

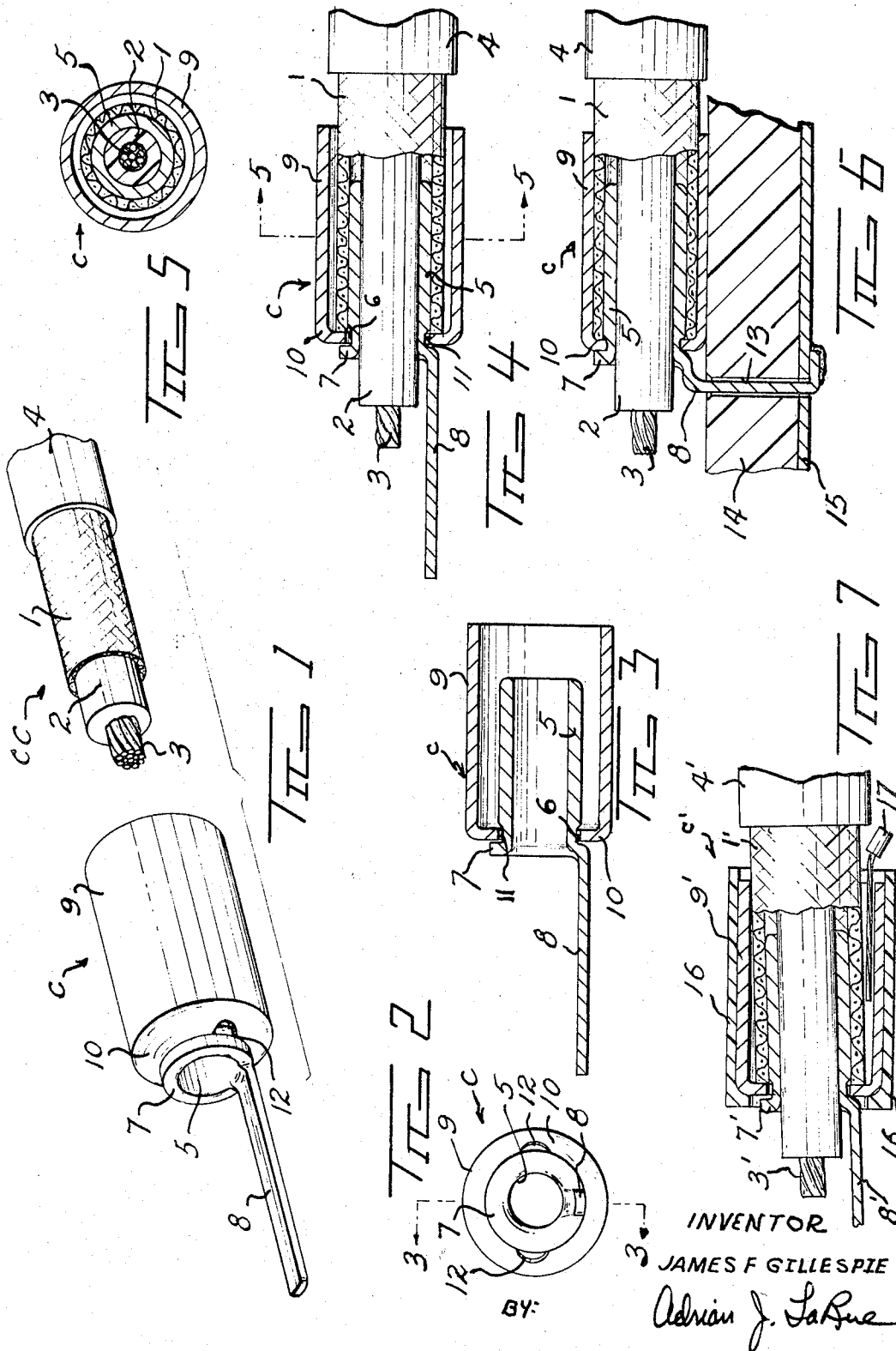
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GROUNDING CONNECTOR

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GROUNDING CONNECTOR

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8 Claims

ABSTRACT OF THE DISCLOSURE

A grounding terminal provided with an inner ferrule through which an insulated center conductor is to pass and around which an outer conductor is to engage, and an outer ferrule concentric with respect to the inner ferrule for crimpable engagement with the outer conductor, and means provided by the ferrules mounting them together including means extending outwardly from the inner ferrule to permit tilting of the sleeves relative to one another and relative to the axial center of the terminal depending on which ferrule is held stationary.

This invention relates to electrical connectors and more particularly to electrical connectors of the grounding variety for grounding the shielding of coaxial cables and shielded wires.

U.S. Patent 3,141,924 discloses a grounding connector for crimping onto the braided shield of a coaxial cable with the outer ferrule and the inner ferrule of the connector being held stationarily and coaxially spaced from one another via dielectric means and the inner ferrule or the outer ferrule is provided with an extension for connection to a conductive strip of a printed circuit board or the like. This connector has proved satisfactory with the exception that the braid is difficult to be positioned between the ferrules prior to being crimped therebetween. Also, the braid would, in some cases, pile up or become packed within the close tolerance space between the ferrules which would impede the insertion of a grounding conductor between the ferrules prior to crimping.

