

Nov. 1, 1960

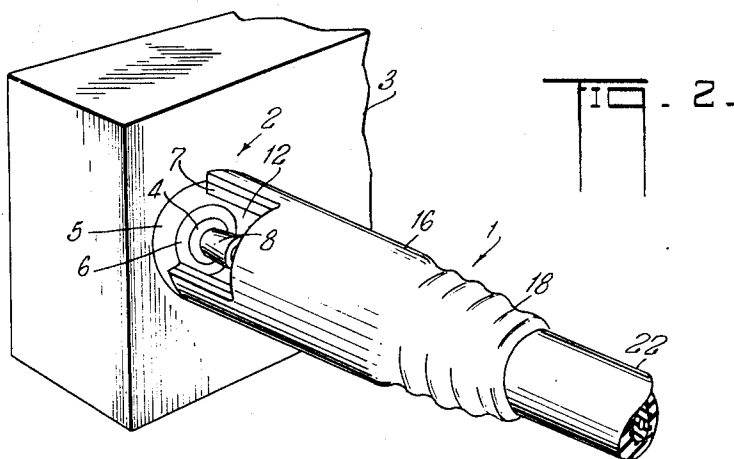
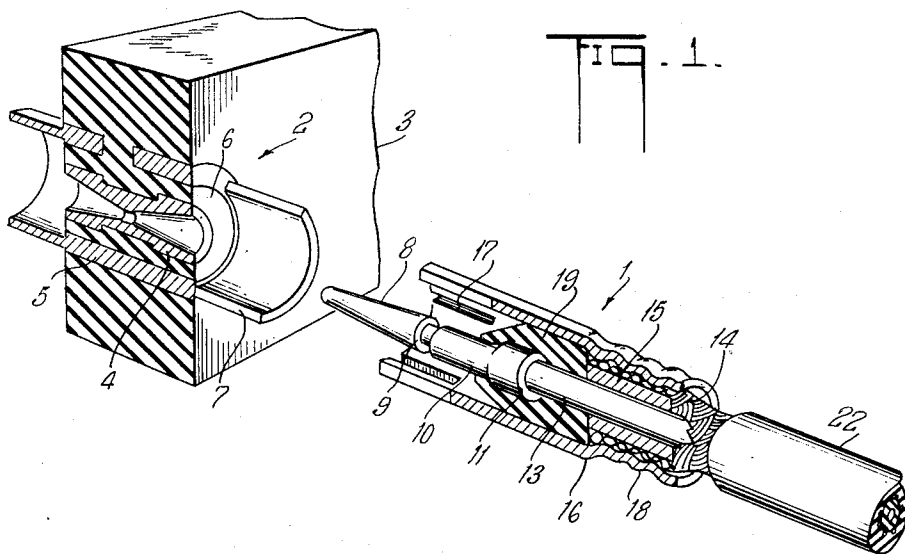
H. P. DUPRE ET AL

