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(54) Coaxial connector

(57) A coaxial connector (10) that comprises an attachment member (40) and a compression sleeve (22). The attachment member includes a collar (44), which is coupled with a nut (42) that is free to rotate about the collar, for receiving, at least partially, the compression sleeve therein. The collar has an internal shape of decreasing diameter for radially constricting the compression sleeve when inserted into the attachment member such that the coaxial connector may be sealed from environmental elements entering therein. This allows for a much smaller sized barb (48) to be used on the end of a post (46) within the attachment member, or no barb at all. The coaxial connector further includes a lip (50) secured within the compression sleeve for preventing the braided shield (18) from sliding between the compression sleeve and cable jacket (20) during installation of the coaxial connector.

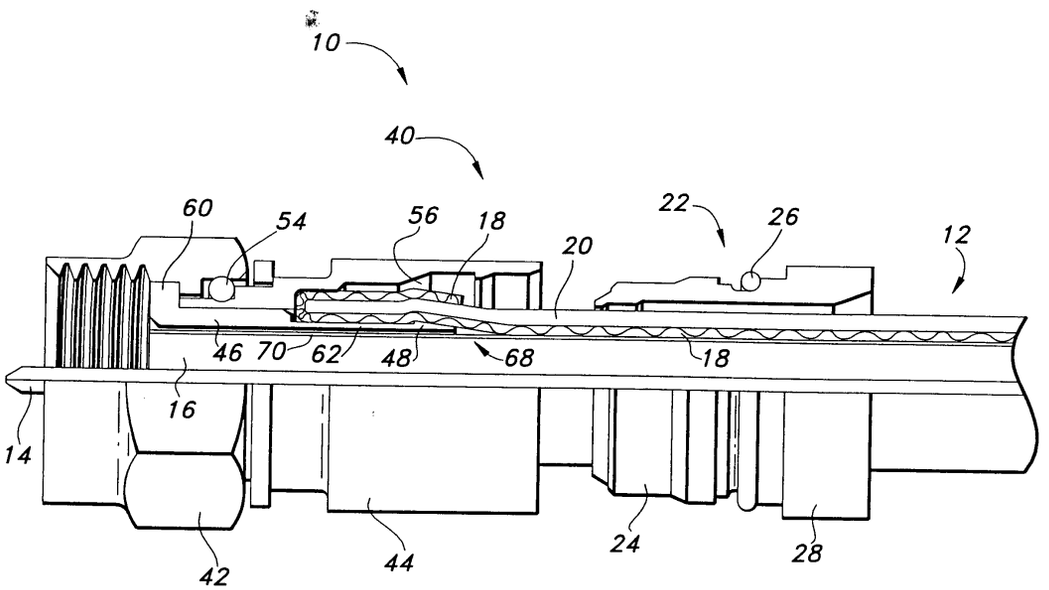

FIG 4

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Description

Field of the Invention

[0001] In general, the present invention relates to cable connectors. And in particular, the present invention relates to a coaxial connector that requires minimal insertion force when mating with a cable for creating an electrical and mechanical connection between a cable and an electronic component.

Background

[0002] The coaxial connector of U.S. Patent No. 4,902,246 to Samchisen, issued February 20, 1990, discloses the use of a connector body post with a large barbed end for radially expanding the flexible jacket of a cable. During assembly, a compression sleeve is inserted into the connector body and interferes with the expanded region of the jacket. A main disadvantage with this patent, however, is that it is very difficult to insert the large barb under stiff jacket materials such as polyethylene.

Summary of the Invention

[0003] The present invention eliminates the above difficulties and disadvantages by providing a coaxial connector for electrically and mechanically connecting a cable to an electronic component. The coaxial connector receives and secures the cable therein for connecting to the electronic component.

[0004] The cable has a plurality of layers including a center conductor, a dielectric insulator encasing the center conductor, a layer of foil surrounding the dielectric insulator, at least one braided shield surrounding the layer of foil, and a jacket encasing the braided shield. The layer of foil and braided shield act to prevent EMF from interfering with a signal carried on the center conductor. The coaxial connector includes a first main component, which is a compression sleeve that has an insertion end, an abutment end integrally formed with the insertion end, and preferably an O-ring secured between the abutment and insertion ends for sealing. During installation, the cable is inserted through the compression sleeve, which surrounds and slidably receives the cable before the coaxial connector is assembled.

[0005] The coaxial connector further includes a second main component, which is an attachment member that has an internally threaded nut for screwingly engaging the electronic component. A post is disposed within the nut with a first end adjacent the internal threading of the nut and a second end including a barb for inserting between the foil and the braided shield to create a slight radial expansion of the cable upon insertion into the attachment member.

