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SEALING CRIMP RING FOR COAXIAL CONNECTOR

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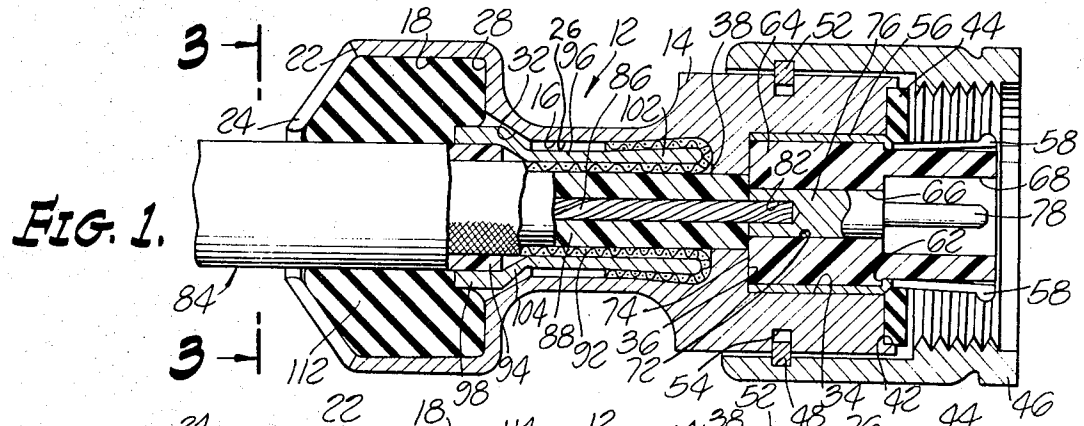

FIG. 1.

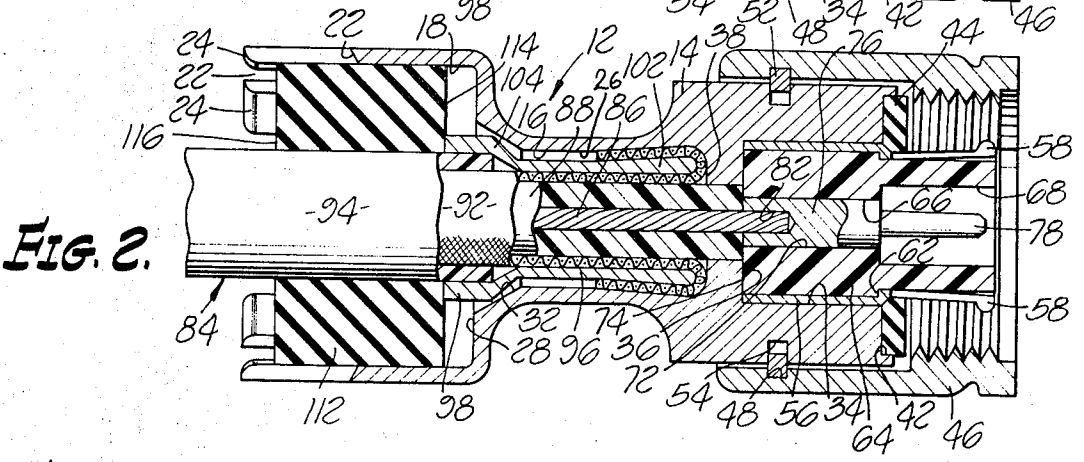

FIG. 2.

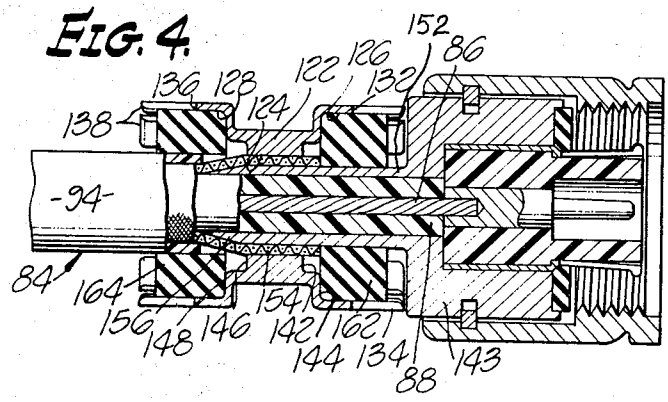

FIG. 4.