2,958,845

COAXIAL CONNECTION

Filed Nov. 7, 1957

2 Sheets-Sheet 1



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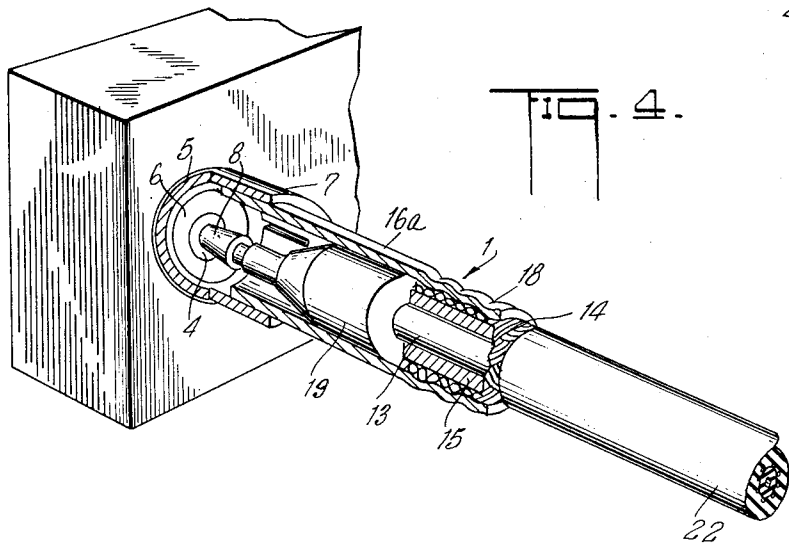
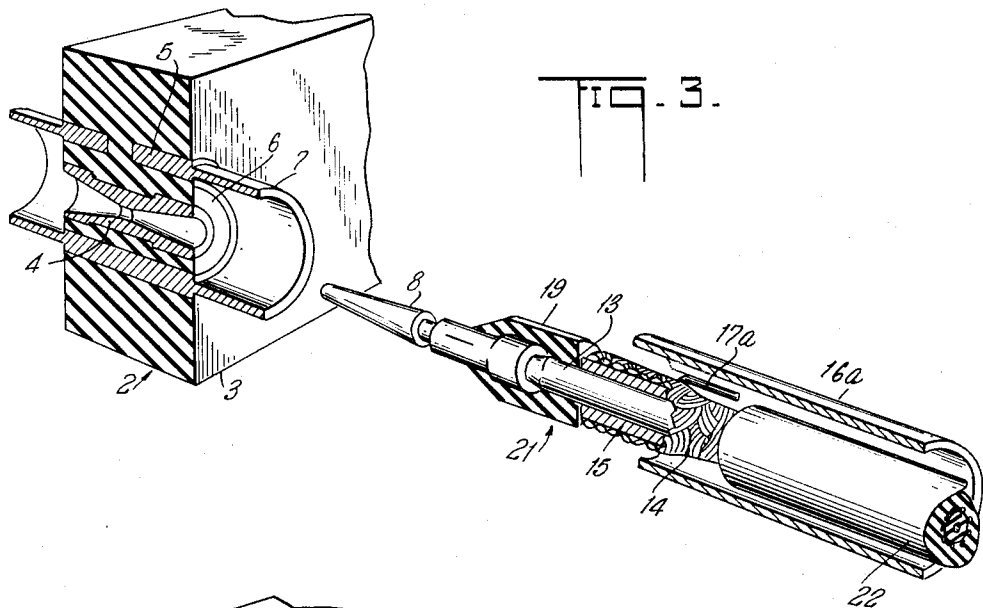
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COAXIAL CONNECTION

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2 Claims. (Cl. 339—177)

Our invention relates to electrical connectors and, more particularly, to electrical connectors in which one coaxial or shielded wire conductor is coupled to another. This can be a single splice or it can be mounted on a panel or patchboard.

It is highly desirable that apparatus utilizing inputs of electrical and magnetic waves of high frequency be coupled with the same facility with which connections of lower frequency apparatus can be accomplished. However, the very nature of the energy used by high frequency apparatus requires a high quality transmission line such as coaxial or shielded wire conductors to be utilized. For example, in the demonstration of high fidelity audio components it is often desirable to be able to interconnect a great plurality of component apparatus in a large number of combinations through the use of coaxial conductors. In the past, electrical connections for coaxial cable have been extremely complicated to establish, thus hindering the demonstration of such equipment.

Most usually, such coaxial or shielded wire conductors were terminated by connections which have required soldering the braid or outer conductor and the inner conductor elements to a terminal connector. The terminal connectors which were attached to the cable by soldering were then mated to receptacles or sockets in order to establish the electrical connection. The soldering of these terminal parts involved the handling of very small parts under awkward conditions, causing the attachment of a single cable terminal to be both tedious and time consuming.

In order to overcome some of the disadvantages of the above described connections, jumper wires were sometimes utilized to form a common grounding connection for all the cable terminals. These jumper wires joined each braided conductor to the next braided conductor in series and connected the last braided wire to the panel or patchboard in order to transmit the ground potential through the panel.

In order to overcome the objection of soldering components, solderless coaxial connectors were developed in which wedge shaped components were utilized to make mechanical and electrical connection between the outer conductor and the terminal of the cable. Such connectors, utilizing wedge shaped elements to force fit conductor portions, have not proven entirely satisfactory since the operator or user of the connector can break the connection by applying a tension between the cable end and the terminal, thus the assurance of always establishing a good connection and maintaining it has been lacking.