[0006] In another embodiment, the post does not have a barbed end, thereby allowing for easier installation of the cable into the attachment member.

[0007] The attachment member further includes an O-ring disposed in the nut for sealing. A collar is integrally formed with the post for receiving, at least partially, the compression sleeve therein and that contacts the abutment end when the compression sleeve is inserted into the attachment member. The collar has an internal shape of decreasing diameter for radially constricting the compression sleeve when inserted into the attachment member such that the coaxial connector is mechanically secured to the cable and sealed from environmental elements entering therein. This allows for the much smaller sized barb to be used on the end of the post or no barb at all.

[0008] In still another embodiment, a lip is included on the interior of the insertion end of the compression sleeve to prevent the braided shield from sliding between the compression sleeve and jacket during installation of the connector.

Brief Description of the Drawings

[0009] FIG. 1 is a perspective view of the cable connector of the present invention fully assembled and with a cable secured therein.

[0010] FIG. 2 is a perspective view of the cable connector of the present invention disassembled and in a shipping configuration.

[0011] FIG. 3 is a partial cut-away view of the cable connector of the present invention with a compression sleeve and cable being inserted into an attachment member of the cable connector.

[0012] FIG. 4 is a partial cut-away view of the cable connector of the present invention with a post and barb of the attachment member being inserted under a jacket of the cable.

[0013] FIG. 5 is a partial cut-away view of the cable connector of the present invention with the compression sleeve and cable inserted into the attachment member, and the compression sleeve having a lip disposed therein.

Detailed Description of the Preferred Embodiment (s)

[0014] The above and other features, aspects, and advantages of the present invention will now be discussed in the following detailed description and appended claims while considered in conjunction with the accompanying drawings in which identical reference characters designate like elements throughout. A coaxial connector 10 is perspectively shown in FIG. 1 for electrically and mechanically connecting a cable 12 to a device such as an electronic component for transmitting or receiving a signal.

[0015] The cable 12, which is preferably a coaxial cable, has a plurality of layers 68, which are shown in FIGS. 3-5. The plurality of layers 68 includes a center

conductor 14 for carrying the signal, a dielectric insulator 16, such as foam polyethylene, which encases the center conductor 14, a layer of foil 70 surrounds the insulator 16, at least one braided shield 18 surrounding the foil 70, and a jacket 20, which encases the braided shield 18. The jacket 20 may be constructed of a hard polymer such as polyethylene or polyvinyl chloride or an elastomer making radial expansion of the jacket 20 during installation of the cable 12 in the coaxial connector 10 difficult.

[0016] The coaxial connector 10 includes a first main component, which is a compression sleeve 22, as shown in FIGS. 1-5, that is preferably constructed from a synthetic resinous plastic. Preferably, acetyl resins are used for this construction such as a linear polyoxymethylene-type acetyl resin marketed under the trademark DELRIN and manufactured by E.I. Du Pont de Nemours and Company of the United States. As shown in FIGS. 2-5 the compression sleeve 22 also includes an annular insertion end 24 and an annular abutment end 28 that is integrally formed with the insertion end 24, and that together form a bore 34 as shown in FIG. 2. The compression sleeve 22 further includes an O-ring 26, preferably formed from synthetic rubbers or elastomers, secured between the abutment end 28 and insertion end 24 to seal off environmental elements from entering the connector 10 between the sleeve 22 and the second main component.

[0017] The second main component of the coaxial connector 10 is an attachment member 40, as shown in FIGS. 1-5, which is preferably fabricated from metal such as brass and plated with another metal such as Cadmium but could also be fabricated a rigid material such as plastic. Moreover, the attachment member 40 may have a coating such as Chromate overlying the Cadmium plating. The attachment member 40 includes a nut 42 that has a partially threaded channel 58 extending through it for screwingly engaging the electronic component. An O-ring 54 is installed within the channel 58 of the nut 42 to seal off environmental elements from entering the nut 42. The O-ring 54 is preferably formed from synthetic rubbers or elastomers.

[0018] As shown in FIGS. 3-5, the attachment member 40 further includes a post 46 that has a first end 60 disposed in the partially threaded channel 58 of the nut 42 and preferably adjacent the internal threading of the nut 42, and a second free end 62. Integrally formed on the second free end 62 is a small flange or barb 48, as shown in FIGS. 3, 4, and 5. The nut 42 is free to rotate about the first end 60 of the post 46. In another embodiment, the second free end 62 can also be without the barb 48 to further decrease insertion force of the cable 12 into the attachment member 40. Even without the barb 48, the second free end 62 of the post 46 is tapered for easier insertion between the foil 70 and braided shield 18. The functional aspects of the barb 48 will be discussed below when referring to the nut 42 of the coaxial connector 10.