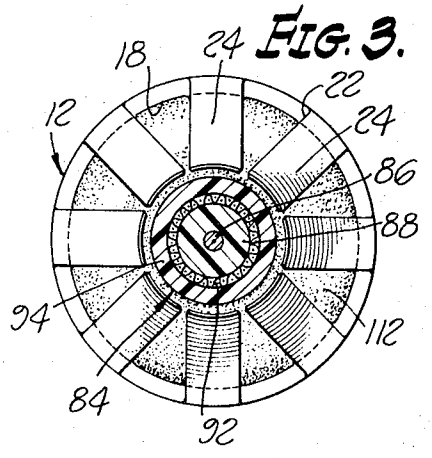

FIG. 3.

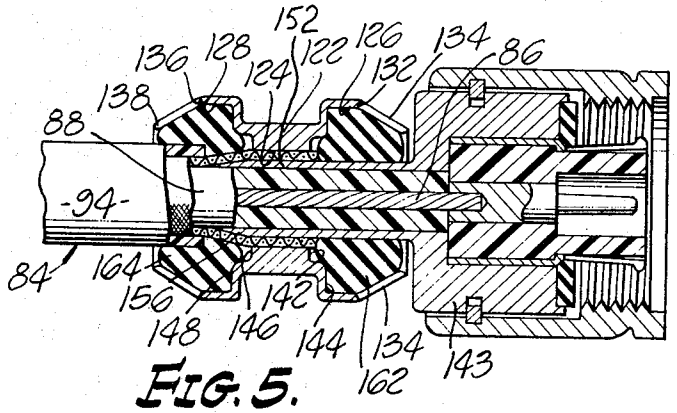

FIG. 5.

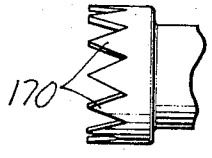

FIG. 6.

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SEALING CRIMP RING FOR COAXIAL CONNECTOR

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U.S. Cl. 174—75 4 Claims

ABSTRACT OF THE DISCLOSURE

The invention comprises a sealing crimp ring for attachment to an end of a coaxial cable. The sealing crimp ring comprises a tubular body having front and rear ends and an intermediate section with the end of the cable being receivable within the tubular body from the rear. A cylindrical rubber seal is mounted within the body, the tubular body being deformable inwardly around the rubber seal to form an environmental seal between the coaxial cable and the tubular body. The tubular body may form an integral part of the electrical connector. Further, a rubber seal may be used at the front end of the tubular body as well as at the rear end.

The invention relates in general to sealing crimp rings and, more particularly to a crimp connector having an environmental seal mounted externally of the connector assembly.

BACKGROUND OF THE INVENTION

In conventional coaxial cable electrical connectors, it has been found advantageous to electrically and mechanically couple the cable shield or braid to the body or outer conductor of the connector member by depositing the braid radially between an inside relatively rigid ferrule and an outside crimp ring, and crimping the outside ring radially inwardly to effect the connection. When designing such a crimp connector, the designer must choose between a crimped but nonenvironmental connector or a crimp connector having an environmental seal containing additional size and parts which increase cost while simultaneously decreasing reliability.

As is well known, the technique of crimping is the compression of a soft metal ring around the connector ferrule with the cable bread sandwiched therebetween. This crimping is accomplished with a crimp tool whose jaws reduce the crimp ring to the tool internal configurations and dimensions. Further, when humidity sealing is required, the crimped cable and connector combination must be contained within the housing which is usually integral with the connector body. Integral with the housing and external to the crimp ring are various types of ramps, seal glands, washers, and clamp nuts to effect an adequate humidity seal. In certain cases, boots and shrink tubes have been used but these do not provide an adequate humidity seal where a true environmental connector is required.

The present invention utilizes a sealing crimp ring combining the high reliability and the simple assembly advantages of the crimped connector with the compression sealing advantages of a threaded clamping mechanism. This sealing crimp ring is as simple to assemble as a conventional crimp conector. Further, it is possible to accomplish an environmental seal in a crimp connector without burying the crimp termination inside of a more complex connector assembly. The sealing crimp ring can be used on any shielded connector where sealing and crimping is desired.

SUMMARY OF THE INVENTION

More particularly, the invention comprises a sealing crimp ring for attachment to an end of a coaxial cable. The sealing crimp ring comprises a tubular body having front and rear ends and an intermediate section with the end of the cable being receivable within the tubular body from the rear. A cylindrical rubber seal is mounted within the body, the tubular body being deformable inwardly around the rubber seal to form an environmental seal between the coaxial cable and the tubular body. The tubular body may form an integral part of the electrical connector. Further, a rubber seal may be used at the front end of the tubular body as well as at the rear end.

