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Campari et al.

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[54] **COXIAL CABLE CONNECTOR AND METHOD THEREFOR**

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[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

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[52] **U.S. Cl.** ..... **174/88 C;** 29/628; 29/630 A; 174/89

[51] **Int. Cl.²** **H02G 15/08**

[58] **Field of Search** ..... 174/88 C, 75 C, 89, DIG. 8; 339/89 C, 177 R, 276 R, 276 T, 276 SF; 29/628, 630 A

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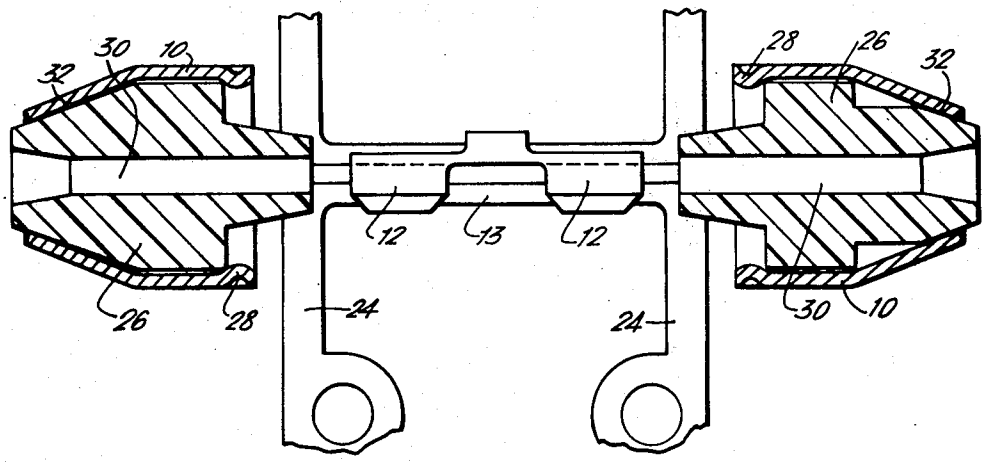
[57] **ABSTRACT**

An electrical connector for coaxial cable includes an inner ferrule and an outer tubular contact spaced from but in axial alignment with the ferrule. The ferrule and tubular contact are integrally connected by a member which is severable on crimped connection of the ferrule to the inner conductor of a coaxial cable. The tubular contact contains a spacer of electrically insulating material having an axially extending through hole. A tubular member is provided which is crimpable about the outer tubular contact when the outer conductor of the coaxial cable is positioned between the tubular member and the tubular contact.

6 Claims, 6 Drawing Figures



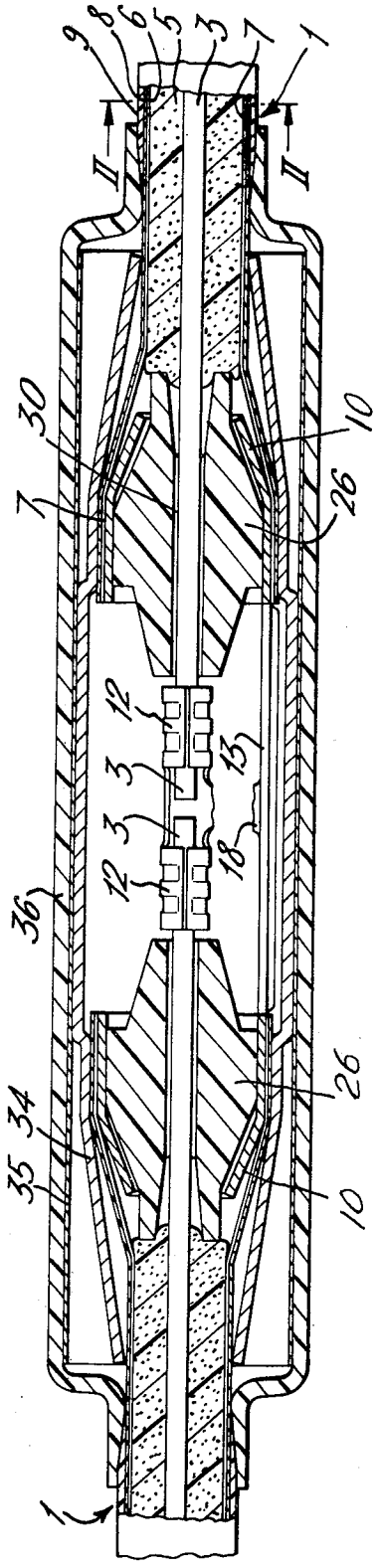


FIG.1.

