

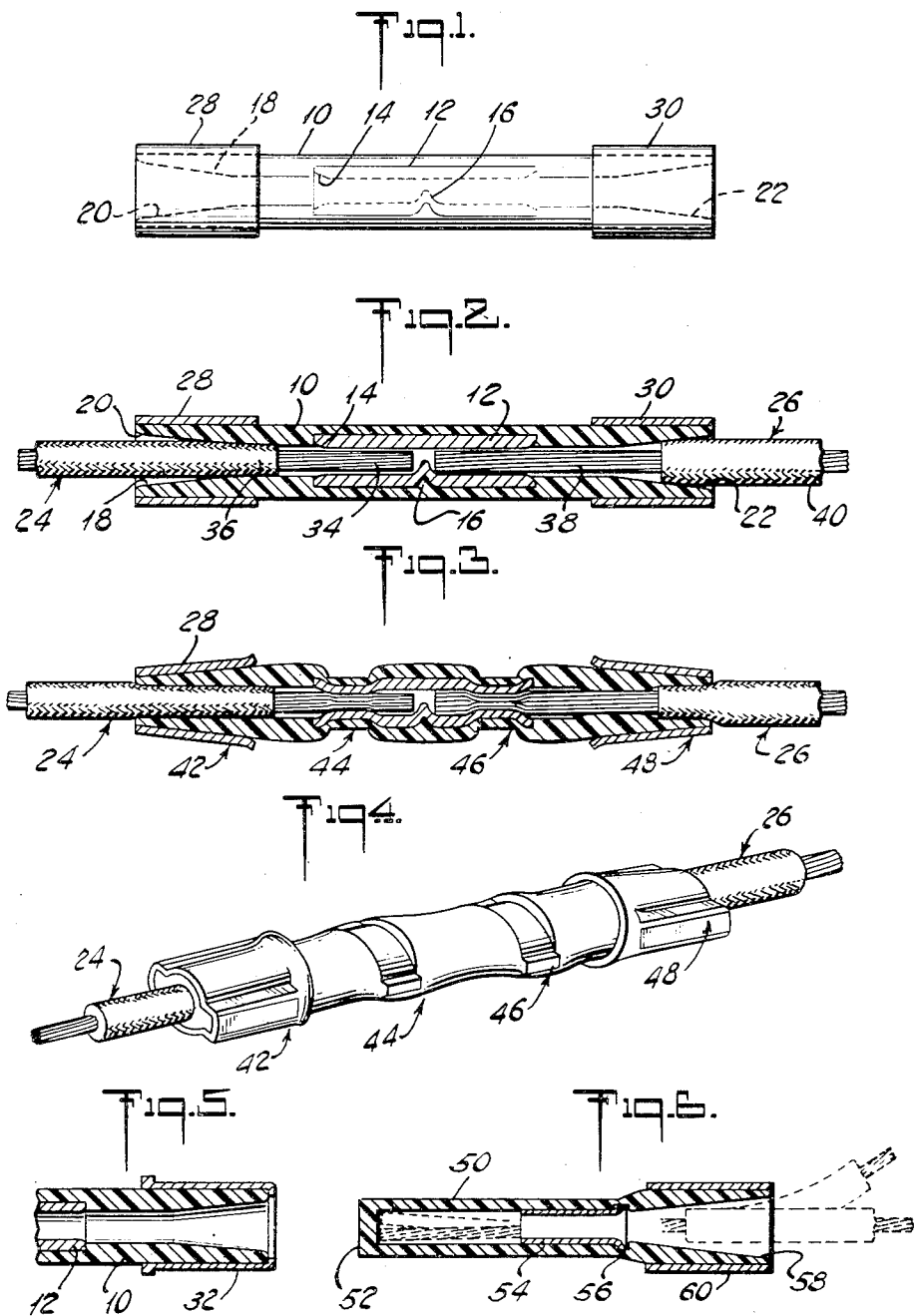
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G. T. RITTER

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ELECTRICAL CONNECTOR

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INVENTOR:
GEORGE T. RITTER

BY
Curtis, Morris & Safford.
ATTORNEYS:

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ELECTRICAL CONNECTOR

George T. Ritter, Harrisburg, Pa., assignor to Aircraft-Marine Products, Inc., Harrisburg, Pa., a corporation of New Jersey

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

To illustrate the utility of the present connector, it may be pointed out that in carrying out demolition operations by blasting, it is frequently necessary to make a large number of electrical connections between the blasting wires leading to the charges to be exploded and two or more firing wires. It is thus necessary to have for such work a relatively simple and certain method of making connections in the field. Moreover it is desirable that the connector used be operative to effect a good electrical connection between the wires under extreme environmental conditions, such as for example, at sub-zero temperatures or in moist ground or even under water. Also since the blasting wire and firing wire are frequently of different sizes, the connector should be able to accommodate different sizes of wire and still provide the desired water-resistant electrically conductive joint.

