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CABLE CONNECTOR

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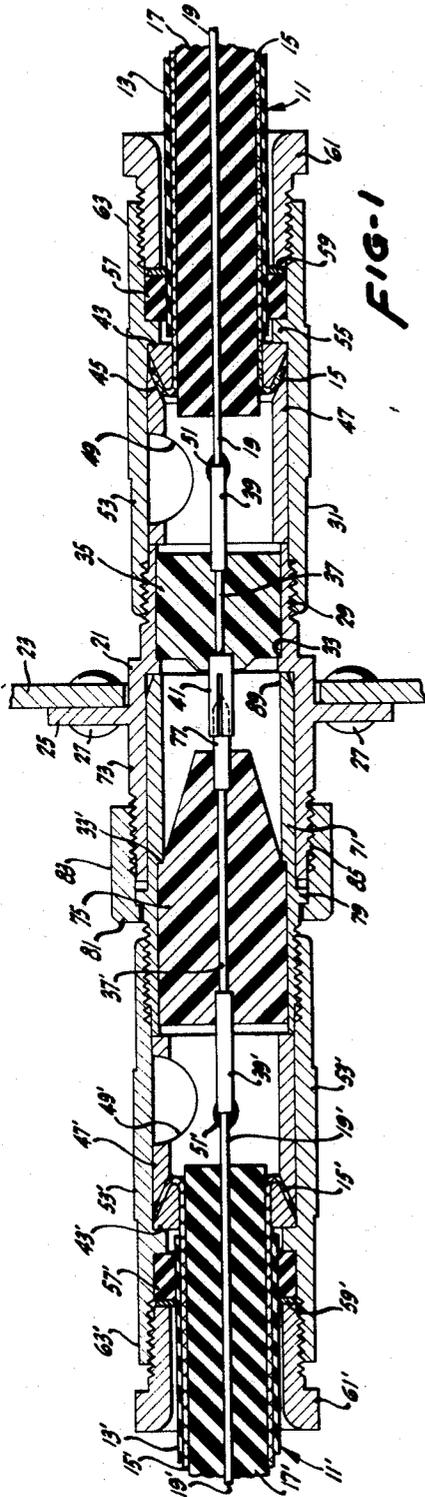