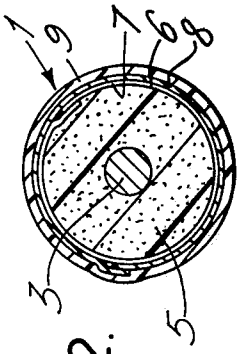


FIG.2.

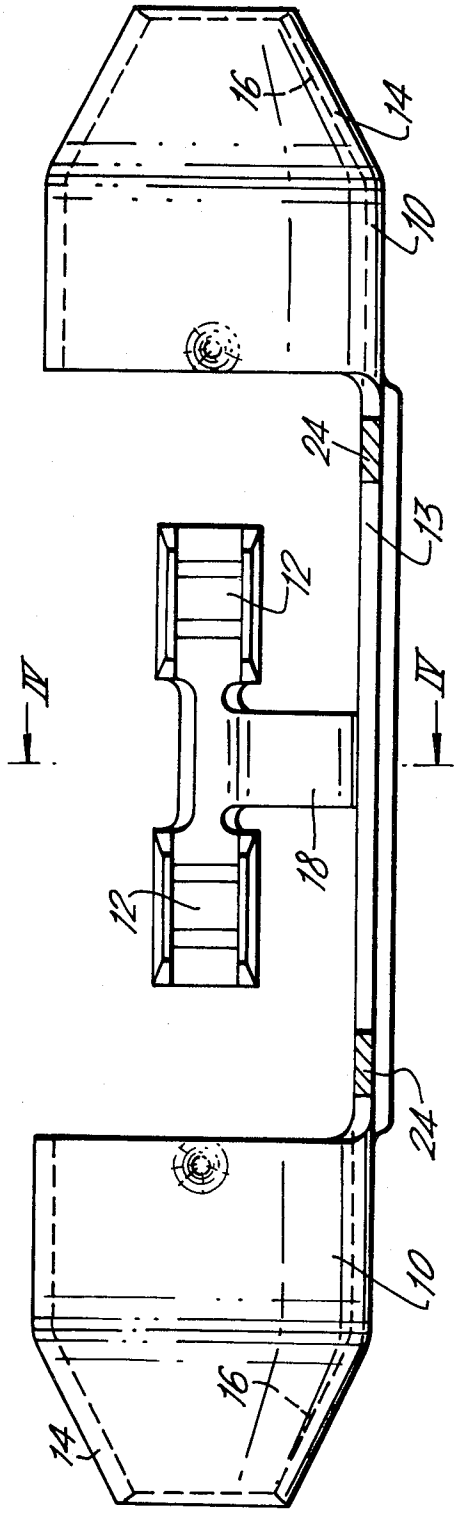


FIG.3.

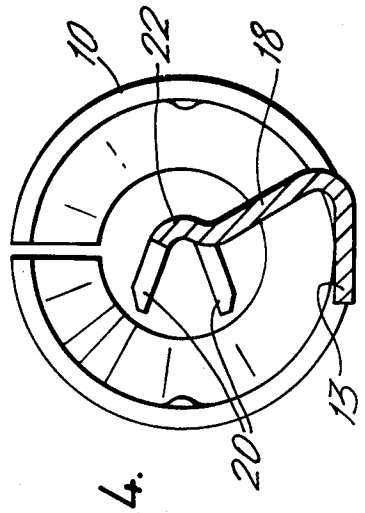


FIG.4.

