

[54] **ELECTRICAL CONNECTOR OPERABLE FOR DIVERSE COAXIAL CABLE CENTER CONDUCTOR DIAMETERS**

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[51] Int. Cl. **H01r 17/04**

[58] Field of Search **339/177, 273; 285/322, 323, 343**

[56] **References Cited**

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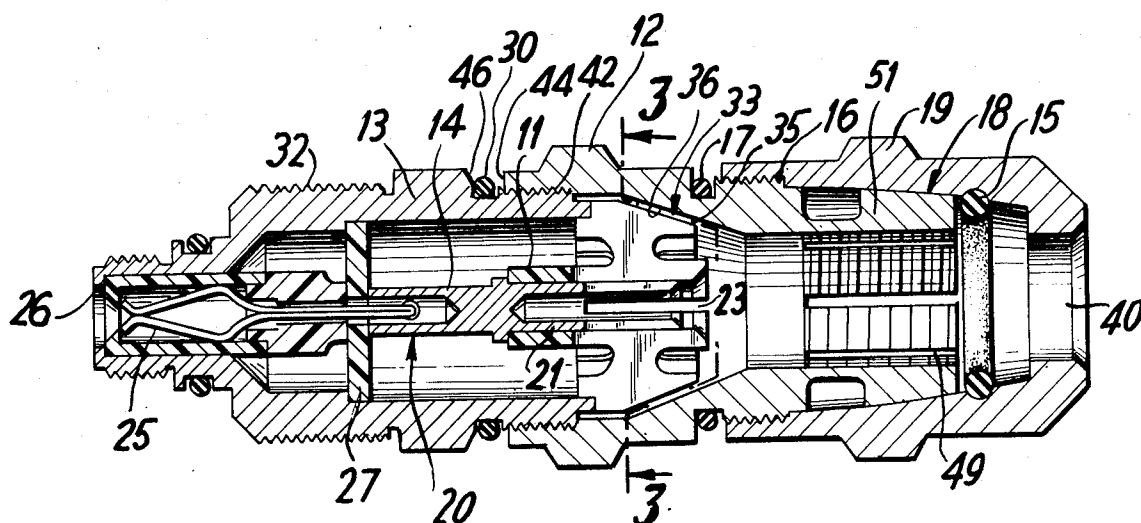
Attorney—Nichol M. Sandoe et al.

[57] **ABSTRACT**

An electrical connector for receiving the conductors of a coaxial cable comprises axially engaging housing members having tapered inner surfaces for selectively radially compressing interior connector elements which seize the coaxial cable center and outer conductors.

The composite connector structure for securing the cable center conductor includes plural, diverse axially oriented slots such that center conductors of varying sizes may be reliably accommodated, and such that the connector housing members may be fully engaged for any size center conductor to provide a reliable ground connection.

