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McMills et al.

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[54] **COAXIAL CABLE CONNECTION METHOD AND DEVICE USING OXIDE INHIBITING SEALANT**

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[73] Assignee: **Raychem Corporation**, Menlo Park, Calif.

[21] Appl. No.: **981,974**

[22] Filed: **Nov. 25, 1992**

[51] **Int. Cl.**[5] **H01R 4/24**

[52] **U.S. Cl.** **439/387**; 439/578; 439/936

[58] **Field of Search** 439/387, 388, 578–585, 439/936

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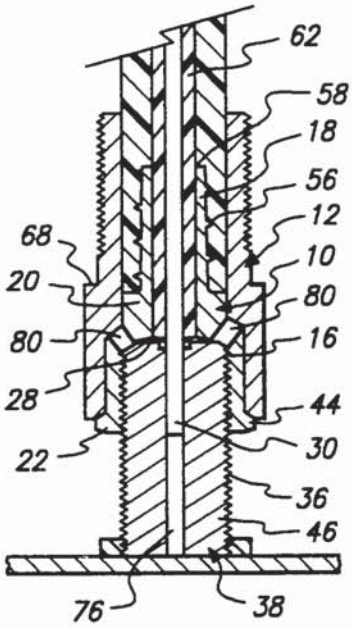
[57] **ABSTRACT**

A method and a device is provided which allows the connection of coaxial cable termini to one another with minimum long-term loss of RFI shielding. The method comprises the removal of metal oxides from the concentric conductor portions of the two cable termini, applying a sealant to the concentric conductor termini and then connecting the central conductor termini to one another and the concentric conductor termini to one another. The device comprises a collet structure dimensioned to slip over the outside of a standard connection jack. Within the collet structure is disposed a quantity of sealant and the collet structure has at least one aperture through which sealant oozes from the collet structure to the exterior of the collet structure. When the collet structure is attached to the jack, the sealant is caused to ooze onto the concentric conductor thereby sealing the concentric conductor from the ambient.