The advantages of this invention, both as to its construction and mode of operation, will be readily appreciated as the same becomes better understood by references to the following detailed description when considered in connection with the accompanying drawing in which like reference numerals designate like parts throughout the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a connector member, partly in section, embodying a novel sealing assembly in accordance with the invention;

FIG. 2 depicts the connector member of FIG. 1 with sealing assembly secured within the connector member prior to completion of assembly of the device.

FIG. 3 is a rear view, partly in section, of the assembled connector, taken along the line 3—3 of FIG. 1.

FIG. 4 depicts an alternative arrangement for utilizing the sealing assembly;

FIG. 5 depicts the sealing assembly of FIG. 4 after completion of the sealing assembly; and

FIG. 6 depicts an alternative arrangement of a portion of the sealing assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, there is shown in FIG. 1 a connector member **12** depicted as a plug connector member, although the invention is equally applicable to a receptacle connector member adapted to be connected with the plug connector member **12**, or may be embodied in other types of connector members. The connector member **12** includes a tubular body or shell **14**. The bore **16** of tubular body **14** includes an enlarged rear portion **18**. Rearwardly opening slots **22** formed by fingers **24** are provided on the rearward section of the tubular body **14**. The bore **16** is of annular configuration where the rear portion **18** meets intermediate constricted bore portion **26** so as to define a rearwardly facing shoulder **28** and an angular section **32**.

The bore **16** further contains an enlarged forward bore portion **34**, a forwardly facing shoulder **36** and a rearwardly facing shoulder **38** where the forward bore portion **34** and intermediate bore portion **26** adjoin each other. A shallow counterbore **42** is provided at the front end of the body **14** for receiving an annular sealing gasket **44**, the gasket being adapted to provide a seal between a forward end of body **14** and the forward end of the body of a mating connector member (not shown).

A coupling nut **46** is rotatably mounted about the front portion of the body **14**, and extends forwardly from the front end of the body **14** for connecting the member **12** with a mating connector member. Coupling nut **46** is rotatably retained on body **14** by provision of an internal annular groove **48** in nut **46** which receives a retainer ring **52**, the ring extending radially inwardly into an annular groove **54** in the outer surface of body **14**.

A tubular outer contact **56** is mounted in the constricted forward bore portion **34** of body **14**, extending forwardly through the gasket **44** and having a forward contacting

portion comprising a plurality of spring contacting fingers **58**. The rear end of the outer contact **56** is aligned with the forwardly facing shoulder **36**. The tubular outer contact **56** has a rearwardly facing annular shoulder **62** therein and serves to limit the forward position of an insulator **64** which is insertable into the tubular contact **56** from the rear. Insulator **64** has an axial bore **66** extending therethrough, with a relatively large forward counterbore **68** and a relatively small rearward counterbore **72** therein. The rear end **74** of the insulator **64** is approximately aligned with the forwardly facing shoulder **36** of bore **16**.

Insulator **64** may be composed of Teflon or other suitable dielectric material having sufficient structural rigidity to support a center contact member **76** within the insulator bore **72**. Center contact member **76** includes a forward contacting portion **78** that is exposed within the insulator forward counterbore **68** so as to be accessible to a mating contact member from the front of the connector member. The center contact member has an axial recess **82** therein which opens to the rear of the contact member so as to receive the bored forward end of the center conductor of a coaxial cable.

The coaxial cable **84** which is engaged with the connector member **12** includes a center conductor **86**, a dielectric layer **88** surrounding the center conductor **86**, a braided tubular outer conductor **92** surrounding the dielectric layer **88**, and a cable jacket **94** of insulation material which surrounds the braided outer conductor **92**.

The dielectric layer **88** is trimmed back from the end of the coaxial cable **84** so as to leave an exposed forward end portion of the center conductor **86** which is inserted into the axial recess **82** of center contact member **76** and secured thereto by soldering or crimping.