FIG-1

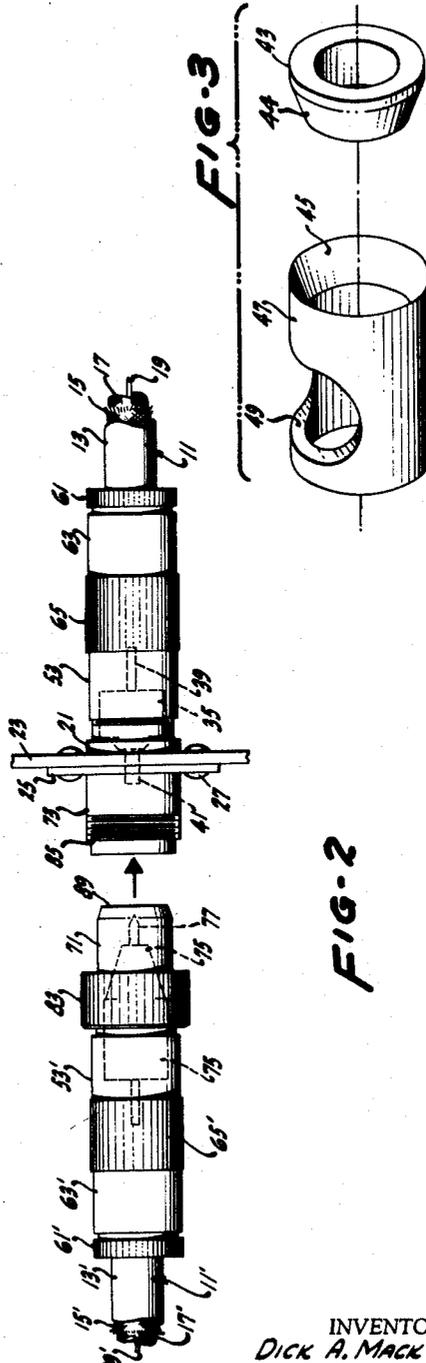


FIG-2

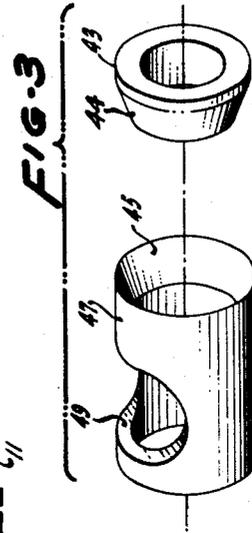


FIG-3

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CABLE CONNECTOR

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2 Claims. (Cl. 339—177)

This invention relates to connectors particularly adapted for securing different coaxial cables together or for readily connecting other elements to coaxial cables.

In the past it has been difficult to provide satisfactory connectors whereby terminating ends of coaxial cable members could readily and efficiently be joined to one another. Accordingly, an attachment providing for securement of the two cable sections which can readily be effective frequently becomes useful both in a panel installation to which one of the cables is secured and from which another is to lead or by which the connection of two separate cables may be made by providing a connecting unit for establishing at any point the effect of joining two units.

Further than this, since it has in the past been difficult to provide connecting units for establishing connection between different cable sections by which the impedance characteristics of the cable could be maintained substantially constant, use of the structure of the present invention by which it is possible to overcome the difficulties of the prior art and to provide connectors which are extremely simple and inexpensive to manufacture, readily set up, and yet which have proper and generally ideal mechanical and electrical characteristics to serve the intended purpose becomes important.

In the preferred form by which the invention is practiced and as here particularly disclosed, the cable connection may illustratively be considered as applicable particularly to the commonly known forms of coaxial cables, although its utilization with other forms of current-carrying elements will be readily apparent. In the most common form of coaxial cables, there is a central conductor held within the cable in suitable insulating material about the outer surface of which an outer conducting element forming the second conductor of the cable is wrapped. The outer conducting element is usually made in the form of many woven strands of electrically conducting elements and this conducting layer then is usually within an insulating outer covering. The cable, as a whole, is generally flexible and so arranged that the central conductor element remains centrally positioned at all times. However, connection between terminating ends of two conductors of this character has been difficult to obtain where the desired impedance characteristics of the cable are maintained substantially free of impairment and change.

The connections as here provided by this invention comprise generally the utilization of a main mounting sleeve (such as a panel sleeve) into one end of which there is formed an insulating component suitably held in its interior position by means of an internal shoulder from which it extends outwardly toward one end of the sleeve. The insulating member is usually formed of one of the plastics, such as polystyrene, molded within the sleeve. Within the insulating member a rigid conducting pin is firmly held as by molding therein, in a fashion to protrude beyond each end of the insulator. The conducting pin also is intended to extend beyond the sleeve in one direction to form, when in assembled array, contact with the

central conductor of the coaxial cable and to protrude beyond the opposite face of the insulating member in a suitable fashion to be joined to a complementarily-shaped pin of a second connecting link. Against the free end of the mounting sleeve there is positioned in the initial set up a clamp sleeve with which is associated a ring element adapted to surround the cable. The outer conductor of the cable is wrapped generally around the ring element and then by suitably forcing the sleeve and ring element together and against the free end of the mounting sleeve the outer cable conductor is securely held and gripped and at the same time the inner conductor is caused to abut the protruding end of the insulator-held pin.

The support for holding the second section of the cable is generally of similar characteristics except that the support sleeve is generally adapted to fit internally of the support sleeve for the first cable, and to be held in tight engagement therewith by means of a suitable connection, such as can be maintained and provided by a union nut secured to the first sleeve.

