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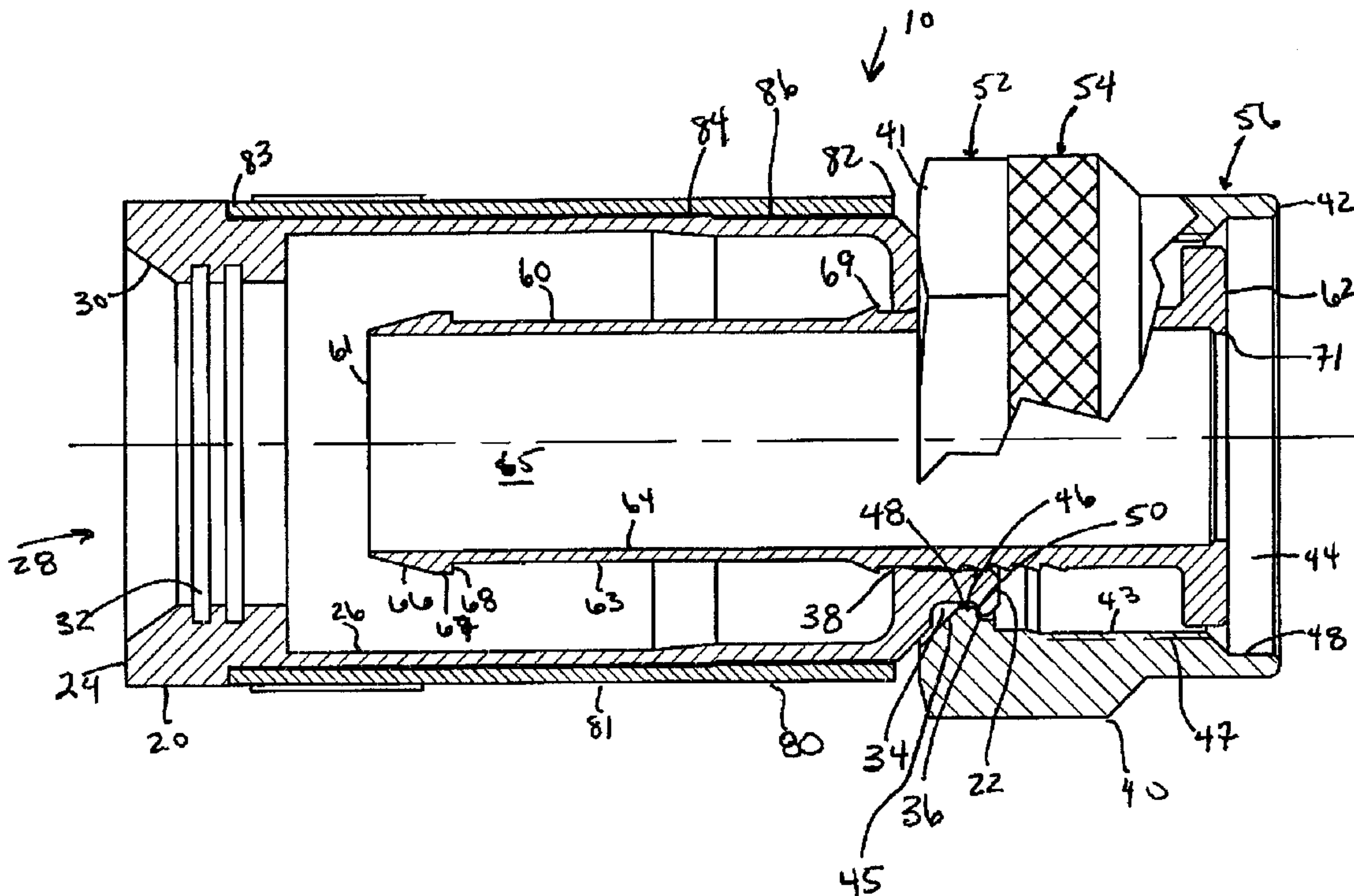
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(54) **Titre :** CONNECTEUR DE CABLE COAXIAL D'INTERIEUR/D'EXTERIEUR