18 Claims, 3 Drawing Sheets



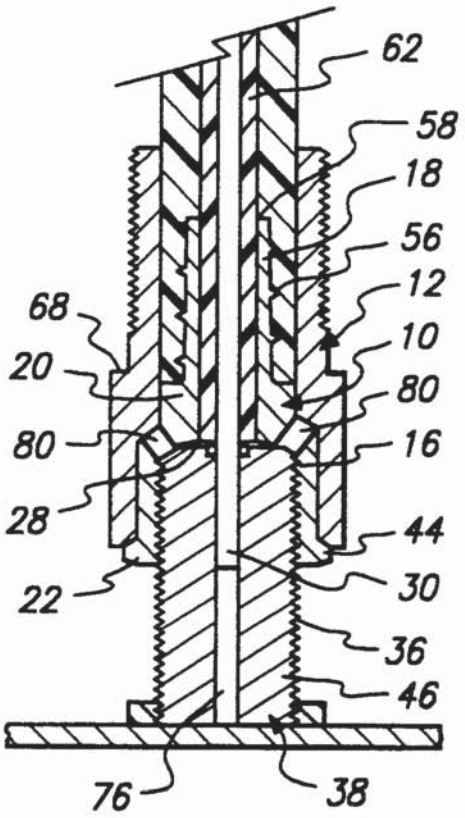


FIG. 1

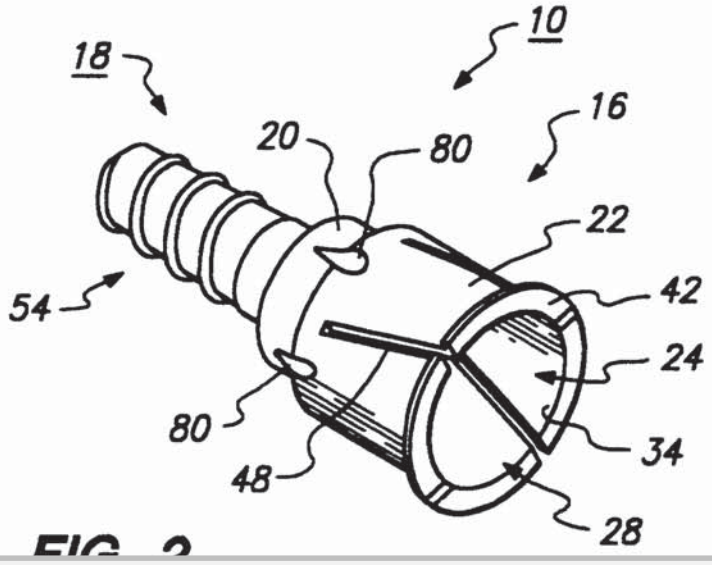


FIG. 2

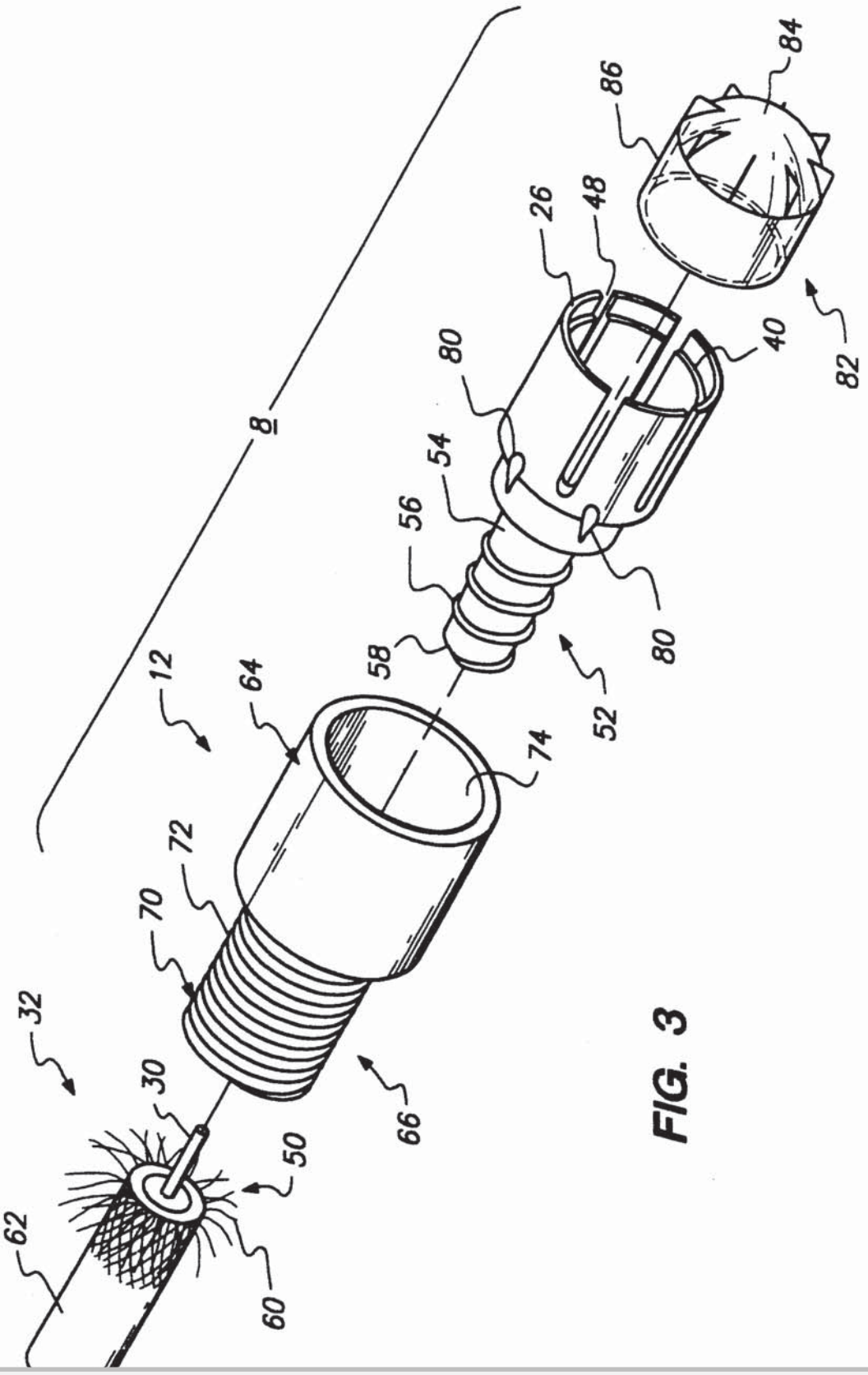


FIG. 3

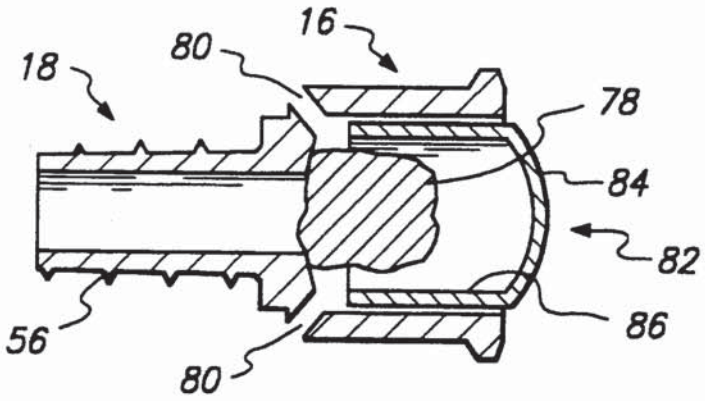


FIG. 4

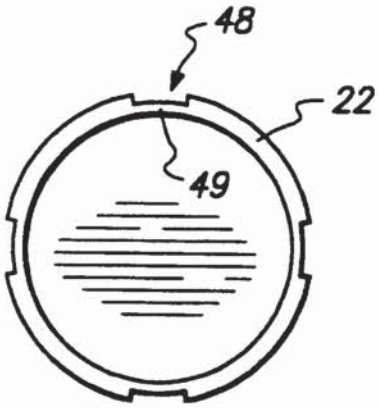


FIG. 5a

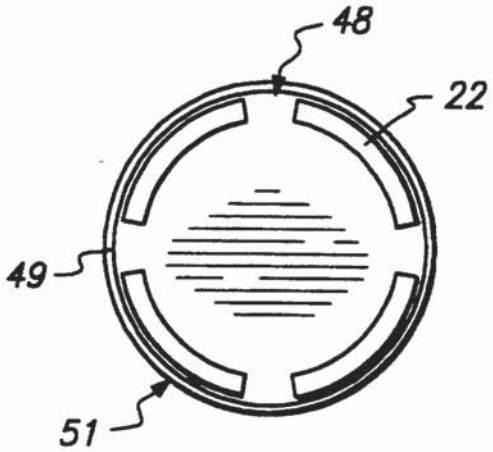


FIG. 5b

COAXIAL CABLE CONNECTION METHOD AND DEVICE USING OXIDE INHIBITING SEALANT

U.S. PATENT APPLICATIONS INCORPORATED BY REFERENCE

This application incorporates herein completely the entirety of U.S. patent application Ser. No. 07/912,106, filed Jul. 9, 1992, U.S. patent application Ser. No. 07/509,669, filed Apr. 19, 1990, U.S. patent application Ser. No. 07/434,068, filed Nov. 8, 1989, and U.S. patent application Ser. No. 07/364,917, filed Jun. 9, 1989.

FIELD OF THE INVENTION

This invention relates generally to methods and devices for connecting the termini of coaxial cables together and, specifically, to methods and devices for sealably connecting the termini of coaxial cables while minimizing radio frequency interference.