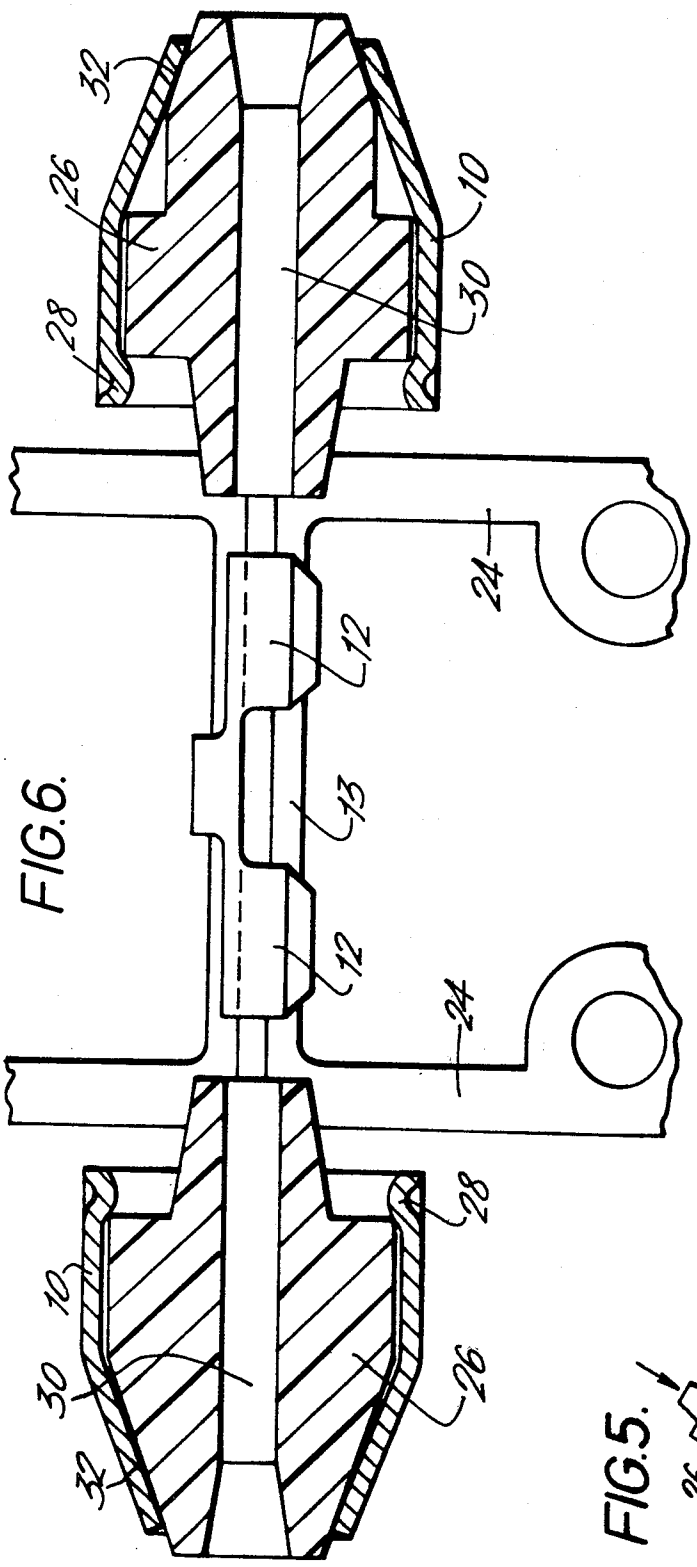


FIG.6.

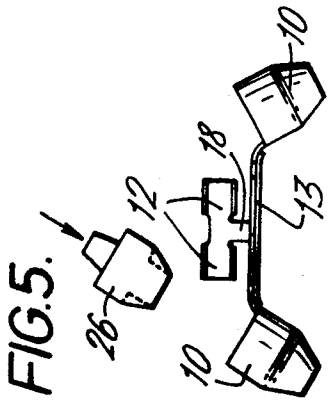


FIG.5.

COXIAL CABLE CONNECTOR AND METHOD THEREFOR

The present invention relates to electrical connectors for coaxial cable and methods of connecting electrical connectors to coaxial cable. According to one aspect of the present invention, an electrical connector for coaxial cable comprises a ferrule for crimped connection to the inner conductor of the coaxial cable, a tubular contact integrally connected to the ferrule by a member, which member is severable on crimped connection of the ferrule to the inner conductor of the coaxial cable, the tubular contact being spaced from but in axial alignment with the ferrule and containing a spacer of electrically insulating material having an axially extending through hole, and a tubular member crimpable about the tubular contact when the outer conductor of the coaxial cable is positioned between the tubular member and the tubular contact.