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 another object to provide a sleeve-type connector that can be crimped at exceptionally low temperatures, say -65°F. , to produce a strong joint of good conductivity. It is still another object of the invention to provide a connector which, when crimped produces a substantially water-tight joint, even when used to connect wires of different sizes. Other objects of the invention will be in part obvious and in part pointed out hereafter.

The many objects and advantages of the present invention can best be understood and appreciated by reference to the accompanying drawing which illustrates a connector incorporating a preferred embodiment of the present invention and two modifications thereof.

In the drawings:

Fig. 1 is a side elevation of the exterior of the connector;

Fig. 2 is a vertical section through the connector of Fig. 1 showing the manner in which the stripped ends of a pair of insulated conductors are inserted therein;

Fig. 3 is a section similar to that of Fig. 2 but showing the connector after crimping;

Fig. 4 is a perspective view of the crimped connector;

Fig. 5 is a fragmentary vertical section showing a modified form of crimping sleeve; and,

Fig. 6 is a vertical section through a modified form of connector wherein one end of the connector is closed.

Referring to the drawings, and particularly to Figs. 1 and 2, the connector comprises a plastic tube 10 molded over and around a sleeve or tube 12 made of an electrically conductive metal. The tube 10 is preferably made of nylon in order to secure the desired crimping charac-

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teristics when the tube is crimped at low temperatures. Particularly good results have been obtained when using a nylon manufactured by E. I. du Pont de Nemours & Co. and designated by the manufacturer as FM-3003. The sleeve 12 is preferably made of fully annealed soft electrical copper rolled up from flat stock.

As shown at 14 in Fig. 2, the ends of sleeve 12 have a slight internal flare and the plastic of tube 10 extends a short way into the flared ends of the sleeve so that the metal sleeve is firmly embedded in the plastic tube. Near the center of the sleeve, the wall thereof is indented to form a stop 16 which limits movement of the conductors into the sleeve. The interior wall 18 of tube 10 is provided at each end with a divergent taper, these tapers being hereafter referred to as tapered entrances 20 and 22. The tapered entrances 20 and 22 serve to guide the ends of a pair of conductors 24 and 26 into the connector, but more importantly serve to position the conductors properly within the connector in a manner to be described hereafter.

At the ends of the plastic tube 10, and snugly surrounding the tube are a pair of sleeves 28 and 30. The sleeves 28 and 30 are preferably made of annealed copper and in the form shown in Fig. 2 are sections of copper tubing. However, as indicated in Fig. 5 they may also be seamless drawn copper such as the sleeve 32. It should be noted that the tapered entrances 20 and 22 are axially somewhat shorter than sleeves 28 and 30 respectively, and are located within these sleeves. Also both the tapered entrances 20 and 22 and sleeves 28 and 30 are substantially spaced from the ends of conductive tube 12.

As shown in Fig. 2, the wire 24 has a stripped end 34 that is positioned within sleeve 12 close to stop 16 and a layer of insulation 36 that extends through the tapered entrance 20 into the plastic tube 10 and has an external diameter approximately the same as the internal diameter of tube 10. The wire 26, which is larger than wire 24, has a stripped end 38 extending to a point close to stop 16 and an insulating layer 40 which, being of significantly greater diameter than layer 36, engages the tapered wall of entrance 22.

As indicated in Fig. 3, the connector is crimped at four points designated 42, 44, 46 and 48. At points 44 and 46 the sleeve 12 is squeezed against the stripped ends 34 and 38 of the conductors 24 and 26, respectively to provide a good electrical connection between the conductors through the sleeve. At points 42 and 48, the sleeves 28 and 30 are crimped to a configuration best shown in Fig. 4, and during this crimping operation the ends of plastic tube 10 are molded around the insulating layers 36 and 40 of conductors 24 and 26 respectively in such manner as to provide a tight seal therebetween. It should be noted that the tapering of entrances 20 and 22 plays an important part in securing this tight seal with conductors of different diameter. Suppose, for example, that the tube 10 were made of uniform internal diameter and of such size as to accommodate the largest sized conductor that it is desired to join. Under such circumstances the smaller conductor would fit into the connector with considerable clearance and hence a tight seal could not be attained with equal degrees of crimping at the two ends of the tube. With the present structure, a seal between the plastic tube and insulation having considerable lateral width is obtained, and thus the water-resistance of the seal is exceptionally good.

