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ELECTRICAL CONNECTOR FOR CONNECTING AN ELECTRICAL LEAD TO THE BRAID OF A BRAID-SHIELDED ELECTRICAL CABLE

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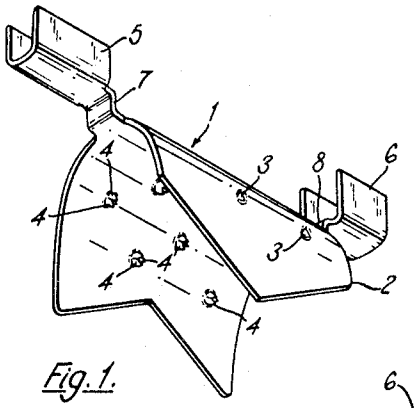

Fig. 1.

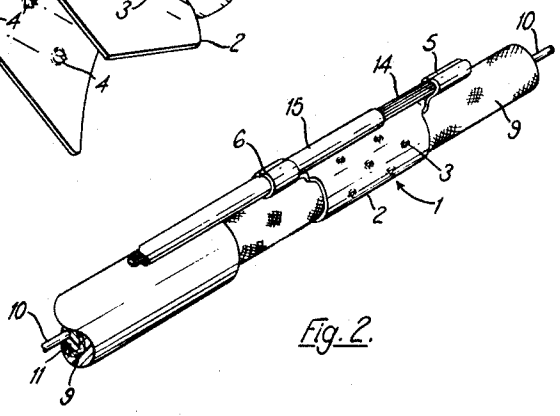

Fig. 2.

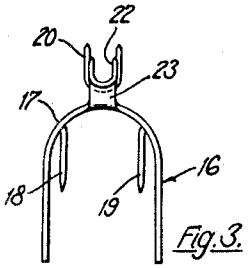

Fig. 3.

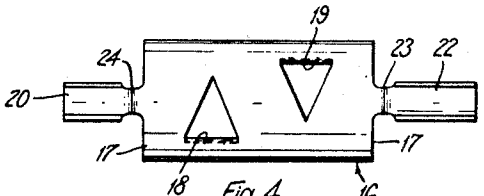

Fig. 4.

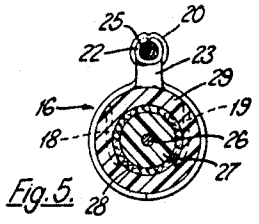

Fig. 5.

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ELECTRICAL CONNECTOR FOR CONNECTING AN ELECTRICAL LEAD TO THE BRAID OF A BRAID-SHIELDED ELECTRICAL CABLE

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9 Claims. (Cl. 174—88)

This invention relates to an improved electrical connector for connecting an electrical lead to the braid of a braid-shielded electrical cable.

It is common practice electrically to shield an electrical conductor by surrounding it with a shield of metal braid, e.g. copper braid, a layer of insulating material being interposed between the conductor and the shield, and the shield being connected by a lead to earth or to a source of constant electrical potential.

Although it is known, for connection the lead to the shield, to crimp a metal ferrule about the shield so that the end of the lead is trapped between the shield and the ferrule, the crimping pressure must be sufficient firmly to fix the lead in position and therefore tends to cause the insulating layer beneath the shield to be extruded so that the cross-sectional area of the insulating layer is reduced beneath the shield, particularly in the vicinity of the lead.

To prevent this extrusion of the layer material a metal sleeve may be introduced, before crimping, between the insulating layer and the shield. The introduction of the metal sleeve is, however, not only undesirably time-consuming and difficult but causes the braid shield to be withdrawn from the end of the conductor to such an extent as to leave a substantial portion of the conductor unshielded.

It is an object of the invention to provide an electrical connector for connecting an electrical lead to the shield of a braid-shielded cable, the connector being so constructed that the lead need not be crimped directly against the shield.

It is another object of the invention to provide a crimped electrical connection between an electrical lead and the shield of a braid-shielded electrical cable having a central electrically conductive core separated from the shield by an insulating layer, the insulating layer being substantially undeformed by the crimping pressure.

The invention provides an electrical connector comprising a first ferrule-forming portion for crimping about the shield and further ferrule-forming portions for crimping to the lead so that the lead lies alongside the first ferrule-forming portion. The further ferrule-forming portions extend from opposite ends of the ferrule-forming portion. The further ferrule-forming portions can accordingly be crimped without damaging the first ferrule-forming portion and vice versa.