4 Claims, 3 Drawing Figures



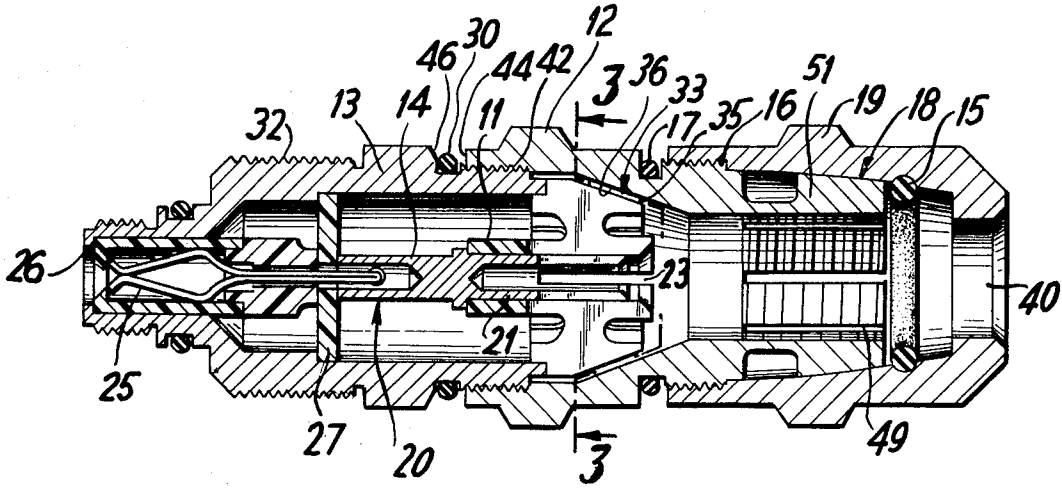


FIG. 1

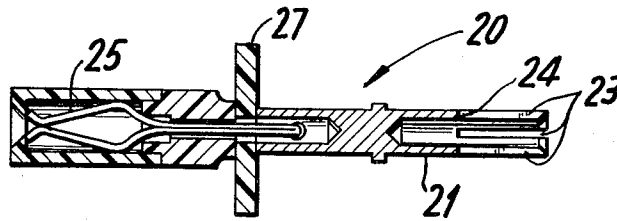


FIG. 2

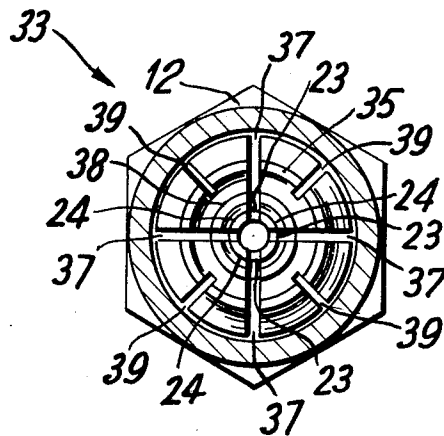


FIG. 3

ELECTRICAL CONNECTOR OPERABLE FOR DIVERSE COAXIAL CABLE CENTER CONDUCTOR DIAMETERS

BACKGROUND OF INVENTION

This invention relates to electrical connector apparatus and, more specifically, to a connector for receiving coaxial cables with center conductors of varying diameter.

It is an object of the present invention to provide an improved electrical connector.

More specifically, an object of the present invention is the provision of a connector for effecting reliable electrical and mechanical connections with coaxial cables having center conductors of differing size, and which obviates marginal grounding conduction paths characterizing prior art connectors.

The above and other objects of the present invention are realized in a specific illustrative electrical connector for receiving a coaxial cable formed of concentric inner conductor, insulative and outer conductor elements.

To engage the cable, a projecting portion of the inner conductor is placed within a receiving portion of a center pin having axial slots therein, and which is therefore compressible. The pin, in turn, is disposed within a compressible plastic insulator member having two diverse sets of axial relief slots.

The cable center conductor is seized by axially tightening connector housing members, one of which has a tapered inner surface which bears against a like outer surface of the plastic spacer element. Such tightening radially compresses the plastic member, and thereby also the cable center conductor seizing pin. The double slotting of the plastic members permits full closure of the housing members (with concomitant preferred electrical ground connection) for a range of permissible cable center conductor sizes.

A similar axial engagement-radial contraction mechanism is employed to effect electrical and mechanical connection between the connector housing and the cable outer sheath.

The above and other features and objects of the present invention will become more clear from the detailed description of a specific connector embodiment presented hereinbelow in conjunction with the accompanying drawing, in which:

FIG. 1 is a cross-sectional view depicting specific illustrative connector apparatus embodying the principles of the present invention;

FIG. 2 is a cross-sectional view of center pin apparatus included in the FIG. 1 connector; and

FIG. 3 is an elevation view of spacer and center pin apparatus about the plane 3—3' of FIG. 1.

Referring now to FIG. 1, there is shown specific illustrative connector apparatus for receiving a coaxial cable (not shown) in usual form, i.e., having coaxial center conductor, insulation, and an outer conductor element. The connector includes a cable-receiving front housing body member 19, a clamp nut housing member 12, and a rear barrel element 13. The front housing member 19 includes an orifice 40 for receiving the composite coaxial cable.

Examining first the connector structure for mechanically seizing the coaxial cable center conductor, and for thereby providing an electrical connection to the cable center conductor, the clamp nut housing member

12 includes a tapered inner surface 36 which is disposed opposite a similarly formed tapered outer surface of a plastic spacer member 33, this plastic member being shown in particular detail in FIGS. 1 and 3. The plastic spacer member 33 includes a first plurality of axially oriented slots 37 essentially about the entire front portion of the spacer (e.g., four in number spaced 90° apart), and a second plurality of slots 39 disposed only within the outer periphery 35 thereof. The spacer 33 is thus radially compressible responsive to an external compressive force applied thereto, the outer radius of the spacer contracting by closure about the slots 37 and 39, while the inner circular projecting elements 38 of the spacer 33 contract by closure of the vacated relief slots 37 only.

Disposed within the connector, and within the spacer 33, is a conductive cable center conductor receiving center pin 14. The center pin 14, variously illustrated in each of FIGS. 1-3, includes a cylindrical front portion 21 having plural axial slots 23 (e.g., four) therein such that the front portion of pin 14 is similarly compressible.

In its intended operation, a cable with an exposed projecting length of center conductor is inserted in the connector via the orifice 40 and the cable center conductor is placed within the center pin front cylindrical portion 21. When so inserted, the connector outer housing members 13, 12 and 19 initially reside in an axially extended position.