BACKGROUND OF THE INVENTION

Coaxial cable is widely used for distributing wide band radio frequency information, such as television and radio signals. The cable television/radio industry, which relies almost exclusively on coaxial cable, is one of the most rapidly expanding segments of the United States' economy. It is anticipated that in the very near future the amount and type of information available via coaxial cable networks will be greatly expanded beyond traditional television and radio signals. Coaxial cable networks may soon be the principal vehicle by which consumers obtain their daily news, access library information, do their shopping, pay their bills, and otherwise interact with much of the outside world. Maintaining and controlling the integrity of these critical coaxial cable distribution networks is a major challenge for the cable network industry.

Coaxial cable typically includes a central axial conductor and an outer conductor which is disposed concentrically around the central conductor. A low-loss, high dielectric insulation material, such as plastic foam, separates the two conductors. An outer insulating jacket is often provided over the concentric conductor to provide electrical insulation, shielding and physical protection to the cable. The concentric conductor may be a single continuous element or, more commonly, it is a composite of several layered elements of thin conductive foil, wire braid or similar material. The foil, braid or other similar material is generally made from an aluminum alloy.

Coaxial cable networks comprise lengths of cable connected to one another by connection equipment. Such connection equipment most often takes the form of a male/female connection system wherein the male member includes a connection jack and the female member includes a threaded or friction-fit coupler dimensioned to couple with the male jack. As shown in FIG. 1, a standard connection jack RG-59 cable, comprises a cylindrical, externally threaded body. For RG-59 cable the outside diameter of the jack is about 0.375 inches (0.952 cm). The outwardly projecting end of the jack is covered by a planar member which has a central aperture. Behind the aperture, within the confines of the body of the jack, is disposed an internal conductor. The body is electrically connected to one of the coaxial cable circuits and the inner conductor is connected to the other coaxial cable circuit.

The female member in the typical male/female connection system commonly comprises a jack connection moiety which is adapted to attach to the cable connection jack. The female member also comprises a cable connection moiety which physically attaches to the terminus of a coaxial cable in such a way that the cable connection moiety is in electrical contact with the concentric conductor of the coaxial cable. The cable connection moiety is adapted to allow the terminus of the central conductor to project through the center of the female member without contacting the female member, so that, when the jack moiety is attached to the outside of the conductor jack body, the central conductor terminus protrudes into the connection jack central aperture (without contacting the jack connection moiety of the female member or the conductor jack body) and is placed into electrical contact with the internal conductor of the connection jack. It is a basic requirement of the male/female connection system that electrical continuity is provided between the outer concentric conductors and the central conductors of joined cables while maintaining isolation between these conductors.

When all of the connections along a run of coaxial cable are properly made, the cable is largely shielded from the receipt and emission of electromagnetic radiation. This is because the outer concentric conductor carries a current which is precisely the reverse of that which is carried by the central axial conductor, so that the resulting pair of magnetic fields cancel each other out. If, however, the concentric conductor is improperly connected anywhere along the cable run, little or no reverse current will flow along that conductor and the shielding normally present in the cable run will be eliminated. Without such shielding, the signal current traveling along the central axial conductor will emit electromagnetic radiation to the atmosphere, and extraneous electromagnetic radiation from the atmosphere will be received by the central axial conductor.

Electromagnetic radiation in the radio frequency range can present at least two problems. Firstly, incoming radio frequency radiation interferes with the signal carried by the central axial conductor. Secondly, radio frequency radiation emanating from the central axial conductor interferes with other radio wave receiving equipment in the vicinity. The Federal Communications Commission (FCC) has promulgated and enforces strict regulations regarding radio frequency emission interference ("RFI").

Improper connections along concentric conductor circuits can arise for several reasons. Firstly, the connection equipment is sometimes improperly installed or a subsequent event may mechanically damage the connection equipment. Secondly, the connection termini are frequently covered by a coating of oxidation at the time of initial connection. Finally, the connection termini tend to continue to oxidize after installation. This phenomenon is especially prevalent where the concentric conductor is made from an aluminum alloy.

The prior art contains numerous methods and devices to provide long-term integrity of the outer conductor circuit. For example, methods and devices which use mechanical techniques for creating an especially strong contact between connection elements and the outer conductor have been tried. However, these methods and devices are generally expensive and usually require the use of special tools. Also, the methods are of limited value in protecting the connection points from the el-

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