(54) **Title:** INDOOR/OUTDOOR COAXIAL CABLE CONNECTOR



(57) **Abrégé/Abstract:**

An indoor/outdoor coaxial cable connector for coupling an end of a coaxial cable to a terminal is disclosed, the connector comprising a coupler having a portion with a hexagonal outer configuration and a knurled configuration. The indoor/outdoor coaxial cable connector also has a hollow body and a tubular post, with the coupler engaging the hollow body to prevent moisture and contaminant ingress into the connector. The indoor/outdoor coaxial cable connector can also have a seal disposed between the hollow body and the coupler.

INDOOR/OUTDOOR COAXIAL CABLE CONNECTOR**ABSTRACT OF THE DISCLOSURE**

An indoor/outdoor coaxial cable connector for coupling an end of a coaxial cable to a terminal is disclosed, the connector comprising a coupler having a portion with a hexagonal outer configuration and a knurled configuration. The indoor/outdoor coaxial cable connector also has a hollow body and a tubular post, with the coupler engaging the hollow body to prevent moisture and contaminant ingress into the connector. The indoor/outdoor coaxial cable connector can also have a seal disposed between the hollow body and the coupler.

PATENT
CASE NAME: SP06-112

INDOOR/OUTDOOR COAXIAL CABLE CONNECTOR

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates generally to coaxial cable connectors, and particularly to coaxial cable connectors suitable for both indoor and outdoor use.

TECHNICAL BACKGROUND

[0002] Coaxial cable connectors such as F-connectors are used to attach a coaxial cable to another object such as an appliance or junction having a terminal adapted to engage the connector. F-connectors are often used in conjunction with a length of coaxial cable to create a jumper cable assembly to interconnect components of a cable television system. A jumper typically has one coaxial connector (connector termination) at each end of the length of cable. The coaxial cable typically includes a center conductor, or inner conductor, surrounded by a plurality of outer cable components, for example the inner conductor is surrounded by a dielectric, in turn surrounded by one or more outer conductive layers, or metallic layers, such as a conductive grounding foil and/or braid, wherein the outer conductive arrangement is itself surrounded by a protective outer jacket. The dielectric can be plastic, rubber, glass, or ceramic. Various types of coaxial cable have different outer protective layers or jackets. The F-connector is typically secured over the prepared end of the jacketed coaxial cable by use of a crimp tool or compression tool specifically designed to crimp or actuate the connector. Once secured to the coaxial cable, the connector is then capable of transferring signals by engaging the connector with a threaded connection or threaded port, such as found on typical CATV electronic devices like set top converters, television sets or DVD players.

[0003] Typically, two different coaxial connectors were required; one for indoor use and one for outdoor use. The indoor-use coaxial connectors do not need to be and are not moisture-proof. The indoor-use connectors are also only hand-tightened to prevent any possible damage to the equipment to which they are attached. Thus, the indoor connectors typically

only have knurling or other surface configurations to allow for increased grip. The outdoor-use coaxial connectors must be moisture-proof and tightened with a wrench or other tool to achieve a tight connection to the terminal. Thus, the outdoor-use connectors have a seal (typically an o-ring) and have a hexagonal configuration to allow a wrench or other tool to be used to tighten the connector. As a result, the field technicians are required to carry multiple coaxial connectors, depending on the specific use of the connector.

SUMMARY OF THE INVENTION

[0004] Disclosed herein is an indoor/outdoor coaxial cable connector that includes both a hexagonal configuration and knurling for tightening on the terminal, as well as being sealed.

