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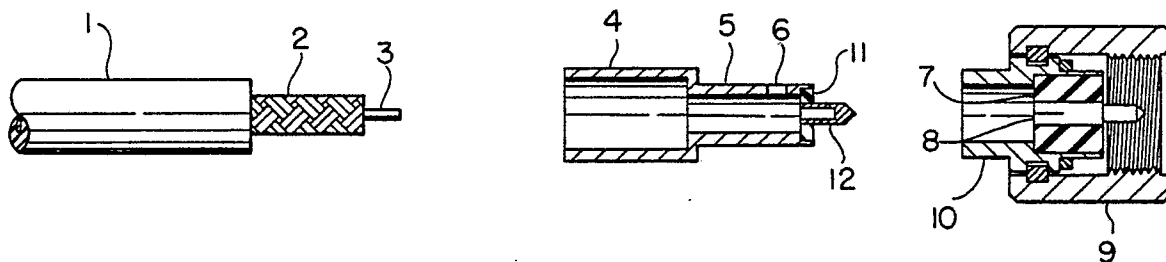
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(54) Ferrule and method for terminating a flexible coaxial cable.

(57) A ferrule for use in terminating a flexible microwave coaxial cable with a standard connector, comprises a rigid metal tube having tubular sections (4,5) of stepped diameter, fitting respectively over the jacket (1) and the exposed metallic shield (2) of the cable and secured to said jacket and/or said shield. A final tubular section (12) can be provided to fit over a central conductor (3) of the cable, this final section being insulated from the remainder of the ferrule.

FIG. 2

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FERRULE AND METHOD FOR TERMINATING A FLEXIBLE COAXIAL CABLE

This invention pertains to a ferrule and a method for using it to terminate a flexible microwave coaxial cable.

Semi-rigid cables, with their fixed inner and outer conductor diameters, have permitted simple termination methods which are very precise and which give terminated cables of good electrical performance when applied to semi-rigid cable. In these terminations, the outer metal tubular shield and the solid heavy gauge wire signal conductor are stiff, strong and tightly and easily wedged into a standard connector sized for the particular cable using a simple terminating tool by squeezing the cable and connector parts together to effect termination with a pliers-like squeezing motion. Such methods do not lend themselves to termination of flexible coaxial cables which may contain flexible new low dielectric constant materials and the inner and outer conductor diameters may be small and varied, depending upon the loss characteristics desired for a given cable size or impedance.

The invention provides termination for flexible coaxial cables, such as a microwave cable, by utilizing standard semi-rigid type connectors in combination with a metal ferrule which is soldered to the metal shields of the cable and optionally bonded to the insulation of the cable.

According to the present invention there is provided a ferrule for surrounding and supporting a flexible coaxial electric cable during hand or automatic termination to a connector comprising a concentrically fitting cylindrical electrically conducting metal tube, including sections having diameters to closely approximate the outer diameter of corresponding sections of coaxial cable prepared for termination.

According to another aspect of the present invention there is provided a process for terminating a flexible coaxial electric cable comprising the steps of, (a) trimming to selected length at an end of said cable the layers of insulative and protective jacket, metallic shield, insulation between the shield and centre conductor, and said centre conductor to locate the ends of said layers at spaced apart intervals from one another, (b) inserting the trimmed cable end into an electrically conductive metal ferrule having portions of stepped diameter sized to approximately fit said jacket and metal shield respectively, (c) soldering or otherwise conductively securing said ferrule to said metallic shield, or alternatively bonding by adhesive means said insulative jacket to said ferrule, and (d) fitting a connector to said ferrule.

According to a further aspect of the invention

there is provided a flexible coaxial electric cable having an external jacket, a metallic shield and a centre conductor insulated from said shield, and prepared for fitting to a connector, the cable having at one end thereof a rigid metallic ferrule comprising tubular portions of stepped diameter, one portion fitting closely around the jacket of the cable and another section fitting around and contacting the exposed metallic shield.

The ferrule is formed from electrically conductive, readily shapable metal commonly used in electrical wire, cable and connectors, such as copper and its alloys, including brass formulations, plated aluminium, or plated steel or other ferrous metal compositions, and shaped to fit the connector chosen for use on the cable. The end of the cable to be terminated is shaped to closely approximate the contour of the ferrule and overlap a portion of metal shielding and usually outer insulation or jacket, so that adequate bonding strength may be achieved by soldering the ferrule to the metal shielding and/or bonding if desired, such as by epoxy or other appropriate cement, glue, or adhesive, to the insulation or jacket.

The invention will now be particularly described by way of example with reference to the accompanying drawings in which:-

Figure 1 is an exploded cross-sectional view depicting a coaxial cable, a ferrule, and a connector;

Figure 1A shows a cross-sectional view of the parts depicted in Figure 1 after termination;

Figures 2 and 2A show a variation of Figures 1 and 1A, where the centre conductor of the cable is small, the ferrule includes a centre contact held by insulation in the end of the ferrule, and a standard connector, and

Figure 3 is a cross-section of a terminated cable bound within an angled ferrule to provide an angled connector.