[0019] A collar 44 is coupled to the nut 42 and extends axially therefrom, and in which the post 46 is secured. The collar 44 is also preferably constructed of metal, such as brass but could also be constructed of hard plastic, and further defines the channel 58 and includes an internally formed shape 56 of generally decreasing diameter, as shown in FIGS. 3-5. The functional aspects of the shape 56 of generally decreasing diameter will also be discussed in greater detail below.

[0020] As shown in FIG. 2, the coaxial connector 10 of the present invention is preferably shipped in two joined components; the first being the compression sleeve 22 and the second being the attachment member 40. A shipping ring 30, which is integrally formed with sleeve 22 and both are preferably formed of DELRIN but could also be formed of a hard plastic, encircles the attachment member 40 and remains thereon or alternatively is cut off before assembly of the coaxial connector 10. The shipping ring 30 is integrally formed with an extension 32 that in turn is integrally formed with the abutment end 28 of the compression sleeve 22, coupling the attachment member 40 to the compression sleeve 22.

[0021] Installation of the cable 12 and how the coaxial connector 10 is assembled, is as follows. As is best shown in FIG. 2, the compression sleeve 22 defines bore 34 for slidably receiving, and through which, the cable 12 is inserted prior to the coaxial connector 10 being assembled. The free end of the cable 12 is prepared for installation by a quarter-quarter preparation tool that has two blades of different lengths. A first blade scores the cable 12 to the depth of the center conductor 14 thereby cutting the jacket 20, braided shield 18, foil 70, and the dielectric insulation 16 to the appropriate length. A second blade simultaneously scores the jacket 20 to a shorter length. Then, the remaining underneath length of braided shield 18 is folded over top of the jacket 20 as shown in FIG. 3. The underlying foil 70 is then exposed. It is understood that for QS-type coaxial cables 12, extra layers 68 of braided shields may be employed together as inner and outer braided shields with a layer of foil in between with the foil being scored and removed, and the inner braided shield being folded over the outer braided shield.

[0022] Once the cable 12 is prepared and received by the compression sleeve 22, the cable 12 is then inserted into the bore 34 of the attachment member 40 so that the post 46 or barb 48 is resting on the exposed foil 70. Next, as shown in FIG. 4, the cable 12 is inserted into the attachment member 40 causing the post 46 or barb 48, depending on the embodiment, to be inserted between the foil 70 and the braided shield 18 thereby creating radial expansion of the cable 12 by radial expansion of the jacket 20. It is expressly understood, however, that the post 46 or barb 48 could be inserted between any of the plurality of layers 68 surrounding the dielectric insulation 16 to create radial expansion of the cable 12.

[0023] As shown in FIG. 5, the collar 44 of the attachment member 40 receives, at least partially, the com-

pression sleeve 22 therein and contacts the abutment end 28. In particular, the insertion end 24 of the compression sleeve 22 is received inside the portion of the channel 58 that is contained within the collar 44. The internal shape 56 of generally decreasing diameter of the collar 44 radially and gradually constricts the compression sleeve 22, and particularly the insertion end 24, when received by the attachment member 40 such that a uniform, radial compression is created around the cable 12. Simultaneously, axial retention of the cable 12 is thereby created in the coaxial connector 10 such that the connector 10 is sealed from environmental elements entering therein. The cable 12 is now fixedly secured within the coaxial connector 10 for later operation and coupling with the electronic device.

[0024] As further shown in the embodiment of FIG. 5, a lip 50 is included on the interior of the insertion end 24 such that the lip 50 prevents the braided shield 18, or any strands thereof, from sliding between the compression sleeve 22 and jacket 20 during installation of the connector 10. This prevention is accomplished by the lip 50 being dimensioned so that it can flex outward to clear the braided shield 18 when the cable is being inserted into the sleeve 22. When the sleeve 22 is squeezed into the back of the collar 44, in the last step of assembly, the lip 50 does not flex outward and instead eliminates the clearance space between the sleeve 22 and jacket 20 thereby preventing the braided shield 18 from getting wedged between the sleeve 22 and jacket 20 such that the folded-back portion of the braided shield 18 becomes bunched or curled up.

[0025] Although the invention has been described in detail above, it is expressly understood that it will be apparent to persons skilled in the relevant art that the invention may be modified without departing from the spirit of the invention. Various changes of form, design, or arrangement may be made to the invention without departing from the spirit and scope of the invention. Therefore, the above mentioned description is to be considered exemplary, rather than limiting, and the true scope of the invention is that defined in the following claims.