[0005] In one aspect, an indoor/outdoor coaxial cable connector is disclosed herein, the indoor/outdoor coaxial cable connector for coupling an end of a coaxial cable to a terminal, the indoor/outdoor coaxial cable connector includes a hollow body, the hollow body comprising a rear end, a front end, and an internal surface extending between the rear and front ends of the hollow body, the internal surface defining a longitudinal opening, a tubular post disposed at least partially within the longitudinal opening of the hollow body, the tubular post comprising a rear end, an inner surface and an outer surface, the rear end of the tubular post having at least one protrusion on the outer surface, and wherein at least a portion of the outer surface of the tubular post and at least a portion of the internal surface of the hollow body define an annular cavity therebetween, wherein the hollow body and tubular post are movable relative to one another along the longitudinal axis to compress at least a portion of the coaxial cable between the tubular post and the hollow body, and a coupler disposed proximate the front end of the hollow body to engage a terminal, the coupler having a first portion with a hexagonal outer configuration and a second portion with a knurled configuration.

[0006] In some embodiments, the coupler is movable in a rearward direction from the front end of the hollow body.

[0007] In one embodiment, the post moves relative to the coupler and the hollow body to engage the coaxial cable.

[0008] In other embodiments, the connector includes an outer body that has a longitudinal opening in which at least a portion of the hollow body is disposed.

[0009] Additional features and advantages of the invention will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the invention as described herein, including the detailed description which follows, the claims, as well as the appended drawings.

[0010] It is to be understood that both the foregoing general description and the following detailed description of the present embodiments of the invention, and are intended to provide an overview or framework for understanding the nature and character of the invention as it is claimed. The accompanying drawings are included to provide a further understanding of the invention, and are incorporated into and constitute a part of this specification. The drawings illustrate various embodiments of the invention, and together with the description serve to explain the principles and operations of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 shows a partial cutaway view of an one embodiment of an indoor/outdoor coaxial cable connector according to the present invention;

[0012] FIG. 2 shows a partial cutaway view of another embodiment of an indoor/outdoor coaxial cable connector according to the present invention;

[0013] FIG. 3 is a cutaway view of one embodiment of a coupler according to the present invention;

[0014] FIG. 4 is a side view of the coupler of FIG. 3;

[0015] FIG. 5 is a side cutaway view along the centerline another embodiment of an indoor/outdoor coaxial cable connector according to the present invention;

[0016] FIG. 6 is a partial side cutaway view along the centerline of the connector of FIG. 5 installed on an indoor terminal; and

[0017] FIG. 7 is a partial side cutaway view along the centerline of the connector of FIG. 5 just prior to installation on an outdoor terminal.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Reference will now be made in detail to the present preferred embodiment(s) of the invention, examples of which are illustrated in the accompanying drawings. Whenever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts.

[0019] Referring to FIG. 1, the indoor/outdoor cable connector 10 comprises a hollow body 20, a coupler 40, and a tubular post 60. The hollow body 20 is preferably made from metal and plated with a non-corrosive material such as nickel. Preferably, coupler 40 is made from a conductive material such as brass and is plated with a corrosion resistant material, for example nickel. Alternatively, coupler 40 may be constructed from an engineering polymer. Tubular post 60 is preferably made from electrically conductive material, such as brass and is preferably plated with a conductive material such as tin or nickel-tin. An outer body 80 is preferably installed over hollow body 20 by means of a press fit and serves to provide additional mechanical strength to the hollow body 20. The outer body 80 is typically made of a metallic material such as brass and is typically plated with conductive corrosion resistant material such as nickel.

[0020] Turning to each component in more detail, hollow body 20 includes a front end 22 and a rear end 24 with an internal surface 26 extending therebetween. Hollow body 20 also has a longitudinal opening 28 that is defined by the internal surface 26. Adjacent the rear end 24 of hollow body 20 is a chamfered portion 30 to assist with the insertion of the coaxial cable into the longitudinal opening 28. Adjacent the chamfered portion 30 are grooves 32 that assist (in connection with the tubular post 60 as described below) in retaining the coaxial cable within the coaxial connector 10. The front end 22 of hollow body 20 has a circumferential groove 34 that retains a portion of the coupler 40 to limit the axial movement of the coupler 40 relative to the hollow body 20. The circumferential groove 34 preferably allows for some axial movement of the coupler 40 in the forward and rearward axial direction. However, once the coupler 40 is threaded onto a terminal, the coupler 40 engages the rearward facing surface 36 defined by circumferential groove 34 of hollow body 20, which seals the connector 10 from moisture and contaminants. The hollow body 20 also has a reduced opening 38 (i.e., smaller in diameter than the longitudinal opening 28) at the front end 22 to receive tubular post 60.