In the copending application of coinventor Henry P. Dupre, Serial No. 683,997, filed September 16, 1957, entitled "Panel Connection," there was disclosed a connector for joining coaxial cable or shielded wire connections to a panel in which the inner and outer conductors were joined to the panel connector and which utilized a tapered pin for terminating the inner conductor of the cable.

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The tapered pin was mechanically and electrically crimped to the inner conductor and an inner sleeve formed of a relatively hard metal was inserted beneath the outer conductor and an outer ring of a softer metal was inserted over the outer conductor and crimped thereto. An outer sleeve was electrically connected to the outer ring and provided electrical contact making means for connecting the outer conductor of the cable to the outer connection panel, while the tapered pin was inserted into the inner connection of the panel.

While the above described connection is satisfactory for many purposes we have found that the cable termination can be greatly improved by providing means for rigidly maintaining the coaxial spacing between the inner and outer portion of the cable termination. In addition, means are provided for the insertion of the tapered pin member after the outer sleeve or grounding member of the cable termination has made contact with the panel socket. Moreover, we have found that a suitable and satisfactory connection can be made by utilizing a unitary structure providing the functions of the former outer ring and outer sleeve members described in the above reference copending application.

One of the objects of our invention, therefore, is to provide a coaxial cable or shielded wire connection that is simple to make, easy to install, and provides a positive spacing member between the inner and outer cable terminating members.

Another object of our invention is to provide a coaxial or shielded wire connection which may be installed by the pressure method employing a tapered pin that can be force fitted into the panel socket to resist loosening and which may be inserted before or after the shielded connection is established.

One of the features of our invention is to provide a connector for joining coaxial cable or shielded wire connections to a panel in which the inner and outer conductors are joined to the panel connector and which utilizes a tapered pin for terminating the inner conductor. The tapered pin is mechanically and electrically crimped to the inner conductor and an inner sleeve formed of a relatively hard metal is inserted beneath the outer conductor and an outer sleeve of a softer metal is inserted over the outer conductor and crimped thereto. The outer sleeve is separated from the tapered pin by means of an insulating ring insert disposed coaxially between the tapered pin and the outer sleeve. The outer sleeve may have an opening therein to permit the force fitting of the tapered pin to the panel socket subsequent to the connection of the outer socket member to the outer sleeve of the cable termination.

The above mentioned and other features and objects of our invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an exploded perspective view partly in section of one form of the panel connection of my invention.

Fig. 2 is a perspective view partly in section of the connection shown in Fig. 1.

Fig. 3 is an exploded perspective view partly in section of another form of my invention.

Fig. 4 is a perspective view partly in section of the cable connection shown in Fig. 3.

Referring to Figs. 1 and 2 of the drawing a panel connection in accordance with the principles of my invention is therein shown to comprise a cable termination 1 and a panel socket 2. Reference numeral 3 indicates a fragmentary portion of a panel wall made of electrical insulating material through which extends an inner socket 4 and an outer socket 5. The socket members 4 and 5 may be molded in spaced-apart relationship at the same time that the panel wall 3 is molded, and may be proper-

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ly insulated from each other by insulation 6 which may be the wall material or a separate insulation spacer. The socket members 4 and 5 are suitably secured to the panel wall 3, preferably in a manner which makes the mounting leakproof. Outer socket member 5 extends beyond the panel wall 3 and terminates in an external portion 7 which is utilized to engage the cable termination 1. It is, of course, understood that a plurality of panel sockets 2 can be located in the panel wall 3 to provide a multiplicity of socket connections or splices.

The cable termination 1 comprises the tapered pin shaped member 8 which is force fitted into the inner socket member 4 by the use of an insertion impacting tool (not shown). The insertion impacting tool utilizes the shoulder 9 to apply force to the tapered pin 8. The inner conductor is located in the conductor receiving socket 10 of the tapered pin and the insulation surrounding the inner conductor is located within the insulation gripping shroud 11. An indentation or crimping, secures the inner conductor of the cable to the socket conductor 10 and the shroud 11 is compressed to grip the insulation 13.

The braided outer conductor or shield 14 of the cable is exposed and trimmed back of the taper pin member 8 and the supporting ferrule or inner sleeve 15, composed of a relatively hard metal, is mounted or slid under the outer conductor 14 and over the inner conductor insulation 13. A malleable sleeve 16 is crimped as shown at 18 over the outer conductor 14 to the supporting ferrule 15, thus the inner conductor or the cable is mechanically crimped to the taper pin 8 and the outer conductor 14 is mechanically crimped to the sleeve 16.