Claims

1. A coaxial connector for electrically and mechanically connecting a cable to an electronic component, the cable being secured in the coaxial connector and having a plurality of layers including a center conductor, a dielectric insulator encasing the center conductor, a layer of foil surrounding the dielectric insulator, at least one braided shield surrounding the layer of foil, and a jacket encasing the at least one braided shield, the coaxial connector comprising:

   a compression sleeve defining a bore and having an insertion end, and an abutment end integrally formed with the insertion end, the cable being received within the bore; and
   an attachment member defining a channel and comprising a nut, a collar coupled with the nut for receiving, at least partially, the compression sleeve therein, the collar having an internal shape of decreasing diameter for radially constricting the compression sleeve when inserted into the attachment member, and a post having a first end secured in the attachment member and a second free end for inserting between two of the plurality of layers upon insertion into the attachment member.

2. The coaxial connector of claim 1 wherein the channel is partially threaded.

3. The coaxial connector of claim 1 or claim 2 wherein the post includes a barb for inserting between two of the plurality of layers.

4. The coaxial connector of any one of claims 1 to 3 further comprising an O-ring disposed in the nut for preventing environmental elements from entering the nut.

5. The coaxial connector of any one of claims 1 to 4 wherein the collar contacts the abutment end when the compression sleeve is inserted into the attachment member such that the coaxial connector is sealed from environmental elements entering the coaxial connector.

6. The coaxial connector of any one of claims 1 to 5 wherein the post is inserted between the dielectric insulator and the at least one braided shield.

7. A coaxial connector for electrically and mechanically connecting a cable to an electronic component, the cable being secured in the coaxial connector and having a plurality of layers including a center conductor, a dielectric insulator encasing the center conductor, a layer of foil surrounding the dielectric insulator, at least one braided shield surrounding the layer of foil, and a jacket encasing the at least one braided shield, the coaxial connector comprising:

   a compression sleeve defining a bore and having an insertion end, and an abutment end integrally formed with the insertion end, the cable being received within the bore; and
   an attachment member defining a channel and comprising a nut, a collar secured with the nut for receiving, at least partially, the compression sleeve therein, the collar having an internal shape of decreasing diameter for radially constricting the compression sleeve when inserted

into the attachment member such that the coaxial connector is sealed from environmental elements entering therein, and a post having a first end secured in the attachment member and a second free end including a barb for inserting between two of the plurality of layers upon insertion into the attachment member.

8. The coaxial connector of any one of claims 1 to 7 further including an O-ring secured between the abutment end and the insertion end for preventing environmental elements from entering the compression sleeve.

9. The coaxial connector of any one of claims 1 to 8 wherein the compression sleeve slidably receives the cable before the coaxial connector is assembled.

10. The coaxial connector of claim 7 wherein the channel is partially threaded for screwingly engaging the electronic component.

11. The coaxial connector of claim 7 or claim 10 wherein the post is inserted between the layer of foil and the at least one braided shield.

12. The coaxial connector of any one of claims 7, 10 or 11 wherein the attachment member further includes an O-ring disposed in the nut for preventing environmental elements from entering the nut.

13. The coaxial connector of any one of claims 7, 10, 11 or 12 wherein the collar contacts the abutment end when the compression sleeve is inserted into the attachment member.

14. The coaxial connector of any one of claims 1 to 13 wherein a lip is secured within the bore for preventing the braided shield from sliding between the compression sleeve and jacket during installation of the coaxial connector.

15. A coaxial connector for electrically and mechanically connecting a cable to an electronic component, the cable being secured in the coaxial connector and having a plurality of layers including a center conductor, a dielectric insulator encasing the center conductor, a layer of foil surrounding the dielectric insulator, at least one braided shield surrounding the layer of foil, and a jacket encasing the at least one braided shield, the coaxial connector comprising:

a compression sleeve defining a bore and having an insertion end that includes a lip secured within the bore for preventing the braided shield from sliding between the compression sleeve and jacket during installation of the coaxial connector, an abutment end integrally formed with the insertion end, and an O-ring secured between the abutment end and the insertion end, the cable being received within the bore; and

an attachment member defining a channel and comprising a nut with the channel threaded therein for screwingly engaging the electronic component, a collar coupled with the nut for receiving, at least partially, the compression sleeve therein and contacting the abutment end when the cable connector is assembled, the collar having an internal shape of decreasing diameter for radially constricting the compression sleeve when inserted into the attachment member, and a post having a first end secured in the attachment member and a second free end for inserting between the layer of foil and the at least one braided shield upon insertion into the attachment member, an O-ring disposed in the nut.