In Figure 1, an end of a microwave coaxial cable is shown with an external jacket of insulation 1 removed from a layer of metal shielding 2, which surrounds an inner layer of insulation containing the centre signal contact 3. These parts of the cable have been trimmed to the proper length and the centre contact 3 pointed for termination with a selected connector of the known semi-rigid type. The ferrule has a section 4 of larger diameter to fit over insulation 1, where it can be adhesively bonded, and a section 5 of smaller diameter sized to fit over the metal shield 2 portion of the coaxial cable and be soldered thereto by a standard method known in the art, for example through solder ap-

erture 6.

After the solder has hardened and any adhesive present set, the now ferruled cable is inserted into sleeve 10. A hand-termination tool, well known in the art, now is used to grip the end of the ferrule after the cable and the connector parts are placed together and the end of the connector 9 between its jaws and the two parts urged together such that the end of the ferrule at termination rests against insulation block 7 and centre conductor 3 has penetrated and been firmly grasped by connector pin 8 as shown in Figure 1A, and tube wall 10 crimped to tube wall 5.

Figure 2 is similar to Figure 1, but centre conductor 3 is very small, smaller than standard semi-rigid, and its size requires increase for adequate termination in standard connectors. This is done by fitting the ferrule with a centre contact 12 of selected appropriate size affixed in the centre of a block of insulation 11 which is fitted into the small end of the ferrule. Termination of the cable can then proceed similarly as described above with Figures 1 and 1A to give a terminated cable as shown in Figure 2A.

Figure 3 illustrates a form of the invention in which the length of ferrule has been increased, terminated, and then formed at an angle so that an angled connector may be provided.

This invention thus provides a simple economical way to terminate a flexible cable by methods not normally lending themselves to such cables - a simple, cheap method for semi-rigid cable converted to use for a small, soft, flexible cable by a ferrule anchored to the cable end to be terminated. The invention lends itself to automatic termination techniques as well as to individual assembly.

Claims

1. A ferrule for surrounding and supporting a flexible coaxial electric cable during hand or automatic termination to a connector comprising a concentrically fitting cylindrical electrically conducting metal tube, characterised in that the ferrule comprises sections (4,5) having diameters to closely approximate the outer diameter of corresponding sections of coaxial cable prepared for termination.

2. A ferrule according to claim 1, characterised in that the metal is copper, a copper alloy, steel, stainless steel, or aluminium.

3. A ferrule according to claim 1 or claim 2, characterised in that one section (12) of said ferrule, for receiving therein the central conductor of a cable, is connected to the remainder of the ferrule through an insulative connection (11).

4. A process for terminating a flexible coaxial electric cable comprising the steps of trimming to selected length at an end of said cable the layers of insulative and protective jacket, metallic shield, insulation between the shield and centre conductor, and said centre conductor to locate the ends of said layers at spaced apart intervals from one another, and characterised by inserting the trimmed cable end into an electrically conductive metal ferrule having portions of stepped diameter sized to approximately fit said jacket and metal shield respectively, soldering or otherwise conductively securing said ferrule to said metallic shield, or alternatively bonding by adhesive means said insulative jacket to said ferrule, and fitting a connector to said ferrule.

5. A process according to claim 4, characterised in that the step of fitting a connector to said ferrule comprises placing said ferrule encased cable end in position for termination within a connector, grasping said connector and said cable end in the operating jaws of a termination tool, and operating said tool to seat said cable in said connector to effect termination of said cable.

6. A process according to claim 4 or claim 5, characterised in that the termination tool is a hand tool.

7. A process according to claim 4 or claim 5, characterised in that the termination tool is an automatic multiple terminating machine for electric cables.

8. A process according to claim 4 or claim 5 which is further characterised by conductively securing the centre conductor of the cable to a portion of the ferrule insulated from the remainder, prior to fitting a connector to said cable.

9. A flexible coaxial electric cable having an external jacket (1), a metallic shield (2) and a centre conductor (3) insulated from said shield, and prepared for fitting to a connector (10), characterised in that the cable has at one end thereof a rigid metallic ferrule comprising tubular sections (4,5) of stepped diameter, one section (4) fitting closely around the jacket (1) of the cable and another section (5) fitting around and contacting the exposed metallic shield (2).

10. An electric cable according to claim 9, characterised in that the ferrule includes a further stepped tubular section (12) insulated from the remainder of the cable by insulator (11) and fitting around and contacting the exposed centre conductor (3).