An insulating ring or sleeve composed of an insulating material is disposed in front of the inner ring 15 and is designed to maintain the spaced coaxial relationship between the tapered pin 8 and the outer sleeve member 16. The insulation sleeve 19 may be manufactured of a deformable or elastic insulation material and force fitted over the tapered pin 8 into its proper location. Alternately, it can be formed of two halves which are fitted around the tapered pin 8 and maintained in place by the sleeve 16. It is equally apparent that spacers may be used in lieu of sleeve/s or air may form the dielectric between sleeve 16 and pin 8.

The outer conducting sleeve 16 mates with the external portion 7 of the outer socket panel member 5. End 17 of sleeve 16 may be slotted to insure good electrical contact due to the spring-like action of the slots 17. After the tapered pin 8 has been inserted in the inner socket 4 the outer sleeve 16 may be mounted onto the outer socket member 5 and an insertion tool utilized to force fit the tapered pin 8 into the inner socket member 4 of the panel connection 2. The insertion tool may fit the tapered pin 8 into the socket by means of the opening 12 in the outer sleeve member 16. Thus, the opening 12 permits the force fitting of the tapered pin 8 after contact is made between sleeve 16 and outer socket member 17. The end 7 of the outer socket member 5 may also have an opening therein which matches the opening 12 in the outer sleeve 16. After connection is made the cable termination 1 and socket member external portion 7 may be rotated relative to each other to misalign the matched openings and close the connection against such undesirable influences as dirt and dust.

Referring to Figs. 3 and 4 of the drawing, parts identical to corresponding portions of the embodiment shown in Figs. 1 and 2 are identified by similar numbers. The alternate embodiment of my invention shown in Figs. 3

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and 4 utilizes a panel socket 2 in the wall 3. The coaxial cable and shielded wire termination 21 uses a tapered pin 8 crimped onto the inner conductor of coaxial cable 22. An inner ring 15 is positioned between the inner conductor insulation 13 and the shielded wire or outer conductor 14. An insulating sleeve 16a is located in front of the inner ring 15 in a manner heretofore described. The outer sleeve 16a may be slotted as at 23 to facilitate the coupling of the outer sleeve 19a to the outer socket member 5a. Thus after the cable termination 21 is coupled to coaxial cable 22 in the manner hereinbefore explained, the tapered pin 8 is inserted in the inner socket 4 and the outer sleeve 19a grips socket member 7 due to the spring action of slots 23.

The diameter of the outer sleeve 16a is made slightly greater than the inner diameter of the end of the outer socket member 5 of the panel socket connection. This is done to provide an outward pressure when the outer sleeve 16a is inserted into the outer socket member 5. After the tapered pin 8 and outer sleeve 16a make contact with the panel connection the outer sleeve 16a may be crimped to mechanically and electrically secure the outer conductor 14 of the coaxial cable 22 between the outer sleeve 16a and the inner ring 15.

While we have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

We claim:

1. A coaxial conductor connection comprising: a receptacle including a block of insulating material, an inner socket member having a tapered socket embedded in said block, an outer socket member in said block coaxial with said inner socket member; a cable having an inner conductor and a concentrically positioned outer conductor; a pin member including a tapered portion for insertion into said tapered inner socket member; a conductor receiving portion electrically secured to said inner conductor, and a shoulder disposed between said tapered portion and said conductor receiving portion, and adapted to receive the force transmitting end of an insertion tool; a ferrule positioned under said outer conductor; a sleeve made of insulating material positioned coaxially about said pin member; a cylindrical outer sleeve member for contact with said outer socket member and electrically coupled to said outer conductor and coaxial with said insulating sleeve; whereby said inner and outer conductors may be electrically connected to said inner and outer socket members by said pin and said outer sleeve; said outer socket member and said outer sleeve member each including lateral openings whereby said two openings may be laterally mounted one over the other to permit access to said shoulder when said outer members are disposed in telescopic relationship.

2. The connection of claim 1 wherein said insulating sleeve is longitudinally split to maintain said pin shaped member and said outer sleeve in spaced insulated relationship.

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