According to a further aspect of the present invention a method of connecting an electrical connector as defined above to the end of a coaxial cable comprises the steps of removing a portion of outer insulation sleeve from the end of the cable to expose a length of outer conductor, removing a portion of dielectric material from the end of the cable to expose a length of inner conductor, threading the tubular member over and rearwardly of the prepared end of cable, passing the inner conductor through the axially extending hole in the spacer until an end portion is received in the ferrule, positioning the outer conductor so that an end portion surrounds the tubular contact, crimping the inner ferrule to the inner conductor, severing the member, passing the tubular member over the tubular contact so that the outer conductor is sandwiched between the tubular member and the tubular contact and crimping the tubular member to the tubular contact.

Preferably, two tubular contacts are provided one at each of two opposed ends of a connecting member, the outer tubular contacts being positioned in axial alignment, and two ferrules, the ferrules being arranged in axial alingment with and between the tubular contacts and supported by a branch member integral with the connecting member, the branch member being severable when the inner ferrules are crimp connected to inner conductors of respective coaxial cables.

An embodiment of the invention will now be described, by way of example, reference is being made to the Figures of the accompanying diagrammatic drawings in which:

FIG. 1 is a view, partly in cross-section of an electrical connector connecting the opposed ends of two coaxial cables;

FIG. 2 is a cross-section on the line II-II of FIG. 1;

FIG. 3 is a side view of part of the electrical connector of FIG. 1;

FIG. 4 is a cross-section on the line IV—IV of FIG. 3;

FIG. 5 is a view similar to FIG. 3 but illustrating an assembly operation of the electrical connector; and FIG. 6 is a plan view of part of the electrical connector of FIG. 1.

As shown in FIGS. 1 and 2, a coaxial cable 1 comprises an inner conductor 3, dielectric material 5 separating the inner conductor 3 from an outer conductor 7 and an outer insulation sleeve 9.

The inner conductor 3 is a copper wire, the dielectric material 5 is expanded polyethylene, the outer conductor 7 comprises an inner tube 6 of copper and an outer tube 8 of steel and the outer insulation sleeve 9 is a treated paper.

Referring also to FIGS. 3 to 6, an electrical connector for electrically connecting the opposed ends of two coaxial cables 1 includes two outer tubular contacts 10 and two inner ferrules 12 blanked and formed from a single strip of electrically conductive sheet material, for example, brass. The tubular contacts 10 are in axial alignment and are positioned one at each end of an elongate connecting member 13. An outer portion 14 of each tubular contact is tapered to define a conical inner surface 16. A branch member 18 extends from the connecting member 13 and supports the two inner ferrules 12. The inner ferrules are in axial alignment with the tubular contacts 10. Each inner ferrule 12 has a pair of side walls 20 interconnected by a bight portion 22 to define a generally U-configuration.

After blanking and forming, a plurality of tubular contacts 10 and associated inner ferrules 12 are maintained in strip form by carrier strips 24. Whilst still in strip form successive pairs of tubular contacts are bent as indicated in FIG. 5 to permit assembly of a spacer 26 in each tubular contact 10 of the pair. Subsequent to the assembly of a spacer 26 in a tubular contact 10 a lip 28 is formed around the periphery of the tubular contact to prevent withdrawal of the spacer 26. Each spacer 26 has an axially extending through hole 30 and a conical surface 32 which engages the surface 16 to locate the spacer 26 in the tubular contact 10. After assembly of the spacers 26, each tubular contact 10 of a pair is bent back into axial alignment as shown in FIG. 6.

The electrical connector further includes a tubular member 34 of copper, a tubular shield 35 of magnetic material, for example, mild steel and an outer tubular shield 36 of thermosetting, heat-shrinkable plastics material. The tubular shield 35 is inserted within the outer tubular shield 36 and forms with it a tubular shield sub-assembly. The tubular shield 35 has longitudinal edges which overlap to allow for any decrease in diameter of the outer tubular shield 36 when heat is applied to the shield 36.

When it is desired to electrically connect the opposed ends of two coaxial cables 1, said ends are prepared as follows. Firstly, a portion of the outer insulation sleeve 9 is removed from the end of the coaxial cable 1 to expose a length of outer conductor 7. Secondly, the outer conductor 7 is trimmed so that a portion of the inner conductor 3 surrounded by dielectric material 5 extends axially beyond the outer conductor 7. Finally, a portion of the dielectric material 5 is removed from the end of the coaxial cable 1 to expose a length of inner conductor 3.