With the cable center conductor in place within the receiving member 21, the clamp nut 12 is tightened onto the connector barrel 13, there being a threaded interface 42 therebetween. As the members 12 and 13 close, the tapered inner wall 36 of the clamp nut 12 bears against the outer periphery of the compressible spacer 33 which thereby radially contracts by a continuous closure of the slots 37 and 39 therein. At this time also then, inner projecting segments 38 of the spacer 33 contract filling the initial spacing slots 37 while also applying an inward radial force to the center pin members 24 which close the gaps 23 therebetween. The inner surface of the center pin members 24 is advantageously serrated and continues to close as nut 12 tightens upon barrel 13 until the elements 24 tightly seize the cable center conductor, and thus exhibit an inner diameter essentially given by the outer conductor of the cable center.

Hereafter as the clamp nut 12 continues to move rearwardly onto the barrel 13, further radial contraction of the spacer 33 dictated by the tapered inner wall 36 of the clamp nut 12 is absorbed by the outer portion of slots 37 and, principally, by the radial slots 39. The clamp nut 12 thus continues to move upon the barrel 13 until a rear surface 44 of the clamp nut 12 passes over a sealing O-ring 30 and contacts a front facing surface 46 of the barrel housing member 13.

Several observations are made at this point regarding electrical and mechanical seizure of the cable center conductor by the center pin connector member 14. First of all, the center pin tightly engages the cable center conductor irrespective of the diameter of the cable conductor (within the operative connector range, which may be made quite broad). This markedly contrasts with prior art structures wherein the final dimension of the center conductor seizing element is determined by the connector structure per se rather than by the center conductor itself as is the case for the present

invention. Then also the clamp nut 12 and the barrel 13 completely close (contact between the surfaces 44 and 46) irrespective of the size of the cable center conductor. This assures a reliable radio frequency electrical ground connection between the clamp nut 12 and the barrel 13 through the engaged surfaces 44 and 46 for any size center conductor rather than relying on electrical connections through engaged threads 42 alone — a connection subject to oxidation and the like.

The rear portion 25 of the electrically conductive center pin 14 comprises two mechanically biased contacts which face a rear connector orifice 26. Thus, electrical connection to the cable center conductor is made via a lead or pin inserted through the orifice 26 and which separates and is retained by the biased contacts 25.

Electrical connection to the outer cable conductor is made in a manner similar to that described above for the center conductor. In particular, the connector body member 19 engages a front portion of the clamp nut 12 as via threaded area 16. Further, a tapered interface 18 obtains between engaging surfaces of the nut and body members 12 and 19, and the inner cylindrical surface 49 of the clamp nut 12 has cable outer conductor gripping threads or serrations. Further, the front portion 51 of the body member 12 includes axial slots, and is therefore compressible.

When the cable is inserted into the connector, the body members 12 and 19 are extended and the front portion 51 of the clamp nut 12 is radially expanded. Accordingly, the outer sheath readily fits within the interior of the clamp nut 12. After the center conductor is seized as above discussed by fully tightening clamp nut 12 onto barrel 13, the body member 19 is tightened onto the clamp nut 12. The tapered inner surface of the body member 19 therefore bears against and compresses the front portion 51 of the clamp nut 12 which compresses, such that the serrated inner portion 49 thereof tightly binds the cable outer connector for mechanical and electrical integrity and connection.

The above description has shown the manner in which the improved connector of FIGS. 1-3 receives and secures the two members of a coaxial cable. The connector, in turn, may be mechanically secured within, and electrically connected to a chassis by

threaded insertion into an orifice in the chassis via exterior threads 32 on the connector. Electrical connection to the cable center conductor is accomplished via the orifice 26 and the biased conducting prongs 25 as above described.

The above described connector embodiment is merely illustrative of the principles of the present invention. Numerous modifications and adaptations thereof will be readily apparent to those skilled in the art without departing from the spirit and scope of the present invention.

What is claimed is:

1. In combination in an electrical connector for receiving coaxial cables formed of a center conductor and an outer conductor, first and second cylindrically shaped connector body members, means for providing relative axial translation between said first and second body members, center pin means within said connector body members, said center pin means including a compressible cable center conductor seizing portion having axial slots therein, and radially compressible insulative spacer means about said center pin compressible portion, said spacer means comprising an outer tapered surface, one of said connector body members including an inner tapered surface engaging said tapered outer surface of said spacer means, said spacer means including axial slots about its inner and outer surfaces, said outer surface of said spacer means including a greater number of slots than the inner surface of said spacer means.

2. A combination as in claim 1 wherein a subportion of the axial slots in said outer surface of said spacer means are continuous to said inner surface of said spacer means.

3. A combination as in claim 2 further comprising a third connector body member for engaging one of said first and second body members, said third body member including a tapered inner surface for causing said first or second body member engaged therewith to seize an outer coaxial cable conductor.

4. A combination as in claim 3 wherein the inner surface of said first or second body member engaged by said third body member is compressible.

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