16. The coaxial connector of claim 15 wherein the second free end includes a barb integrally formed thereon.

17. The coaxial connector of claim 15 or claim 16 wherein when the collar contacts the abutment end when the compression sleeve is inserted into the attachment member, the coaxial connector is sealed from environmental elements entering the coaxial connector.

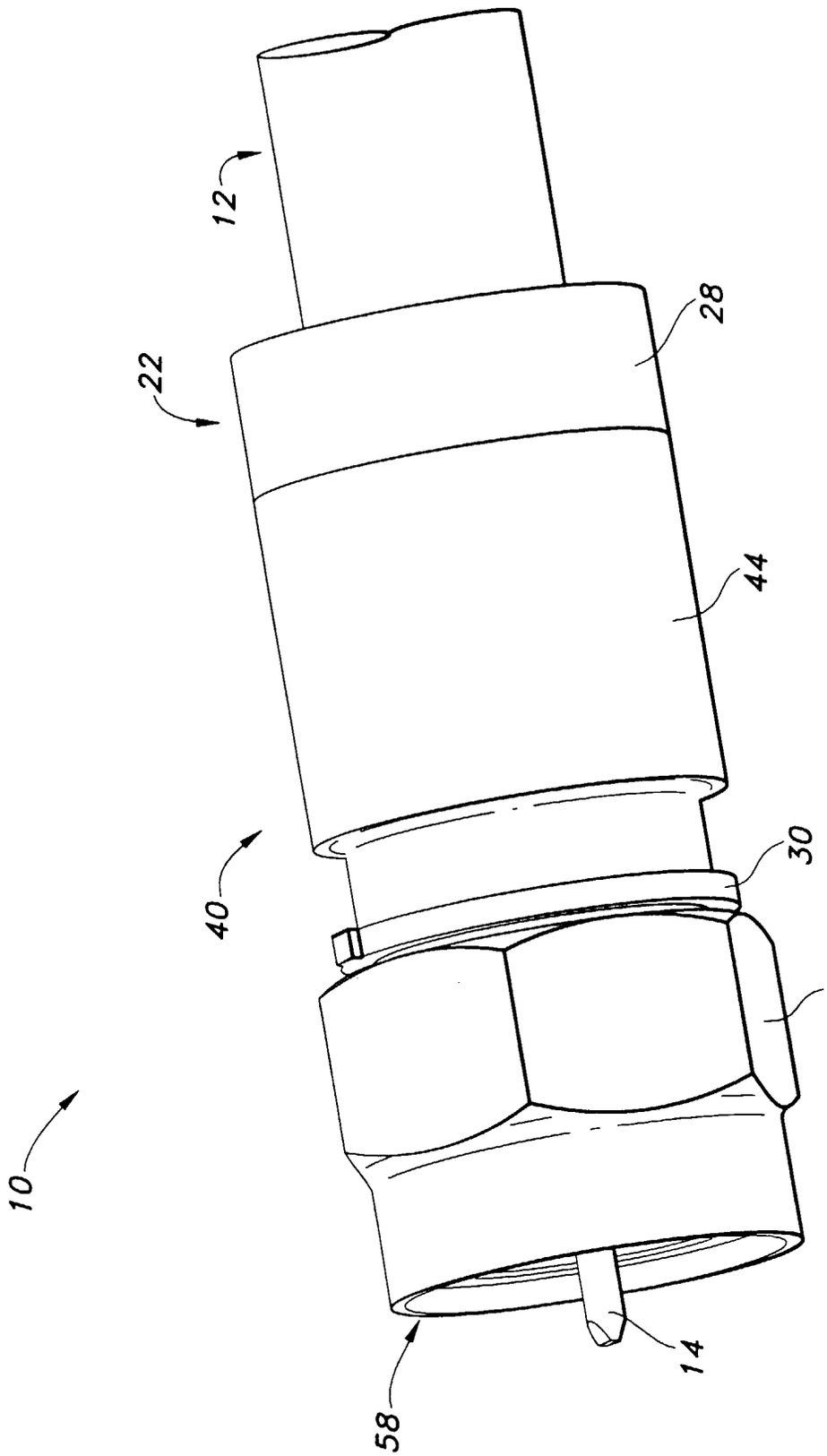

FIG 1

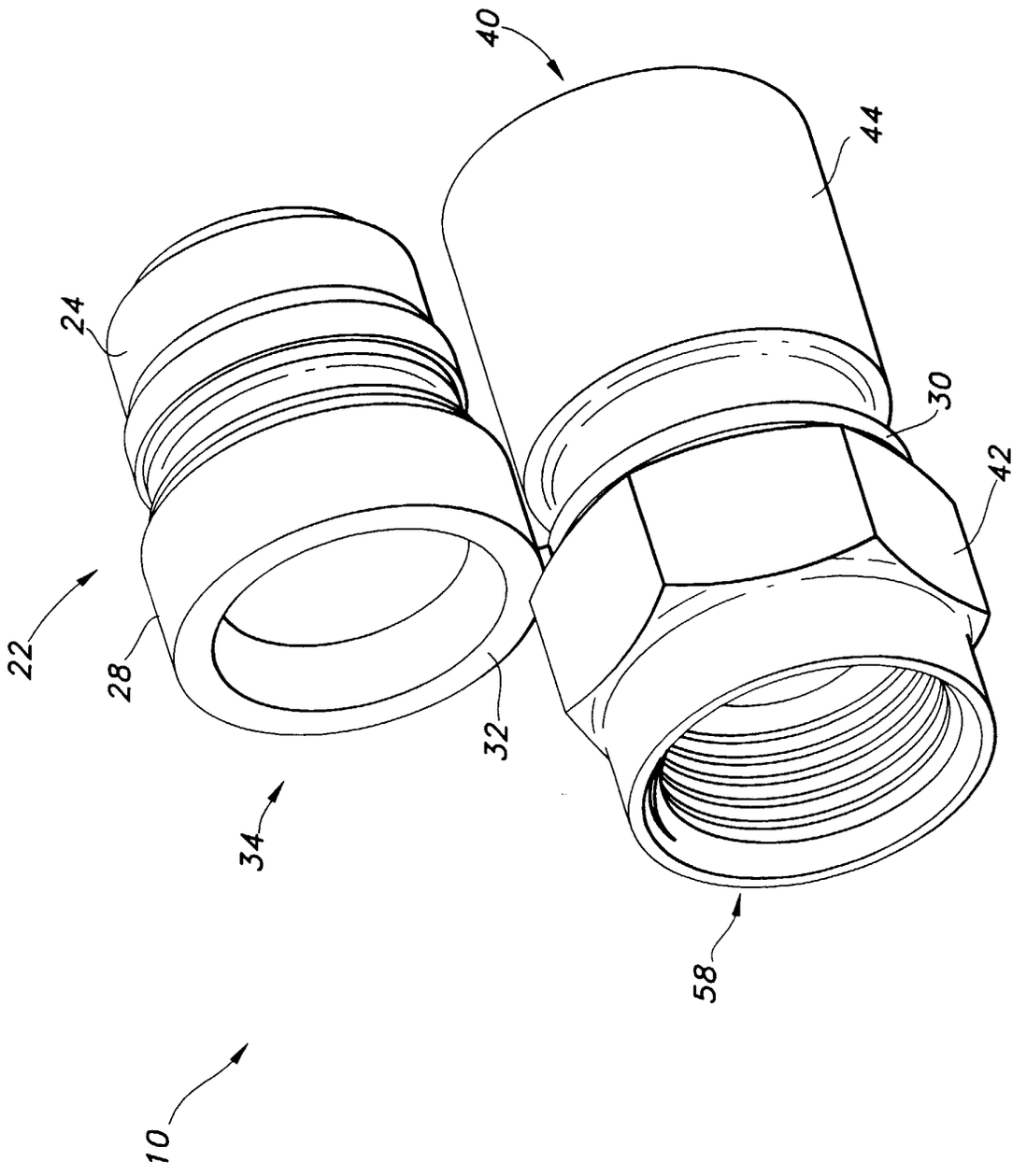

FIG 2

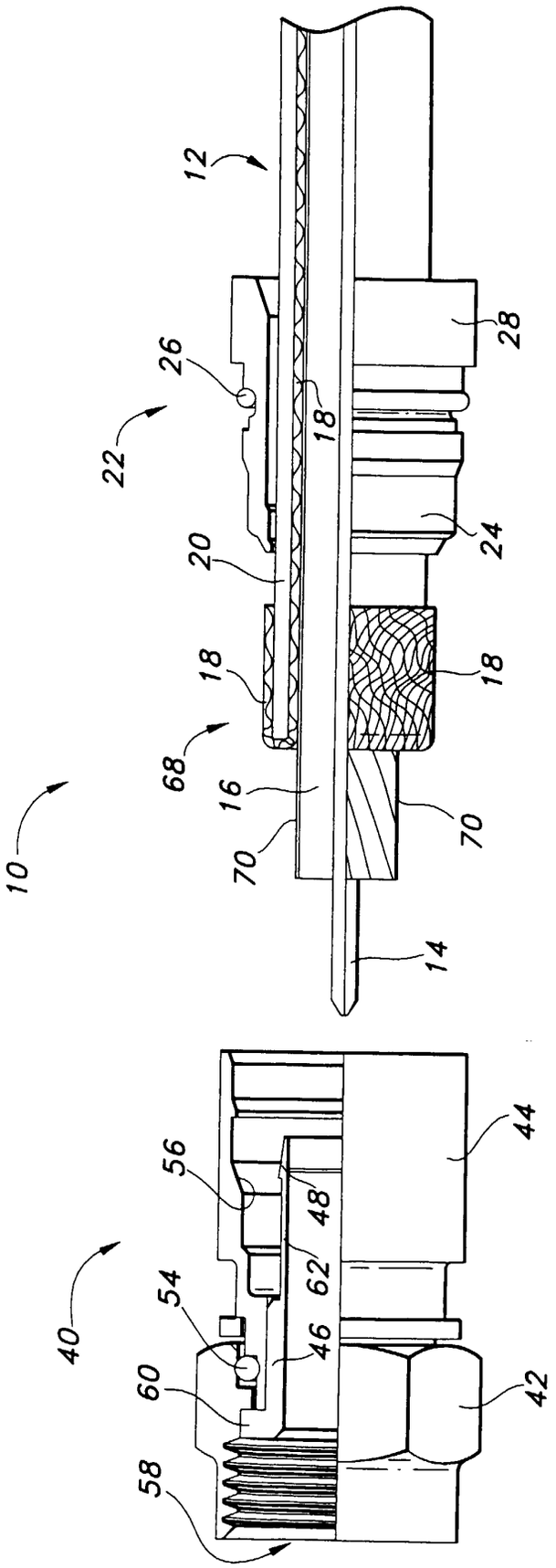
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FIG 3