[0021] Coupler 40 includes a back end 41, a front end 42, and an internal surface 43 defining internal bore 44. The coupler 40 shown in FIG. 1 is in the form of a coupling nut, wherein internal surface 43 includes an internal chamfer 45, an inwardly projecting annular ridge 46, internal threads 47, and an internal recess 48. The reduced diameter of annular ridge 46 defines a reduced diameter through-bore section of internal bore 44. The reduced diameter portion also defines a forward facing surface 50 that engages the rearward facing surface 36

of hollow body 20. The increased diameter of internal recess 48 defines an increased diameter section of internal bore 44. Coupler 40 may also take other forms in other embodiments.

[0022] Coupler 40 also includes a first portion 52 that has a hexagonal configuration and a second portion 54 with a knurled configuration. The hexagonal configuration in first portion 52 allows for the coupler 40 to be tightened with standard tools that are carried by technicians (or may even be owned by consumers). The second portion 54 has a knurled configuration to promote gripping by the user or field technician for tightening on a terminal. The coupler 40 also includes a front portion 56 with a constant diameter that is preferably smaller than the diameter of the first portion 52 and second portion 54. The front portion 56 is, as described below in conjunction with Fig. 7., configured to be compatible with a seal ring for outdoor use.

[0023] Tubular post 60 is generally tubular and comprises back end 61, front end 62, outer surface 63, and internal surface 64 that defines through-bore 65. It should also be noted that internal surface 64 and/or outer surface 63 can have differing diameters or shapes. Back end 61 of tubular post 60 is configured to be inserted into the end of the cable between the braid and shield as is known in the prior art. Front end 62 is adapted to engage hollow body 20, or alternately, partially engage coupler 40. The outer surface 63 of tubular post 60, as shown in FIG. 1, preferably includes an external tapered area 66 adjacent back end 61 leading to a first surface 67 preferably of constant diameter and an external annular face 68. The outer surface 63 of tubular post 60 also includes a number of projections 69 that engage the reduced opening 38 of hollow body 20. The internal surface 64 of post 60 shown in FIG. 1 preferably comprises an inwardly projecting lip 71 that defines a reduced diameter through-bore portion of through-bore 65 to prevent the coaxial cable from exiting the tubular post 60. In this embodiment, the tubular post 60 is moved relative to the hollow body 20 and the coupler 40 to engage and secure the coaxial cable.

[0024] As also seen in FIG. 1, outer body 80 is generally tubular and comprises outer surface 81, front end 82, back end 83, internal surface 84 defining internal bore 86 that extends between front and back ends, 82 and 83. By generally tubular, either the outer surface 81 or the internal surface 84, or both, of outer body 80 can have more than one diameter or shape.

[0025] As the coupler 40 is secured onto a terminal, the coupler 40 is moved forward (or to the right in FIG. 1) relative to the hollow body 20 and the tubular post 60. As indicated

[0025] As the coupler 40 is secured onto a terminal, the coupler 40 is moved forward (or to the right in FIG. 1) relative to the hollow body 20 and the tubular post 60. As indicated above, the forward facing surface 50 of the coupler 40 engages the rearward facing surface 36 of the hollow body 20 in a tight manner, which seals the connector 10 from moisture and contaminants.

[0026] Another embodiment of a indoor/outdoor cable connector 100 is illustrated in FIG. 2 and comprises a hollow body 120, a coupler 140, and a tubular post 160. The hollow body 120 is preferably made from metal and plated with a non-corrosive material such as nickel. Preferably, coupler 140 is made from a conductive material such as brass and is plated with a corrosion resistant material, for example nickel. Tubular post 160 is preferably made from electrically conductive material, such as brass and is preferably plated with a conductive material such as tin or nickel-tin. An outer body 180 is slideably attached over hollow body 120 by means of a press-fit and, as discussed in detail below, cooperates with the hollow body 120 to secure the coaxial cable in the connector 100. The outer body 180 is typically made from a corrosion resistant material, for example nickel plated brass.