U.S. Patent 3,315,024 describes a grounding connector similar to that disclosed in the above-mentioned patent except that the inner ferrule is freely movable relative to the outer ferrule to facilitate the insertion of the braid between the concentric ferrules. One disadvantage to this connector is that only the inner ferrule is movable relative to the outer ferrule which limits its application. Another disadvantage of this connector is the requirement for a dielectric member on the outer ferrule which is necessary to secure the inner ferrule in position. A further disadvantage is the costly manufacture of the connector. An additional disadvantage is the lack of any means extending outwardly from the inner ferrule for electrical connection to a conductive means.

The connector of the present invention overcomes the drawbacks of the connectors described hereinabove and an object of the invention is to provide a grounding connector having inner and outer ferrules with either ferrule being movable about the axis of the connector while the other ferrule is held stationary.

Another object of the invention is the provision of a grounding connector having outer and inner ferrule members provided with means adjacent respective ends securing the ferrule members together so that either ferrule member is movable about the axis of the connector while the other ferrule member is held stationary.

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A further object of the invention is to provide a grounding connector having inner and outer ferrules movable with respect to one another and connection means extending outwardly from the inner ferrule for connection to a conductive member.

An additional object of the invention is a grounding connector having inner and outer ferrules movable with respect to one another and insulation means on the outer ferrule.

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.

In the drawings:

FIGURE 1 is a perspective exploded view of the grounding connector and a stripped coaxial cable for connection thereto;

FIGURE 2 is a front end view of the grounding connector;

FIGURE 3 is a view taken along lines 3-3 of FIGURE 2;

FIGURE 4 is a partial cross-sectional view of the grounding connector in position on the coaxial cable;

FIGURE 5 is a view taken along lines 5-5 of FIGURE 4;

FIGURE 6 is a view similar to FIGURE 4 with the grounding connector in position on a printed circuit board; and

FIGURE 7 is a cross-sectional view of an alternative embodiment of the invention.

Turning now to the drawings and more particularly to FIGURES 1 through 5, there is illustrated a connector C which is primarily for use as a grounding connector for grounding the outer conductor 1 of a coaxial cable CC. Outer conductor 1 generally takes the form of a braid and surrounds insulation 2 in which inner conductor 3 is disposed. An insulation sheath 4 covers outer conductor 1 and provides protection therefor; however, in some cases, insulation sheath 4 is unnecessary depending upon the circumstances. Coaxial cable CC is stripped as illustrated so that outer conductor 1 can be connected to connector C as hereinafter described and inner conductor 3 is bared for connection to an intended circuit.

Connector C comprises an inner ferrule 5 provided with an annular groove 6 adjacent an annular shoulder 7 which includes an integral extension 8 extending outwardly therefrom which serves as a pig-tail connection means.

An outer ferrule 9 has one end 10 turned inwardly to provide an opening 11 having oppositely-disposed depressions 12. The diameter of opening 11 is slightly less than the outside diameter of inner ferrule 5 so that the ferrules can be mounted together via the axial movement of one ferrule relative to the other until opening 11 mates with annular groove 6 with shoulder 7 acting as a positioning step, thereby securing the ferrules to-

gether as a unit. Depressions 12 permit end 10 to be somewhat flexible to permit outer ferrule 9 to be moved along inner ferrule 5 until opening 11 is seated in groove 6. Groove 6 is of a configuration to permit slight axial movement of outer ferrule 9 relative to inner ferrule 5.

By holding extension 8, outer ferrule 9 can be moved in a tilting and orbital manner around inner ferrule 5 and relative to the longitudinal axis of connector C. Conversely, outer ferrule 9 can be held and inner ferrule 5 can be tilted within outer ferrule 9 and moved relative to the longitudinal axis of the connector. Moreover, each ferrule can be rotated relative to the other depending upon which ferrule is held stationary.

In assembly, insulation 2 is inserted within inner ferrule 5 since the inside diameter of inner ferrule 5 is such to permit ready movement of insulation 2 there-through, and braided conductor 1 is disposed onto the outer surface of inner ferrule 5 as the coaxial cable is axially moved along connector C. In order to facilitate the movement of braided conductor 1 along inner ferrule 5 until it abuts against end 10 of outer ferrule 9, extension 8 can be engaged to permit rotative movement of the coaxial cable thereby permitting orbital and tilting movement of outer ferrule 9 relative to inner ferrule 5 until outer conductor 1 has bottomed against end 10 as illustrated in FIGURE 4. Depressions 12 serve as inspection ports to observe the engagement of outer braid 1 with end 10. The orbital movement is affected by rotating coaxial cable CC in an orbital manner or by reciprocatory movement thereof. Outer ferrule 9 can be held stationary while the coaxial cable is rotated or reciprocated and this will cause orbital and relative movement of inner ferrule 5 about the longitudinal axis of connector C thereby facilitating the seating of outer conductor 1 around inner ferrule 5. The inner end of inner ferrule 5 is beveled or radiused as illustrated in FIGURE 3 to facilitate the entry of inner ferrule 5 within outer conductor 1 and to ease the disposition of conductor 1 around the outside surface of ferrule 5.