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 two 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.

In the drawings:

FIGURE 1 is a perspective view of an electrical connector according to one embodiment of the invention;

FIGURE 2 is a perspective view of the connector shown in FIGURE 1 when crimped to a braid-shielded electrical cable and an insulated electrical lead;

FIGURE 3 is an end view of an electrical connector according to another embodiment of the invention;

FIGURE 4 is a plan view of the connector shown in FIGURE 3; and

FIGURE 5 is an elevational view of the connector shown in FIGURES 3 and 4 when crimped to a braid-shielded electrical cable and an insulated electrical lead, the cable being shown in cross-section.

As shown in FIGURE 1, an electrical connector **1** for electrically connecting the shield of a braid-shielded electrical cable to an electrical lead, has a first ferrule-forming portion **2** which is generally U-shaped as seen in cross-section and has a series of perforations **3** punched therein to provide lances **4** extending inwardly of the portion **2**. Two substantially axially aligned further ferrule-forming portions **5** and **6** integrally formed with the portion **2** and being generally U-shaped as seen in cross-section, extend from opposite ends of the bight of the portion **2** and are connected to the portion **2** by goose-necks **7** and **8** so as to be radially offset from the portion **2**.

FIGURE 2 shows an electrical connection in which the portion **2** is crimped about the bared end of the shield **9** of a braid-shielded electrical cable having an electrically conductive central core **10** insulated from the shield **9** by a layer **11** of insulating material. The lances **4** key into the surface of the shield **9** to prevent displacement of the portion **2** axially of the shield **9** and provide good electrical connection between the shield and the portion **2**, the portion **5** being crimped to the electrically conductive core **14** of an electrical lead having an insulating sheath **15** electrically to connect the shield **9** to the core **14**. The portion **6** is crimped about the sheath **15**, thus preventing work-hardening of the core **14** near the crimped portion **5** due to movement of the lead, since that portion of the lead which extends between the ferrules **5** and **6** is maintained in a fixed position (i.e. parallel to the cable) relative the ferrule **5**. To form the connection shown in FIGURE 2, the portions **5** and **6** are first crimped to the lead, the portion **2** being subsequently crimped about the shield **9** by crimping dies (not shown), one of which receives the portion **2** and is recessed to accommodate the lead.

According to another embodiment of the invention, an electrical connector **16** (FIGURES 3 and 4) comprises a first ferrule-forming portion **17** of generally U-shaped cross-section having triangular shaped lances **18** and **19** struck-out from the bight of the portion **17**, the lances extending generally parallel to the sidewalls of the portion **17**. Two generally axially aligned further ferrule-forming portions **20** and **22** integrally formed with the portion **17** are connected to opposite ends of the bight by goosenecks **23** and **24** respectively, so as to be radially offset from the portion **17**.

To form an electrical connection between an insulated electrical lead (FIGURE 5) having an electrically conductive core 25, and a braid-shielded electrical cable having a central core 26, inner insulating layer 27, braid shield 28 and outer insulating layer 29, the portions 20 and 22 are initially crimped respectively about the bared end of the core 25 and about the insulation (not shown) of the lead. The cable is then inserted into the portion 17 so that the lances 18 and 19 pierce the outer insulating layer 29 to lie one on each side of the shield 28. The portion 17 is then crimped about the cable, for example, by dies such as those described above, so that the lances 18 and 19 embrace the shield 28, as shown in FIGURE 5, to provide good electrical contact between the portion 17 and the shield 28 and thus between the shield 28 and the core 25.

To avoid stripping the lead end at least one of the further ferrule-forming portions may have an insulation piercing lance (not shown) arranged to be driven through the insulation of the lead to make electrical contact with the core of the lead, when the further ferrule-forming portion is crimped about the insulation of the lead.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. A sheet metal electrical connector comprising a generally U-section first ferrule forming portion for crimping about a braid-shielded electrical cable and having struck-out therefrom a series of upstanding internal lances adapted to make contact with the braid, second generally U-section ferrule forming portion oppositely directed to the first ferrule forming portion and being of smaller internal cross-sectional area than the first ferrule forming portion, a first resilient neck integrally formed with the first and second ferrule forming portions and extending from one end of each of these portions, a third generally U-section ferrule forming portion of smaller internal cross-sectional area than the second ferrule forming portion and being oppositely directed to the first ferrule forming portion, and a second resilient neck integrally formed with the first and third ferrule forming portions and extending from the other end of the first ferrule forming portion and one end of the third ferrule forming portion, the second and third ferrule forming portions being axially spaced from the first ferrule forming portion.