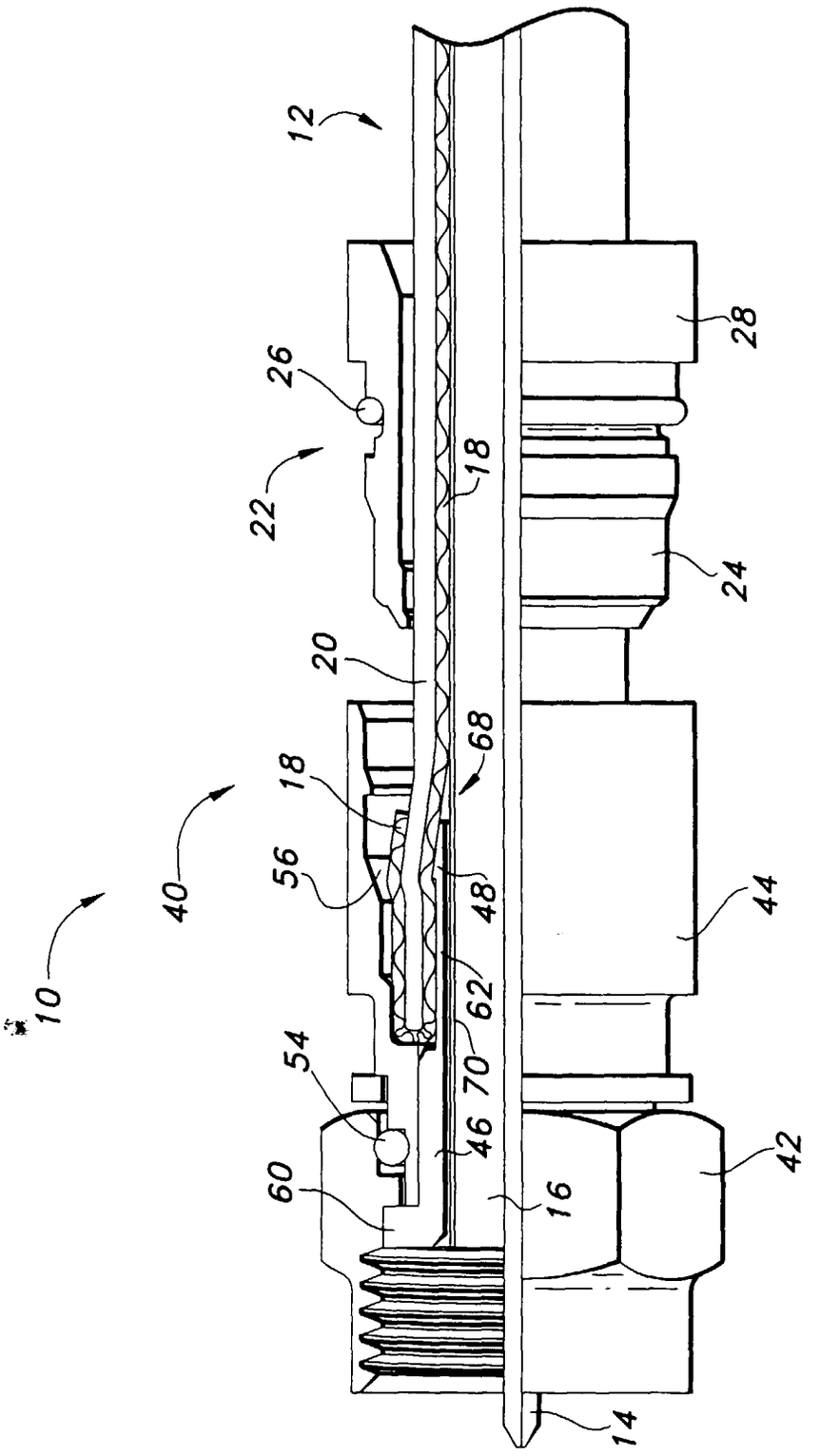

FIG 4