Next, the tubular member 34 and the tubular shield sub-assembly comprising the tubular shield 35 and outer tubular shield 36 are threaded over and rearwardly of the prepared end of one coaxial cable 1. Each inner conductor 3 is then passed through a hole 30 in the spacer 26 of a tubular contact 10 until an end portion is received in the inner ferrule 12 adjacent the tubular contact 10. At the same time, the exposed length of each outer conductor 7 is flared so that it surrounds its respective tubular contact 10. The inner ferrules 12 are then crimped to their respective inner conductors

3 and simultaneously the branch member **18** is severed. Next, the tubular member **34** is passed over both tubular contacts **10** thereby sandwiching each outer conductor **7** between the tubular member **34** and its respective tubular contact **10.** The tubular member **34** is then crimped to each tubular contact. Finally, the tubular shield sub-assembly is passed over the tubular member **34** and by the application of heat, the outer tubular shield **36** is bonded at each end to the outer insulation sleeve **9.**

Modifications can be made to the above described embodiment. For example, a separate tubular member **34** for each tubular contact **10** could be provided. However, mismatch impedance at the connection is minimized by having a single tubular member **34** embracing both tubular contacts **10.**

Further, a single inner ferrule **12** and complementary tubular member can be used to terminate a single coaxial cable **1.**

What is claimed is:

1. An element for use in an electrical connector for connecting the opposed ends of two coaxial cables, said element comprising a pair of ferrules arranged in axial alignment and being connected to each other, said ferrules being for crimped connection to the inner conductors of the coaxial cables, a pair of tubular contacts disposed one at each of two opposed ends of a connecting member, the tubular contacts being positioned in axial alignment with each other and with the pair of ferrules, the ferrules being disposed between the tubular contacts and supported by a branch member integral with the connecting member, the branch member being severable when the ferrules are crimp connected to the inner conductors of the coaxial cables, and a spacer of electrically insulating material disposed in each said tubular contact and having an axially extending through hole in alignment with the ferrules.

2. A method of connecting an electrical connector to the end of a coaxial cable wherein the connector comprises a ferrule, a tubular contact integrally connected to the ferrule by a member, the tubular contact being spaced from but in axial alignment with the ferrule and containing a spacer of electrically insulating material having an axially extending through hole, and a tubular member, said method comprising the steps of removing a portion of outer insulation sleeve from the end of the cable to expose a length of outer conductor, removing a portion of dielectric material from the end of the cable to expose a length of inner conductor, threading the tubular member over and rearwardly of the prepared end of cable, passing the inner conductor through the axially extending hole in the spacer until an end portion is received in the ferrule, positioning the outer conductor with an end portion thereof surrounding the tubular contact, crimping the ferrule to the inner conductor, severing the member, passing the tubular member over the tubular contacts with the outer conductor being sandwiched between the tubular member and tubular contact, and crimping the tubular member to the tubular contact.

3. A method as claimed in claim **2,** wherein the step of severing the member occurs simultaneously with the step of crimping the inner ferrule.

4. A method of electrically connecting the opposed ends of two coaxial cables with an electrical connector wherein the electrical connector comprises two tubular contacts, one at each of two opposed ends of a connecting member and in axial alignment, two ferrules arranged in axial alignment with and between the tubular contacts and supported by a branch member integral with the connecting member, and two spacers of electrically insulating material contained by said tubular contacts, each said spacer having an axially extending through hole, and a tubular member, the method comprising the steps of removing a portion of outer insulation sleeve from the end of each cable to expose a length of inner conductor, threading a tubular member over and rearwardly of the prepared end of one of the cables, passing each exposed inner conductor through the axially extending hole in the spacer of the tubular contact until an end portion is received in the ferrule adjacent the tubular contact, positioning each outer conductor with an end portion thereof surrounding a respective tubular contact, crimping the ferrules to their respective inner conductors, severing the branch member, passing the tubular member over the tubular contacts with each outer conductor being sandwiched between the tubular member and the outer tubular contacts, and crimping the tubular member to the tubular contacts.

5. A method as claimed in claim **4,** in which the step of severing the branch member occurs simultaneously with the step of crimping the inner ferrules.

6. A method as claimed in claim **4,** including the steps of threading a tubular shield of magnetic material and an outer tubular shield of electrically insulating material over and rearwardly of the prepared end of one cable prior to the crimping steps and, subsequent to crimping, passing the tubular shield and the outer tubular shield over the tubular member and subsequently sealing the outer tubular shield at each end to a portion of the outer insulation sleeve of each coaxial cable.

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