2. A sheet metal electrical connector comprising a generally U-section first ferrule forming portion for crimping about the braid of a braid-shielded electrical cable and having struck-out therefrom discrete groups of short upstanding internal lances adapted to key into the cable braid, a second generally U-section ferrule forming portion of smaller internal cross-sectional area than the first ferrule forming portion and directed oppositely thereto, a first resilient neck integrally formed with the first and second ferrule forming portions and extending from one end of each of these portions, a third ferrule forming portion of smaller internal cross-sectional area than the second ferrule forming portion and being oppositely directed to the first ferrule forming portion, and a second resilient neck formed integrally with the first and third ferrule forming portions and extending from the other end of the first ferrule forming portion and from one end of the third ferrule forming portion, the second and third ferrule forming portions being axially spaced from the first ferrule forming portion and being radially offset therefrom.

3. A sheet metal electrical connector according to claim 2, in which the lances of each group are disposed about the periphery of a perforation in the first ferrule forming portion.

4. A sheet metal electrical connector comprising a first ferrule forming portion having a pair of upstanding sidewalls extending from opposite edges of a web joining the sidewalls, a first upstanding lance struck-out from the material of the ferrule forming portion and extending from the junction between one sidewall and the web, substantially parallel to that sidewall, and having a length substantially equal to half the height of that sidewall, a second lance struck-out from the material of the ferrule forming portion and extending from the junction between the web and the other sidewall susbstantially parallel to that sidewall and having a length substantially equal to half the height of that sidewall, a second ferrule forming portion which is generally U-shaped as seen in cross-section and which is of smaller internal cross-sectional area than the first ferrule-forming portion and is oppositely directed thereto, a first resilient neck integrally formed with the first and second ferrule forming portions and extending from one end of the web of the first ferrule forming portion and from one end of the second ferrule forming portion, a third ferrule forming portion which is of smaller internal cross-sectional area than the second ferrule forming portion and which is generally U-shaped as seen in cross-section and is oppositely directed to the first ferrule forming portion, and a second resilient neck formed integrally with the first and third ferrule forming portions and extending from the other end of the web of the first ferrule forming portion and from one end of the third ferrule forming portion, the second and third ferrule forming portions being axially spaced from the first ferrule forming portion and being radially offset therefrom.

5. A connector according to claim 4 in which the lances are triangular and extend substantially parallel to one another and have apices directed oppositely to the second and third ferrule forming portions.

6. In combination, a braid-shielded electrical cable comprising a circular section shield of woven metal braid, an electrically conductive cable core coaxial with the braid shield, and a layer of insulating material interposed between the core and the shield; and a sheet metal electrical connector comprising a first ferule forming portion crimped about the shield of the cable and having upstanding internal lances in electrical contact with the shield but which do not penetrate the insulating material beneath the shield, a second ferrule forming portion crimped about the insulation of an insulated electrical lead, a first resilient neck formed integrally with the first and second ferrule forming portions and extending from one end of each of these portions, a third ferrule forming portion crimped about the core of the lead, and a second resilient neck formed integrally with the first and third ferrule forming portions and extending from the other end of the first ferrule forming portion and from one end of the third ferrule forming portion, the second and third ferrule forming portions each being axially spaced from the first ferrule forming portion and being radially offset therefrom.

7. The combination according to claim 6, in which the lances of the first ferrule forming portion are arranged in groups, the lances of each group being distributed about an aperture in the first ferrule forming portion, the first ferrule forming portion being crimped directly to the shield and the lances thereof keying into the shield.

8. The combination according to claim 6, in which the first ferrule forming portion is crimped about a layer of insulation surrounding the shield, the lances of the first ferrule forming portion extending through this layer of insulation and embracing the shield.

9. The combination according to claim 6, in which the first ferrule forming portion is crimped about a layer of insulation surrounding the shield, the lances of the

first ferrule forming portion being triangular in shape and being parallel to one another, the lances extending through the insulation surrounding the shield and having apices disposed on diametrically opposite sides of the shield.

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