[0027] The hollow body 120 comprises a rear end 122, a front end 124, and an internal surface 126 extending between the rear and front ends 122, 124 of the body 120, the internal surface 126 defining a longitudinal hole 128. The longitudinal hole 128 has a reduced diameter at the front end 124 to engage the tubular post 160, as described below. Similarly, the front end 124 also has a portion 130 having a constant reduced diameter, thereby providing a forward-facing surface 132 to limit the rearward axial movement of the coupler 140. The front end 124 also has a circumferential groove 134 to receive an o-ring 136, which in combination with the coupler 140, forms a moisture (and contaminant) seal for connector 100.

[0028] Coupler 140, which is also illustrated in more detail in FIGS. 3 and 4, includes a back end 141, a front end 142, and an internal surface 143 defining internal bore 144. The coupler 140 shown in FIG. 1 is in the form of a coupling nut, wherein internal surface 143 includes an internal chamfer 145, an inwardly projecting annular ridge 146, internal threads 147, and an internal recess 148. The reduced diameter of annular ridge 146 defines a reduced diameter through-bore section 149 of internal bore 144. Section 149 also defines a forward facing surface 150 that engages a rearward facing surface of tubular post 160. The increased

diameter of internal recess **148** defines an increased diameter section of internal bore **144**.

Coupler **140** may also take other forms in other embodiments.

[0029] Coupler **140** includes a first portion **152** that has a hexagonal configuration and a second portion **154** with a knurled configuration. The hexagonal configuration in first portion **152** allows for the coupler **140** to be tightened with standard tools that are carried by technicians (or may even be owned by consumers). The second portion **154** has a knurled configuration to promote gripping by the user or field technician for tightening on a terminal. The coupler **140** also includes a front portion **156** with a constant diameter that is preferably smaller than the diameter of the first portion **152** and second portion **154**. The front portion **156** is, as described below in conjunction with Fig. 7., configured to be compatible with a seal ring for outdoor use.

[0030] Tubular post **160** is generally tubular and comprises back end **161**, front end **162**, outer surface **163**, and internal surface **164** defining through-bore **165**. Tubular post **160** is preferable press-fit into the longitudinal hole **128** of hollow body **120** and extends through hollow body **120** and partially into outer body **130**. It should also be noted that internal surface **164** and/or outer surface **163** can have differing diameters or shapes. Back end **161** of tubular post **160** is configured to be inserted into the end of the cable between the braid and shield as is known in the prior art. Front end **162** has an annular ring **165** that is adapted to engage the front end **124** of hollow body **120** as well as coupler **140**. The rearward facing surface **170** of the annular ring **165** limits the forward axial movement of the coupler **140**. The outer surface **163** of tubular post **160**, as shown in FIG. 1, preferably includes an external tapered area **166** adjacent back end **161** leading to a first surface **167** preferably of constant diameter and an external annular face **168**. The outer surface **163** of tubular post **160** also includes a number of projections **169** that engage the reduced opening **138** of hollow body **120**.

[0031] As the coupler **140** is secured onto a terminal, the coupler **140** is moved forward (or to the right in FIG. 2) relative to the hollow body **120** and the tubular post **160**. As indicated above, the forward facing surface **150** of the coupler **140** engages the rearward facing surface **170** of the tubular post **160** and the o-ring **136** in a tight manner, sealing the connector **100** from moisture and contaminants.

[0032] Outer body **180** comprises a rear end **182**, a front end **184** surrounding and contacting the hollow body **120**, and an inner surface **186** defining a longitudinal hole **188** extending

between the rear and front ends **182, 184** of the outer body **180**. The inner surface **186** of the outer body **180** preferably comprises a forward facing tapered portion **187** configured to displace the rear end **122** of the hollow body **120** radially inwardly. Preferably, the hollow body **120** contacts the forward facing tapered portion **137** and displaces the rear end **122** of the hollow body **120** radially inwardly in the forward position.