The outer wall of the cable proper is also gripped with each support device by tightening of a suitable cable sheath clamp nut upon the free end of the cable connector sleeve. In the preferred form for establishing this connection a resilient ring in the form of an elastomer is fit around the cable and adapted to be forced against an internal shoulder on the cable connector sleeve so that with compression of the elastomer in the longitudinal direction the elastomer is expanded radially to bear with great force upon the outer covering of the cable and the inner wall of the cable connector sleeve.

In cases where it is desired to provide panel mounting of the connector one of the sections may have the mounting sleeve provided with an outward radial flange adapted to be secured to a suitable panel with the diameter of the mounting sleeve then being such that one section of the unit may be passed through the panel and held there-to by bolts or rivets passed through the mounting flange.

In accordance with the foregoing, it becomes among the objects of the invention to provide a convenient coaxial cable clamp connector which shall so connect the cable sections that the combined unit shall have a substantially constant impedance corresponding to that of the cable itself.

Another object of the invention is to provide a coaxial cable connector which is highly efficient in its use, easy to install, quick to connect and disconnect, and which includes a minimum number of component parts.

Other objects of the invention are those of providing a coaxial cable connector free from complex component parts and, at the same time, which is relatively inexpensive to manufacture and yet is usable for various forms of connections, whether for connecting cables through panels or by splicing parts together.

Other objects and advantages of the invention will become apparent from a reading of the following description and accompanying claims in connection with the attached drawings.

By the several figures of the drawing, Fig. 1 is a longitudinal section of the connector particularly arranged to show the various component parts and the general manner of assembling;

Fig. 2 is an exploded view of the components of Fig. 1 showing the manner of connecting two cable sections together for panel mounting; and

Fig. 3 is also an exploded view showing the cable clamp sleeve with its associated clamp ring.

Referring now to the drawings for a further understanding of the invention, the coaxial cable sections to be held are designated respectively by the numerals 11 and 11'. The cable, per se, comprises usually an outer insulating covering 13 interiorly of which is usually a braided

conducting element 15 wrapped about an insulating central member 17 through which a central conducting element 19 is passed. As the showing has been particularly depicted by Figs. 1 and 2 of the drawings the cable connector will be shown in an arrangement to secure the two cable sections 11 and 11'. The securement is shown in its completed form by the longitudinal cross section of Fig. 1 and by Fig. 2 the exploded view shows the manner in which the connection of the cable section 11' is adapted to be completed with respect to the cable section 11, but the actual components of the left and right sections have not yet been joined (as in Fig. 1).

Referring for the moment to Fig. 1 of the drawing, a mounting sleeve 21 serves as the component through which the two cable connections are established. In the event that the components are used to unite merely two separated cables, the mounting sleeve is generally substantially cylindrical as to its outer periphery, but in the form where the component is to be held and supported in a panel section, such as that schematically represented at 23, there may be an outer radial flange 25 extending from the wall of the mounting sleeve. The sleeve 21 is then passed through the opening, as indicated, in the mounting panel 23 and by suitable bolts or rivets, conventionally represented at 27, it is secured in the desired location. In the arrangement shown by Fig. 1 it will be understood that the cable section 11 is held interiorly of the assumed closure structure of which the panel 23 forms a part. In this connection mounting sleeve 21 has its outer end 29 suitably threaded and it is adapted to be secured to the interiorly threaded end of cable connector sleeve 31.

Within the mounting sleeve 21 a shoulder 33 extends inwardly and against this shoulder an insulating support element is adapted to be rested and tightly secured within the cross section of the sleeve to extend outwardly toward its threaded free end, as indicated. A central conductor 37 is preferably imbedded into the insulator 35, which tightly holds it. The insulator itself is tightly held or moulded in its indicated location. The conductor 37 terminates at one end as an engaging member 39 which is adapted to bear upon and form an electrical connection to the central conductor 19 of the coaxial cable 11. The opposite end of the central conductor 37 terminates in a receptacle or female end 41 to which, as will later be described, the connector for the cable 11' is to be mated and attached.