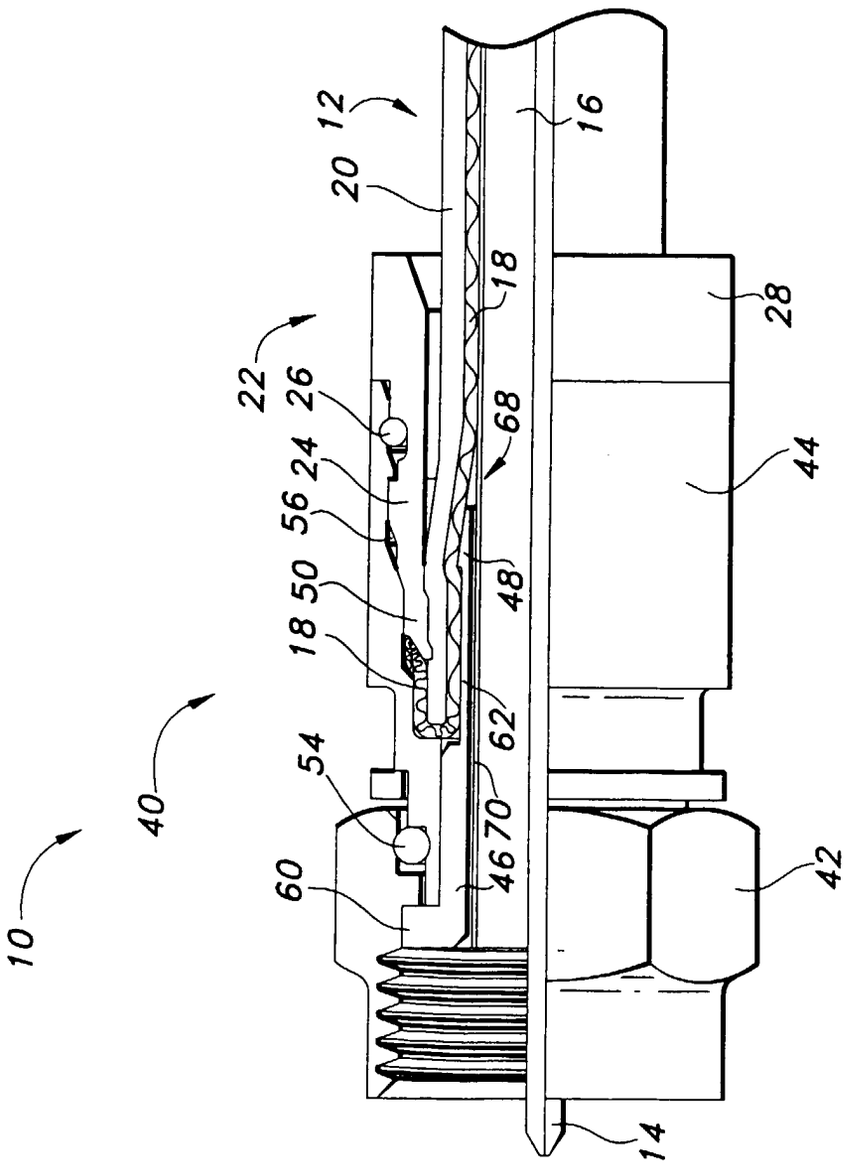

FIG 5