Referring now to Fig. 6, a modification of the connector is shown wherein one end of the connector is closed. The connector comprises a plastic tube 50 having a closed end 52 and molded around a metal sleeve 54. One end of sleeve 54 is flared outwardly to extend into an annular groove 56 formed in the inner surface of the plastic tube 50. The tube 50 has a flared entrance 58 which is sur-

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rounded by a metal sleeve 60, similar to the sleeves 28 and 30 of Fig. 2. In the connector of Fig. 6, the stripped ends of both conductors are inserted through entrance 58 and extend through tube 54 to the closed end 52. The connector is then crimped at only two points, namely opposite sleeve 54 and opposite sleeve 60.

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. The connector is separately crimped to the stripped ends of the conductors and to the insulation thereof. Crimping of the connector can be effected for example by a tool such as that disclosed in Klingler application Serial No. 254,117, filed October 31, 1951.

Crimping of the stripped ends of the conductors provides an electrical connection therebetween and crimping of the insulation provides a water-tight seal. When different sizes of wire are used the tapered entrances of the connector ensure that the different diameter insulations of the two conductors will be in contact with the inner wall of plastic tube 12 before crimping takes place, and hence a tight seal between the plastic tube and conductor insulation is ensured when the ends of the tube are crimped.

It is of course to be understood that the foregoing description is illustrative only and that numerous changes can be made therein without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. An electrical connector adapted to receive the stripped ends of insulated electrical conductors of different sizes and to be crimped to provide a water-tight electrically conductive joint between said conductors, said connector comprising a tube made of an electrically conductive metal and formed to receive said stripped ends, a plastic tube surrounding said metal tube and extending substantially beyond the ends thereof, said plastic tube having an inner wall formed with a diverging taper at each end thereof to position the insulating layers of said conductors to insure a water-tight joint when said connector is crimped, and a metal sleeve of substantially uniform diameter snugly surrounding each tapered end of said plastic tube, said sleeves being axially spaced from the proximate ends of said metal tube and said tapers being located wholly within said sleeves.

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 inner metal sleeve adapted to receive the conductors, means within the metal sleeve for limiting insertion of the conductors, an insulation sleeve tightly surrounding the metal sleeve and extending longitudinal-

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ly of each end thereof, a recess within the insulating sleeve coextensive with the metal sleeve to retain the metal sleeve in place, an inwardly tapering internal surface in each end of the insulating sleeve, and a deformable rigid sleeve surrounding a portion of each end of the insulating sleeve within the extremities of the tapered surface.

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 sleeve adapted to receive the bare ends of the conductors, an insulation sleeve surrounding the metal sleeve and extending longitudinally thereof at each end, the insulation sleeve having a tapered wall at each end thereof, each end of the tapered wall converging from the outer extremity of the wall toward the untapered portion of the insulation sleeve and a deformable rigid sleeve surrounding each end of the insulation sleeve and extending over at least a portion of the tapered surfaces.

4. An electrical connector adapted to receive the stripped ends of insulated electrical conductors and to be crimped thereto to provide a water-tight electrically conductive joint between said conductors, said connector comprising a tube made of an electrically conductive metal and formed to receive said stripped ends, a plastic tube surrounding said metal tube and extending substantially beyond the ends thereof, said plastic tube comprising a wall, said wall being tapered at each end thereof, each end of the tapered wall converging from the outer extremity of the wall toward the untapered portion of the plastic tube and receiving the insulating layers of said conductors whereby a water-tight joint is formed when said connector is crimped onto the conductors, and a pair of metal sleeves of substantially uniform diameter one of said sleeves being disposed adjacent to each tapered end of said wall, and said sleeves being axially spaced from the proximate ends of said metal tube.

References Cited in the file of this patent

UNITED STATES PATENTS

454,181	Nash et al.	June 16, 1891
868,460	L'Hoest et al.	Oct. 15, 1907
2,098,581	Jones	Nov. 9, 1937
2,148,392	Ransone	Feb. 21, 1939
2,276,571	Grypma	Mar. 17, 1942
2,316,267	McLarn	Apr. 13, 1943
2,410,321	Watts	Oct. 29, 1946
2,429,585	Rogoff	Oct. 21, 1947

FOREIGN PATENTS

573,920	Great Britain	Dec. 12, 1945
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