

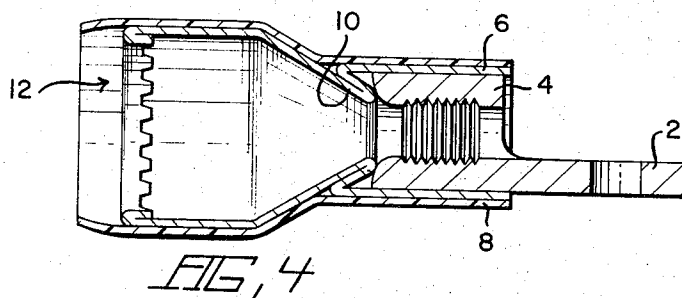
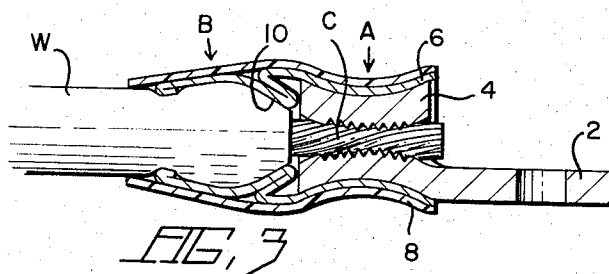
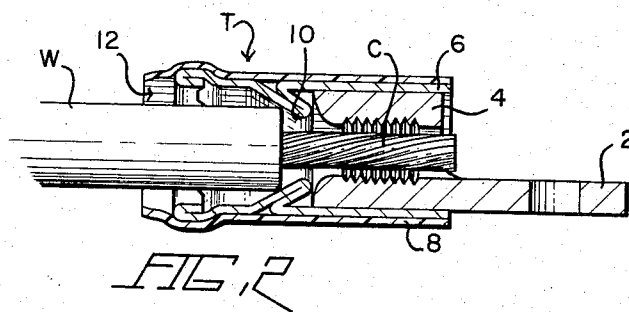
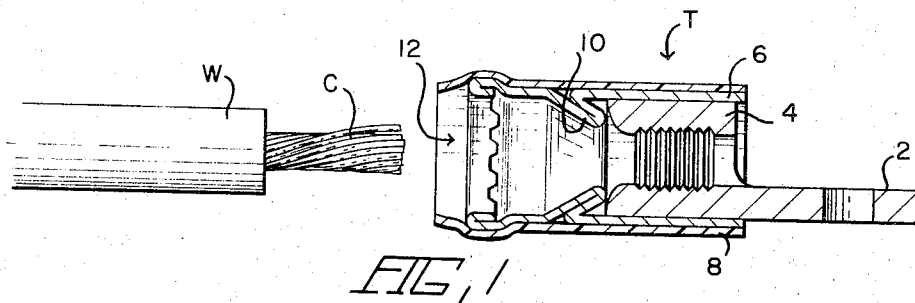
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INSULATION SUPPORT AND WIRE GUIDE FOR AN ELECTRICAL CONNECTOR

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INSULATION SUPPORT AND WIRE GUIDE FOR AN ELECTRICAL CONNECTOR

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5 Claims. (Cl. 339-223)

This invention relates to a terminal used in connecting a wire thereto. The present terminal has means to support the wire where it joints the terminal so as to prevent undue bending stresses which normally concentrate at that point. This support means is disclosed in U.S. Patent No. 2,405,111, and comprises a metal sleeve fitted over the terminal ferrule. More particularly, the present invention relates to the above terminal having funneling means to guide the wire into place in the terminal.

In high speed applications where pre-stripped lead wires are automatically applied to terminals by transfer mechanism of application tooling, some of the outer strands of the lead wires extend outwardly from the gathered strands. These strands fan out and prevent the lead wires from entering the crimping area of the terminal ferrule. In cases wherein lead wires with solid conductors are used, the ends of the conductors sometimes become bent and misaligned or are flattened at the point of cut-off. Since the lead wires are being automatically inserted into the terminals at such a rapid rate of speed, improper insertion of one lead wire into its corresponding terminal causes an improper crimping to occur and quite frequently causes the machine to jam.