[0033] Another embodiment of a indoor/outdoor cable connector **200** is illustrated in FIG. 5 and comprises a hollow body **220**, a coupler **240**, and a tubular post **260**. In fact, the front portion of the connector **200** (hollow body **220**, a coupler **240**, and a tubular post **260**) operates in the same manner as connector **100**.

[0034] FIG. 6 illustrates the connection of one embodiment of a connector (**200**) according to the present invention connected to an indoor terminal **300**. The coupler (**40,140,240**) threadingly engages a threaded port **302** on the terminal **300**. As can be seen, the coupler is moved axially forward to engage the tubular post and the o-ring and seal the connector. The coupler **40** would similarly engage the hollow body **20** in connector **100**, also sealing connector **100**.

[0035] FIG. 7 illustrates one embodiment of a connector (**200**) according to the present invention in preparation to be connected to an outdoor terminal **310**. The outdoor terminal **310** also has a threaded port **312**, but also has a seal ring **314**. The front portion (i.e., front portion **156**) of the coupler **240** is inserted into the seal ring **314** and then threadingly engages the threaded port **312**. The seal ring **314** then provides an added water tight junction with smooth external surface.

What is claimed is:

1. An indoor/outdoor coaxial cable connector for coupling an end of a coaxial cable to a terminal, the indoor/outdoor coaxial cable connector comprising:

a hollow body, the hollow body comprising a rear end, a front end, and an internal surface extending between the rear and front ends of the hollow body, the internal surface defining a longitudinal opening;

a tubular post disposed at least partially within the longitudinal opening of the hollow body, the tubular post comprising a rear end, an inner surface and an outer surface, the rear end of the tubular post having at least one protrusion on the outer surface, and wherein at least a portion of the outer surface of the tubular post and at least a portion of the internal surface of the hollow body define an annular cavity therebetween, wherein the hollow body and tubular post are movable relative to one another along the longitudinal axis to compress at least a portion of the coaxial cable between the tubular post and the hollow body; and

a coupler disposed proximate the front end of the hollow body to engage a terminal, the coupler having a first portion with a hexagonal outer configuration and a second portion with a knurled configuration.