FIG. 1

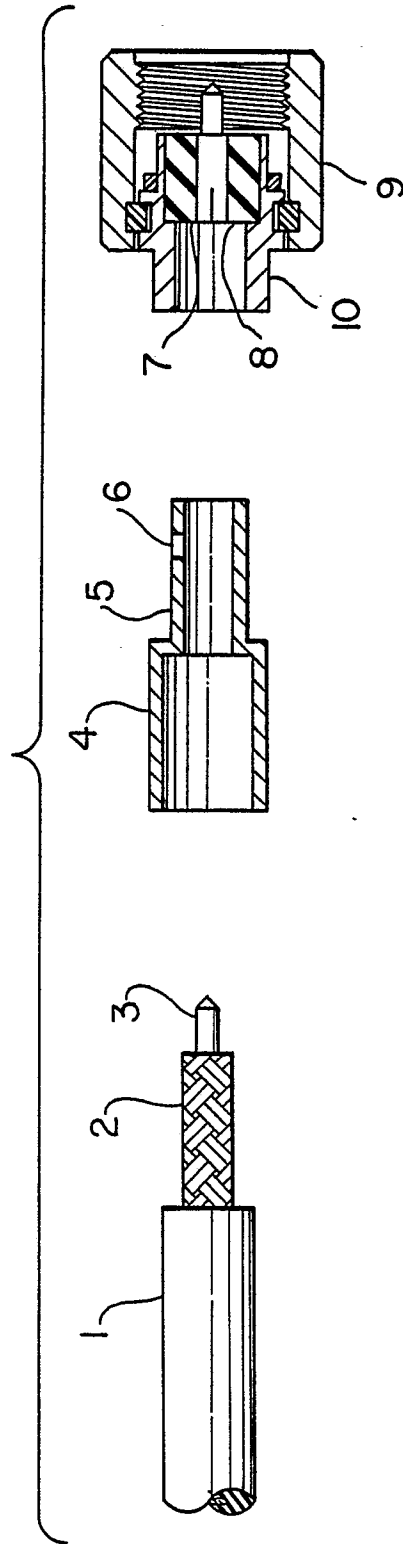


FIG. 1A

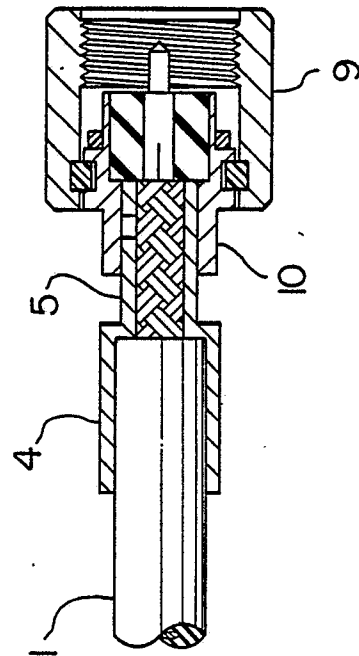


FIG. 2

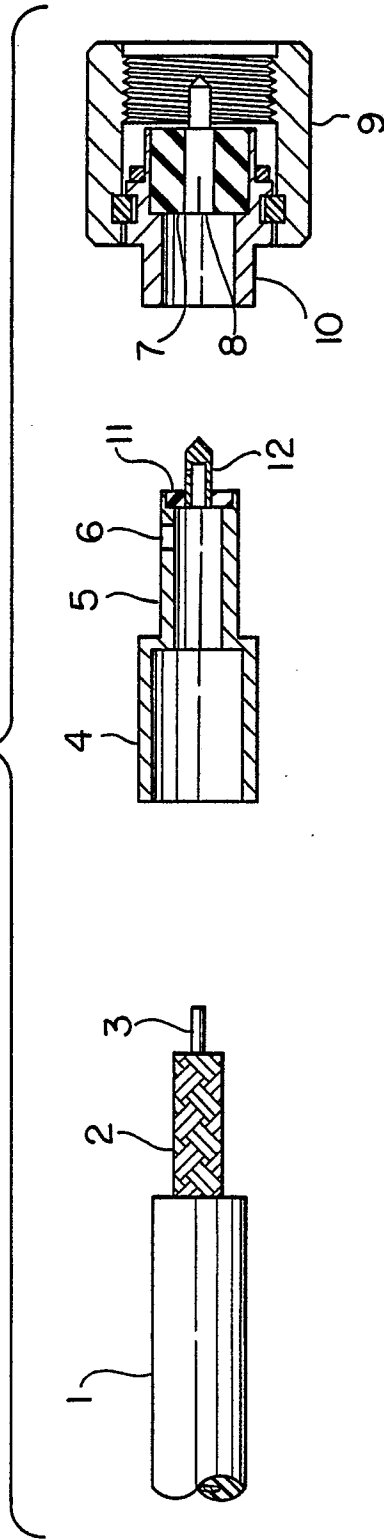


FIG. 2A

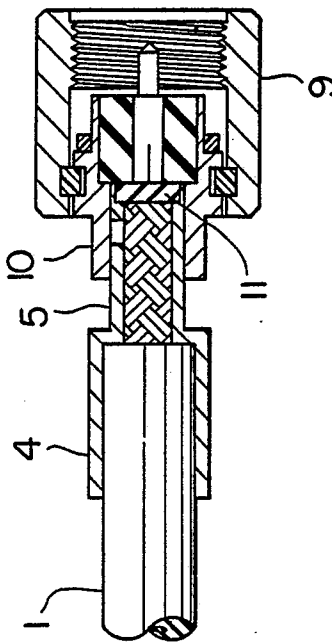


FIG. 3

