22 and 24 and is adapted to be moved between the stripped ends and into contact therebetween by crimping of sleeve 16. The end of stud 30 which makes contact with the stripped ends 22 and 24 is rounded to provide a dull point to prevent its digging into the stripped ends when contact is made; the intent being to have the stud slide between the stripped ends without damaging the conductors and simultaneously to force the stripped ends against the inner wall of ferrule 14 so that they become wedged thereagainst. It is, of course, understood that stud 30 is of sufficient width to wedge the stripped ends 22 and 24 apart, on crimping, so that they are maintained in abutment with the inner wall of ferrule 14. The flexible quality of tube 12 permits movement of stud 30 in this fashion. The length of stud 30 is such that when it is activated by crimping, it moves into ferrule 14 a sufficient distance to contact both stripped ends 22 and 24.

In use, the end sections of conductors 26 and 28, to be joined, are stripped in the usual manner, but only for a length slightly greater than the longitudinal length of ferrule 14. Into opposite ends of ferrule 14, the stripped ends 22 and 24 are inserted in spaced relation intermediate the opposing smaller arcuate portions of the oval ferrule, as shown in FIG. 2, with stud 30 projecting through the ferrule and extending toward the stripped ends. In this position, as indicated in FIG. 1, connector 10 is crimped by a hand-tool at the sections designated 32, 34 and 36 to provide the configuration shown in FIG. 3. At sections 32, and 36, the sleeve 16 is squeezed against the insulated portion of conductors 26 and 28, respectively. This crimping operation seals the insulating material 12 around the insulated conductors in such manner as to provide a water-tight enclosure around the insulated conductors. At section 34, the crimping operation provides a good electrical connection between the stripped ends 22 and 24, as shown in FIG. 4, while increasing the mechanical strength of the splice. Early attempts to produce a connection having stable low contact resistance by crimping were unsatisfactory due to the partial recovery from deformation of the crimped side of the housing or shell. This lack of stability of the deformed section of the housing is overcome by not crimping the more rigid ferrule 14, but by jamming the copper stud 30 between the stripped ends 22 and 24. This action not only joins the stripped ends 22 and 24, but also wedges them against the inner wall of ferrule 14. Thus a rigid static structure is formed which minimizes release of the contact pressure to a measurable degree.

The embodiment depicted in FIG. 5 is similar to the embodiment shown in FIGS. 1 through 4, except that the contact making member is in the form of a staple and comprises a metal bridging bar 38 connecting a pair of identical studs 40, which perform the same function as stud 30. Studs 40 project through ferrule 14', and crimping pressure on bridging bar 38 wedges the stud between the stripped ends 22 and 24, which in turn are jammed against the inner wall of the ferrule.

From the foregoing description it should be apparent that the present invention provides a connector capable of achieving the several objects set forth in the introductory portion of the present specification. It will be understood that various sizes will be made up for use with various size conductors, and in each instance a connector can be chosen in which the stripped ends can be readily

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inserted. In other cases, it is to be noted, the connector can be adapted for coupling a plurality of connectors, in which case several ferrules would be utilized.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is therefore aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. An electrical connector adapted to receive the stripped ends of a pair of insulated electrical conductors and to be crimped to provide a water-tight electrically conductive joint between said conductors, said connector comprising a conductive metal ferrule formed to receive said stripped ends in spaced relationship therein, a tube of insulating material covering said ferrule and extending beyond the end terminals thereof, a malleable metal tube surrounding said insulating material and co-extensive therewith, an electrically conducting stud projecting through said metal ferrule and extending beyond the outer surface thereof into said insulating material, whereby, upon the crimping of said malleable metal tube, said stud is adapted to slidably move into engagement between said spaced stripped ends and wedge said stripped ends so that they are maintained in abutment with the inner wall of said ferrule.

2. An electrical connector adapted to receive the stripped ends of a pair of insulated electrical conductors and to be crimped to provide a water-tight electrically conductive joint between said conductors, said connector comprising a conductive metal ferrule formed to receive said

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stripped ends in spaced relationship therein, a tube of insulating material covering said ferrule and overlapping the end terminals thereof, a malleable metal tube surrounding said insulating material and co-extensive therewith, a pair of longitudinally spaced electrically conducting studs projecting through said metal ferrule, said studs having external terminals extending beyond the outer surface of said ferrule and connected by a bridging bar, whereby, upon the crimping of said malleable metal tube, said studs are adapted to slidably move into engagement between said spaced stripped ends simultaneously and wedge said stripped ends so that they are maintained in abutment with the inner wall of said ferrule.

3. An electrical connector adapted to receive the stripped ends of a pair of insulated electrical conductors and to be crimped to provide a water-tight electrically conductive joint between said conductors, said connector comprising a conductive metal ferrule formed to receive said stripped ends in spaced relationship therein, a tube of insulating material covering said ferrule and overlapping the end terminals thereof, a malleable metal tube surrounding said insulating material and co-extensive therewith, an electrically conducting stud projecting through said ferrule and extending toward said stripped ends, said stud being normally spaced from the stripped ends but adapted to be moved into contact with said stripped ends by crimping of the malleable metal tube, said ferrule being of a material more rigid than said stud so that, when said malleable metal tube is crimped, the ferrule remains in its original form thereby permitting the stud to wedge the stripped ends against the inner wall of said ferrule.

No references cited.