Heretofore, terminals of the general type to which this invention is concerned, have been in commercial use and include funnels directly behind the crimping ferrules thereof. In these terminals, the funnel is on the insulation support sleeve and is defined by a V or U-shaped annular indent. The construction of the funnel in these terminals is unsatisfactory in a number of respects, among which are the following: the V or U-shaped groove weakens the terminal assembly particularly when a portion of the insulation sleeve is expanded for larger wire sizes; the bonding between the insulation support sleeve and the insulation thereon does not occur therebetween at the location of the groove; less crimping area is obtained; and the application of the insulation onto the insulation support sleeve is difficult because of the groove.

In the present invention, an annular projection is integrally formed in the insulation sleeve directly behind the wire entry end of the ferrule. This projection is double in thickness, and is directed inwardly towards the ferrule so as to guide a conductor into a crimping position within the crimping area of the terminal.

It is, therefore, a principal object of the present invention to provide a terminal as described above having funneling means with the insulation support sleeve to gather the strands of a lead wire and guide all of them into the terminal barrel.

Another object is the provision of a new and improved terminal which not only has a wire guide formed on its insulation support sleeve but has a strengthened support sleeve which will not buckle or collapse during the manufacture or use thereof.

Another object is to provide a terminal having more support area between an insulation support sleeve and the insulation jacket of a wire.

Another object is the provision of a terminal having more bonding area between an insulation support sleeve and an outer insulation sleeve.

Still another object is to provide a new and improved terminal having a substantially large flat crimping area not interrupted by large grooves and notches.

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A further object is to provide a terminal wherein the outer insulation sleeve is easier to assemble to the terminal by virtue of a substantially uniform exterior surface on the insulation support sleeve.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

The foregoing and other objects are achieved by a preferred embodiment of an electrical connector comprising a contact section and a ferrule section, a sleeve having a first section and a second section, the first section disposed on the ferrule section, the second section having an inwardly-directed annular fold including a forward part and an adjacent rearward part disposed substantially parallel with respect to each other, the annular fold extending toward the ferrule section at an angle with respect to a longitudinal axis of the ferrule section and provided with an inner end terminating adjacent an inner end of the ferrule, the annular fold defining a funnel.

In the drawings:

FIGURE 1 is a longitudinal cross-sectional view of a terminal in accordance with the invention;

FIGURE 2 is a view similar to that of FIGURE 1 but showing a wire entered therein;

FIGURE 3 is a view of the terminal of FIGURE 1 after crimping; and

FIGURE 4 is a view similar to FIGURE 1 but showing a portion of the terminal expanded.

Referring now to the drawings and more particularly to FIGURE 1, an electrical terminal T according to the present invention comprises a terminal connector or contact section 2 of the apertured-tongue type including a wire barrel or ferrule portion 4 coextensive therewith. A thin metal insulation support sleeve 6 surrounds barrel 4 and extends from the wire entry end thereof. An insulation sleeve 8 of suitable dielectric material is bonded or secured to support sleeve 6 constituting a pre-insulated electrical terminal. The inside surface of ferrule portion 4 is preferably serrated and the entrance thereto has an arcuate configuration.

Support sleeve 6 has a funnel 10 defined by an inwardly-directed annular projection or fold having tapered walls which converge toward ferrule 4. It is desirable that these walls be in engagement but manufacturing tolerances may provide a slight gap between walls of some funnels which is still acceptable. Funnel 10 primarily guides a conductor into proper place in barrel 4 and secondarily acts as a stop means to position sleeve 6 onto barrel 4. Sleeves 6 and 8 along ferrule portion 4 are slightly reduced in diameter to secure these sleeves on the ferrule portion. The inside diameter of funnel 10 is slightly larger than the inside diameter of ferrule portion 4.