The structure in the connector member to which the tubular outer conductor **92** of the cable is crimpel comprises a ferrule **96** having an enlarged rearward portion **98** which is slidably engaged over the cable jacket and a constricted forward portion **102** slidably engaged over the braided tubular outer conductor **92**. The rearward portion **98** and forward portion **102** of ferrule **96** are interconnected by an annular portion **104** adjacent the angular section **32** of tubular body **14**, the cable jacket being terminated at the junction of the rearward portion **98** and the angular portion **104** of the ferrule **96**.

The braided tubular outer conductor engages the inner surface of the forward portion **102** of ferrule **96** and then overlaps the end thereof adjacent the rearwardly facing shoulder **38** and is interposed between the outer surface of forward portion **102** and the constricted intermediate bore portion **26** to provide electrical contact between outer conductor **92** and outer contact **56** through the tubular body **14**.

A cylindrical rubber seal **112** which is slidably inserted over the cable jacket has its outer surface adjacent the enlarged rear bore portion **18** of the body **14**. The front surface **114** of the seal abuts the rear end of the rearward portion of the ferrule **96**, thereby forming an air gap between the remainder of the front surface **114** and the rearwardly facing shoulder **28**. The rear surface **116** of the seal terminates short of the end of the fingers **24**.

By applying a crimp tool to the members **24**, the rubber member **112** is compressed, with the final angle of the members **24** determining the amount of compression transferred throughout the resilient material. Of course, a crimp tool could be designed which could fold over members **24** to the desired angle while simultaneously crimping the center region of the assembly to the braid **92**.

Referring now to FIGS. 4 and 5, there is depicted an alternative embodiment of the sealing assembly of FIG. 1 wherein the ferrule is an integral part of the body of the connector assembly. The sealing mechanism comprises a generally cylindrical ring member **122** having a

reduced diameter central bore **124** and an enlarged diameter forward bore **126**, and an enlarged diameter rear bore **128**. The forward section of the member **122** contains forward opening slots **132** formed between fingers **134**, and rearward opening, slots **136** formed between fingers **138**. An annular notch **142** is formed in the member **122** adjacent the bore **124** and a forwardly facing shoulder **144** is formed adjacent the rear end of forward bore **126**. Further, an annular notch **146** is formed in the member **122** adjacent the bore **124** and a rearwardly facing shoulder **148** is formed adjacent the forward end of rear bore **128**.

The connector body **143** is made integral with a rearwardly extending cylindrical ferrule **152** whose bore diameter forms a snug fit with the outer surface of the dielectric member **88** of the conductor **84**. A braid **154** extends over the ferrule **152** to about the forward facing shoulder **144**, the ferrule terminating in a tapered end section **156**. A pair of annular rubber members **162, 164** are inserted within the bores **126** and **128**, respectively. When the members **134, 138** are compressed in a manner similar to that as shown in FIG. 1, the rubber material **162, 164** is compressed thus forming the desired environmental seal. Further, the central reduced section **122** may be crimped to the braid **154** simultaneously. The connector assembly of FIGS. 4 and 5 is similar to that of FIGS. 1 and 2 with the exception of body member **143** and, therefore, the connector assembly has not been described in detail.

Referring now to FIG. 6, there is shown an alternative embodiment of the foldable members of FIGS. 1 and 4. In FIG. 6, the foldable member is shaped as a triangular piece of metal **170** prior to compression. Thus, on compression, each of the triangular members **170** are almost in contact with each other at their edge surface, thus entirely enclosing the rubber packing material within the seal.

What is claimed is:

1. In a cable connector having a coaxial cable end, means coupling the cable end to a cable connector, an outer sleeve in contact with the outer conductor of said cable end, and extending axially along said cable,

said sleeve having an end portion surrounding a portion of said cable and spaced therefrom, a resilient member inserted in the area between said sleeve and said cable, the ends of said sleeve being bent inwardly so as to form an acute angle with the axis of said sleeve, the inward bending of the end of said sleeve compressing said resilient member, the end angle being directly related to the amount of compression transferred to said resilient material.

2. A cable connector in accordance with claim **1** wherein a resilient member is provided at both ends of said sleeve and each of said ends are bent inwardly at said acute angle.

3. A cable connector in accordance with claim **1** wherein said end portion is formed of a plurality of fingers each of said fingers being bent at said acute angle with respect to the axis of said cable.

4. A cable assembly in accordance with claim **3** wherein said fingers are triangular in shape and wherein upon compression said resilient material is thus almost entirely enclosed by said sleeve.

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DARRELL L. CLAY, Primary Examiner

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174—77, 87; 339—177