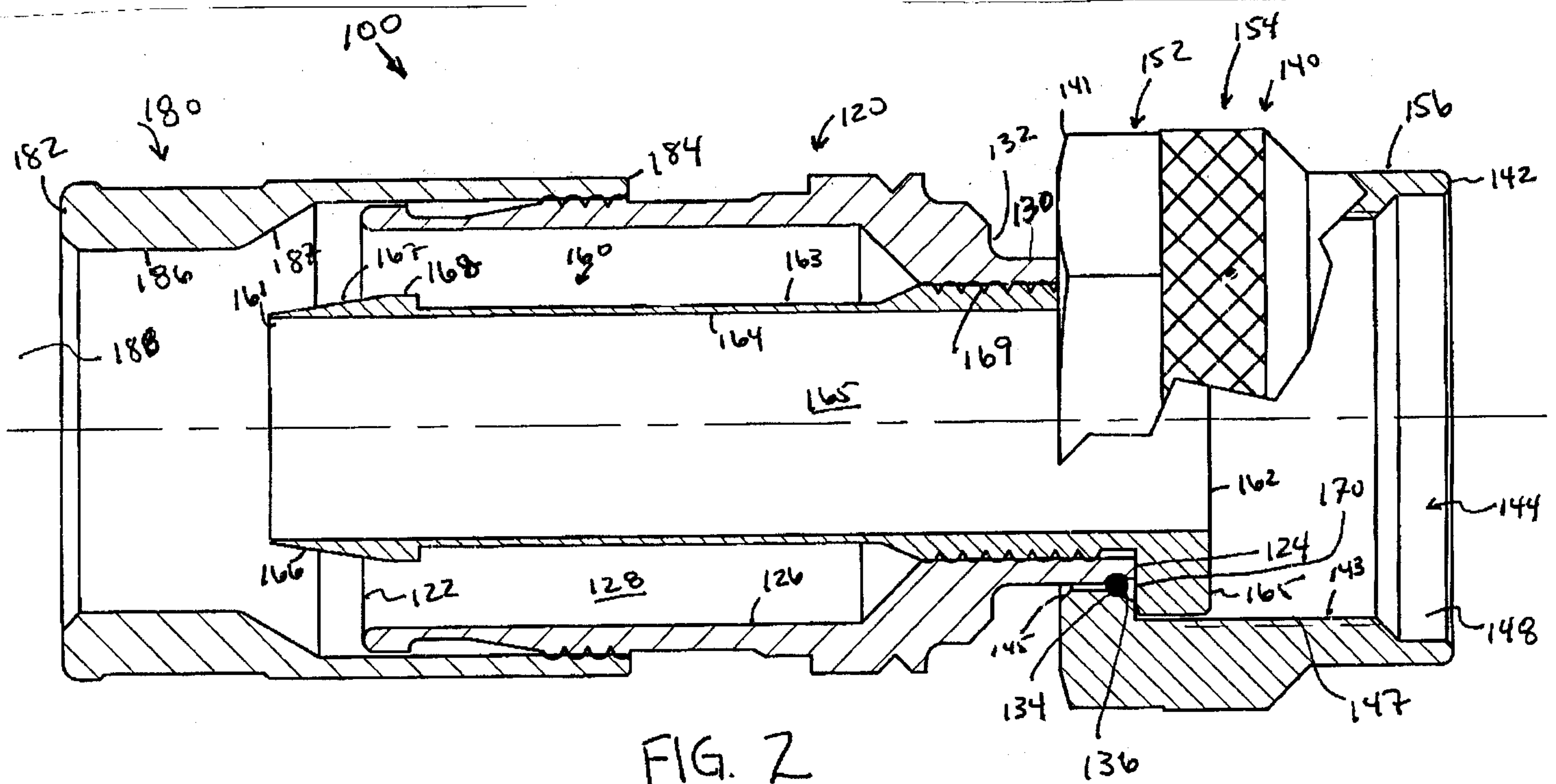
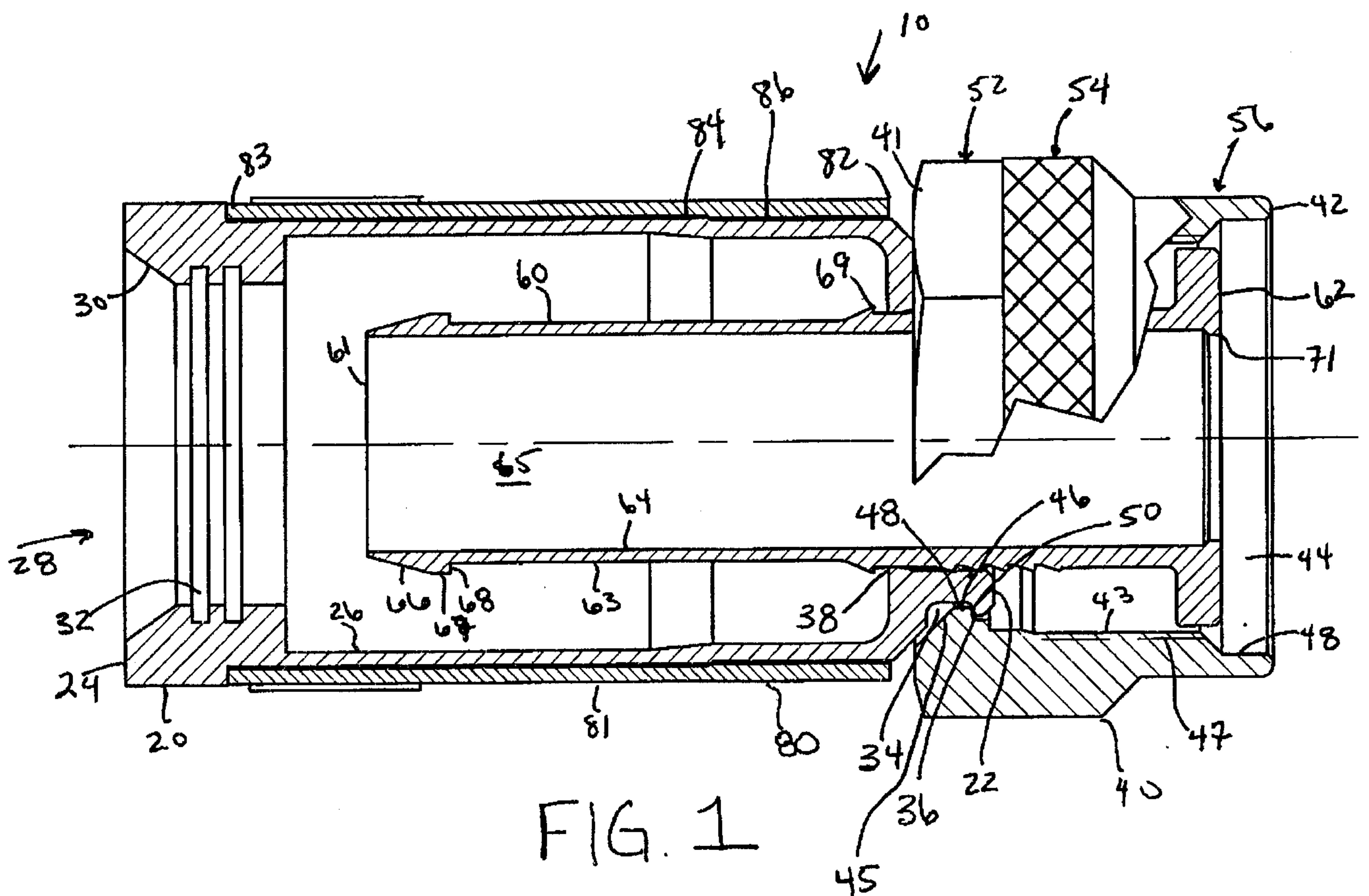
2. The indoor/outdoor coaxial cable connector according to claim 1, further comprising a seal disposed between the coupler and the hollow body to prevent moisture ingress.