Funnel 10 is formed by first indenting the sleeve 6 from the side while it spins on two mandrels which are disposed within the sleeve in spaced relationship. With the side indenting tool removed, one mandrel is held stationary while the other mandrel is moved axially towards the indent. This arrangement collapses the indent and directs its wall toward one end. Sleeve 6 is hardened during the formation of the funnel. After funnel 10 has been formed in sleeve 6, an annealing operation is performed on sleeve 6 to insure against the sleeve splitting

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during crimping. The resultant funnel is stronger by virtue of the adjacent walls. The sleeve may then be plated and the insulation sleeve is applied to the non-plated or plated sleeve.

Referring now to FIGURE 2, the conductor C of a wire W is easily guided into the center of wire barrel 4 because strands of the conductor which may previously have been fanned outwardly, through handling, have been pointed and directed into barrel 4.

Referring to FIGURE 3, a terminal is cold forged onto a wire W and conductor C to effect an electrical and mechanical connection. One crimp A is made directly over wire barrel 4 and another crimp B is made onto a portion of sleeve 6 which contains the insulation jacket of wire W. During crimping, funnel 10 is deformed little if any from its original shape.

FIGURE 4 illustrates a modified form of the invention wherein portions of sleeves 6 and 8 are expanded radially. This is done so that wires with substantially larger insulation jackets may be terminated. Expansion is usually done by forcing an oversize mandrel into the rearward end 12 of sleeves 6 and 8. In prior terminals, the expansion caused V or U shaped wire guides to collapse or become deformed to the point where they were no longer operable as wire guides. In the present invention, double walls of funnel 10 along with the acute angle of the funnel strengthen the wire guide and prevent its deformation during expansion.

It has been found that terminals, according to this invention, can be crimped at relatively high pressures with no detrimental effect to the connection. Funnel 10 is directed inwardly toward barrel 4 at approximately a 30° angle, therefore any excessive crimping pressure will cause the funnel to tend to flatten rather than bite into conductor C.

It should be pointed out that the present invention may be used in conjunction with connectors to splice wires together as well as the support sleeve without any insulation sleeve thereon. It should also be further pointed out that the present invention is directed to automatically feeding wires into the sleeve and barrel portions of terminals but that the configuration of the funnel means is equally applicable and advantageous to hand tool application.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein, are intended as merely illustrative and not as restrictive of the invention.

The invention is claimed in accordance with the following:

1. In an electrical connector, the combination comprising a wire barrel adapted to receive a wire conductor,

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a sleeve fitted to and extending beyond the mouth end of said barrel to support a wire where it joins said barrel, an annular projection in said sleeve, said projection having a forward edge disposed adjacent the opposite end of the barrel to position said sleeve onto said barrel and a rearward transitional slope defining funnel means together and point all strands of said conductor towards the center of said projection and guide said conductor into said barrel, said projection having an inside diameter slightly larger than the inside diameter of said barrel, said projection having a double wall section to strengthen said funnel.

2. A connector according to claim 1 wherein said transitional slope has an approximate 30° taper.

3. A connector according to claim 1 wherein said extending portion of said metallic sleeve is expanded.

4. An electrical connector comprising a wire barrel adapted to receive a wire conductor, a metallic sleeve fitted to and extending beyond the mouth end of said barrel to support a wire where it joins said barrel, and an insulation sleeve over said metallic sleeve, an annular projection in said sleeve, said projection having a forward edge disposed adjacent the opposite end of the barrel to position said sleeve onto said ferrule and a rearward transitional slope defining funnel means to direct said conductor towards the center of said projection and guide said conductor into said barrel, said projection having an inside diameter slightly greater than the inside diameter of said barrel, said projection having a double wall section in combination with an acute bend of material to strengthen said funnel.

5. An electrical connector comprising a contact section and a ferrule section, a sleeve having a first section and a second section, the first section disposed on the ferrule section, the second section having an inwardly-directed annular fold including a forward part and an adjacent rearward part disposed substantially parallel with respect to each other, the annular fold extending toward the ferrule section at an angle with respect to a longitudinal axis of the ferrule section and provided with an inner end terminating adjacent an inner end of the ferrule, the annular fold defining a funnel.

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