In the assembly of the component, the cable 11 has its conducting layer or covering 15 turned back (note particularly Fig. 1) over a frusto-conical clamp ring 43 which is adapted to fit within and wedge to a recessed wall 45 of a cable clamp sleeve 47. The ring 43 is fitted so that its apex faces within the sleeve 47 so that when tightly fitted thereto it secures the conductive member 15 between the clamping ring and the clamp sleeve, this happening when the end 39 of the conductor 37 is brought into abutting engagement with the central conductor 19 of the cable section 11.

In the preferred form of the device the cable clamp sleeve 47 is provided with a wall opening 49 through which, if desired, a soldered connection, such as designated at 51, may be established between the central conductor 19 of the cable 11 and the end 39 of the conducting pin 37 in order to insure a tight electrical connection between them. With the connection established and the cable clamp sleeve 47 then being in abutting contact with the free and threaded end 29 of the mounting sleeve 21, and with the cable connector sleeve 53, which previously has been placed over the cable at a time prior to the assembly, being moved to an engaging relationship between its internally threaded end and the threaded end 29 of the mounting sleeve, the internal shoulder 55 is adapted to bear upon the flat face of the clamp ring 43 to force the conical surface 44 thereof against the outer conductor 15 and also to force this conductor tightly

to the sloping internal wall 45 of the clamp sleeve 47 and, at the same time, force the clamp sleeve 47 against the outer end of the mounting sleeve 21. In this fashion the cable section 11 is generally tightly secured within the mounting sleeve and an electrical connection is established to the mounting sleeve. At the same time an electrical connection is also established between the central conductor 19 of the cable and the pin 37 which extends through the insulator 35. However, in order tightly to secure the outer wall of the cable to the mounting sleeve 53, it is usually preferable to provide a resilient ring 57, formed as an elastomer, adapted to rest upon the outer surface of the shoulder 55. The elastomer ring 57 has an internal diameter which is slightly larger than the outer diameter of the cable and surrounds the outer cable surface. In the assembly of the connector, with the elastomer ring 57 resting against the shoulder 55, there is next placed over the outer surface of the elastomer a washer or other non-compressible component 59 which, by turning the cable sheath clamp nut 61 having its outer threaded surface engage the inner threaded surface of the free end 63 of the connector sleeve 53, forces the elastomer ring 57 to compress longitudinally while at the same time being forced outwardly by radial expansion thereof so as to grip tightly to the wall of the cable and the inner wall of the mounting sleeve 53 to securely hold the cable against movement within the connector. Thus, a tight connection is established between the outer conductor 15 and the clamp ring 43 and the clamp sleeve 47 and at the same time a tight connection is maintained between the central conductor 19 and the outer end 39 of the conducting pin 37. Ordinarily, the outer wall of each of the cable sheath clamp nut 61 and the region 65 of the connector sleeve may be appropriately knurled for easy tightening.

The complementary section or left-hand portion of the cable connector illustrated is formed generally similarly to that hereinabove described and like types of parts are indicated on the drawing by numerals corresponding to the right-hand section of Fig. 1, as already explained, so that detailed discussion of them generally need not here be given. It will, however, be pointed out herein that the mounting sleeve 71 of the left-hand section of the connector serves generally the function of the mounting sleeve 21 of the right-hand section, except that the sleeve 71 at its right-hand end is of substantially the same outer diameter as is the inner diameter of the left-hand end 73 of the mounting sleeve 21 so that the sleeve 71 can be fitted internally of sleeve 21. Likewise, in the mounting sleeve 71 for the left-hand section the internally supported insulator 75 rests against a shoulder 33' generally similar to the shoulder 33 of the right-hand section, with the insulating member filling the mounting sleeve, however, extending further inwardly in the fashion generally shown. In this form the conducting pin member 37 terminates in an outer bayonet pin or male section 77 which when the two components are secured together, fits within the receptacle or female section 41 securely to hold the two connectors together.