After connector C has been positioned on the coaxial cable with outer conductor 1 disposed between ferrules 5 and 9, the connector is subjected to the crimping operation via conventional crimping techniques to crimp the outer conductor between ferrules 5 and 9 with ferrule 5 providing back-up pressure to prevent any disturbance to insulation 2 that would cause disturbance to the characteristic impedance of the coaxial cable and depressions 12 ease the collapse of ferrule 9 during crimping.

After connector C has been properly crimped onto the coaxial cable, extension 8 in the form of a pigtail is bent and positioned in opening 13 of a printed circuit board 14 and the end of pigtail 8 is bent into engagement with conductor strip 15 and soldered in engagement therewith.

FIGURE 7 illustrates an embodiment of the invention wherein outer ferrule 9' of connector C' has a dielectric sleeve 16 in position therearound in order to provide an insulated connector. Dielectric sleeve 16 can be secured onto outer ferrule 9' by shrinking, by using an adhering substance or in any other suitable manner to secure the dielectric sleeve to the outer ferrule. If desired, ground wire 17 can be positioned within connector C' after the outer conductor of the coaxial cable has been properly positioned on inner ferrule 5' to provide a flexible ground wire if such is necessary. In this case, extension 8' can be cut adjacent annular shoulder 7' to eliminate the same.

It will be apparent that the structure described hereinabove forms a compact and unitary connector of flexible utility having inner and outer ferrules loosely secured together to permit orbital movement of one ferrule relative to the other for facilitating the positioning of the outer braid of the coaxial connector between the ferrule prior to the outer braid being crimped therebetween.

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. An electrical connector for terminating a shielding-conductor means of a coaxial cable comprising an inner tubular ferrule, an outer tubular ferrule concentrically disposed along and around said inner ferrule and being spaced outwardly therefrom thereby defining a space between said ferrules and into which the shielding-conductor means is adapted to be disposed and crimped between said ferrules, connecting means provided by said ferrules at one end thereof loosely connecting said ferrules together for tilting and orbital movement relative to one another and relative to an axis of said connector, and unitary means extending outwardly from said one end of said inner ferrule, said unitary means defining a holding means and a connection means, said holding means adapted to be grasped so that said inner ferrule is held and said outer ferrule is moved in a tilting and orbital manner thereby facilitating movement of the shielding-conductor means along said space while an inner insulation sheath of the coaxial cable is moved within said inner ferrule, said connection means adapted to be connected to a conductor means.

2. An electrical connector for terminating a shielding-conductor means of a coaxial cable comprising an inner tubular ferrule, an outer tubular ferrule concentrically disposed along and around said inner ferrule and being spaced outwardly therefrom thereby defining a space between said ferrules and into which the shielding-conductor means is adapted to be disposed and crimped between said ferrules, connecting means provided by said ferrules at one end thereof loosely connecting said ferrules together for tilting and orbital movement relative to one another and relative to an axis of said connector, and unitary means extending outwardly from said one end of said inner ferrule, said unitary means or said outer ferrule adapted to be grasped so that, in the case of said unitary means, said inner ferrule is held and said outer ferrule is moved in a tilting and orbital manner and, in the case of said outer ferrule, said outer ferrule is held and said inner ferrule is moved in a tilting and orbital manner thereby facilitating movement of the shielding-conductor means along said space while an inner insulation sheath of the coaxial cable is moved within said inner ferrule, said unitary means defining connection means adapted to be connected to a conductor means.

3. An electrical connector according to claim 2 wherein said connecting means include one end of said outer ferrule being turned in, said inner ferrule having an annular groove in which said intumed end is disposed.

4. An electrical connector according to claim 3 wherein said intumed end has depressions to provide a view of the space between the ferrules from the one end thereof.

5. An electrical connector according to claim 2 wherein a dielectric sleeve is secured on said outer ferrule to provide insulation therefor.

6. An electrical connector according to claim 2 wherein another end of said inner ferrule which is disposed within said outer ferrule has a beveled or radiused configuration.

7. An electrical connector according to claim 2 wherein said outer ferrule is longer than said inner ferrule.

8. An electrical connector comprising an inner tubular ferrule, an outer tubular ferrule concentrically disposed along and around said inner ferrule and being spaced outwardly therefrom thereby defining a space therebetween, flange means at one end of said inner ferrule and groove means disposed in said inner ferrule adjacent said flange means, said outer ferrule having intumed end means disposed in said groove means thereby defining securing means loosely securing said ferrules together for tilting and orbital movement relative to each other and relative to the axial center of said connector, and

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unitary pig-tail connection means extending outwardly
from said flange for connection to conductor means on
a mounting member.

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U.S. Cl. X.R.

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