To achieve this end result the mounting sleeve 71 also has formed on its outer periphery a shoulder 79 against which the outer wall 81 of an internally threaded union nut 83 is adapted to bear. The internally threaded union nut 83 then threads over the threaded end 85 extending outwardly from the end 73 of the mounting sleeve 21. With tightening of the union nut 83 on the threads 85 the assembly of the left-hand section is then forced to the right from the position shown, so as to force the outer end 89 of the mounting sleeve 71 against the shoulder 33 of the mounting sleeve 21 and at the same time provide a tight fit between the bayonet pin 77 of the central conductor 37' and the receptacle 41 of the central conductor 37 whereby a tight connection is made between the two coaxial cable sections 11 and 11'. Separation of the two components from each other is achieved

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by loosening the union nut 83 and then pulling the two members apart.

It also will be appreciated that by adopting similar principles the arrangement can be used to effect connection of other components, as desired, to coaxial cable members terminating in the supported panel section, as shown, or as already stated, where two coaxial cable sections are to be spliced together the sleeve 21 and the union nut 83 may serve as a connecting union with the connections established as can be particularly appreciated by the showing of Fig. 2 with the radial flange 25 and, of course, the panel 23 removed.

Various modifications, of course, may be made from the invention here disclosed, without departing from its spirit and scope.

Having now described the invention what is claimed is:

1. A connector unit adapted to engage a generally similar, mating connector unit, for connecting coaxial cables having inner and outer conductors, comprising, as assembled, the following parts in coaxially aligned relation: a first metal sleeve having an externally threaded end and having another end adapted for telescopic engagement with the corresponding sleeve of the mating connector unit; a metal connector sleeve having an internally threaded end and an annular internal shoulder facing said internally threaded end, said externally threaded end and said internally threaded end mating with each other and being removably screwed together; a metal clamp sleeve having an outside diameter substantially equal to the inside diameter of said connector sleeve, and having first and second ends, said clamp sleeve being removably disposed within said connector sleeve with said first end abutting on said externally threaded end, said second end having an inwardly sloping, frusto-conical surface; a metal clamp ring having a frusto-conical outer side surface and an annular base with an outside diameter substantially equal to the inside diameter of said connector sleeve, said clamp ring being removably disposed within said connector sleeve with said base abutting on said internal shoulder and said two frusto-conical surfaces facing each other; an insulator bushing affixed to and within said first sleeve; a metal pin affixed to and extending axially through said bushing and having ends projecting therefrom, one end of said pin terminating within said first sleeve and being

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adapted to engage the corresponding pin of the mating connector unit, and the other end of said pin projecting beyond said externally threaded end and terminating within said clamp sleeve, and said clamp sleeve being provided with a lateral aperture to facilitate connection of the inner conductor of the cable to said pin, said lateral aperture being covered and closed by said connector sleeve in the assembled unit; whereby a coaxial cable can extend through said clamp ring with its outer conductor everted over the clamp ring and clamped between said two frusto-conical surfaces and its inner conductor projecting coaxially into said clamp sleeve and contacting said pin, and thereupon said inner conductor can be substantially permanently secured to said pin from without said clamp sleeve which is permitted by the latter's aforesaid lateral aperture, said conductors being thereby electrically connected to said first sleeve and said pin, respectively.

2. A connector unit as in claim 1, wherein said connector sleeve has a second internally threaded end and has a second annular internal shoulder facing said second threaded end; and which additionally comprises an elastomer ring disposed within said connector sleeve abutting on said second shoulder; a washer abutting on said elastomer ring; and an externally threaded nut mating with and screwed into said second threaded end, said nut pressing upon said washer and compressing said elastomer ring to grip the cable.

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