3. The indoor/outdoor coaxial cable connector according to claim 1, wherein the coupler sealingly engages the hollow body to prevent moisture ingress.

4. The indoor/outdoor coaxial cable connector according to claim 1, wherein the coupler is axially movable in a rearward direction away from the front end of the hollow body.

5. The indoor/outdoor coaxial cable connector according to claim 4, wherein the coupler rotates freely relative to the indoor/outdoor coaxial cable connector when the coupler is in a rearward position.

6. The indoor/outdoor coaxial cable connector according to claim 1, wherein the hexagonal configuration is disposed rearward of the knurled configuration on the coupler.
7. The indoor/outdoor coaxial cable connector according to claim 1, wherein the post moves relative to the coupler and the hollow body to engage the coaxial cable.
8. The indoor/outdoor coaxial cable connector according to claim 1, further comprising an outer body, the outer body comprising a rear end, a front end, and an internal surface extending between the rear and front ends of the outer body, the internal surface defining a longitudinal opening therein, the longitudinal opening having at least a portion of the hollow body disposed therein.
9. The indoor/outdoor coaxial cable connector according to claim 8, wherein the internal surface of the outer body has a forward facing sloped portion that engages and radially compresses the rear end of the hollow body inwardly as the outer body moves relative to the hollow body and tubular post to capture a portion of the coaxial cable between the hollow body and the tubular post.
10. The indoor/outdoor coaxial cable connector according to claim 1, further comprising an o-ring received at the front end of the hollow body.
11. The indoor/outdoor coaxial cable connector according to claim 10, wherein the coupler sealingly engages the tubular post and the o-ring to prevent moisture ingress.
12. The indoor/outdoor coaxial cable connector according to claim 1, wherein the coupler further includes a front portion with a diameter smaller than the diameter of the first portion and the second portion configured to be inserted into a seal ring for outdoor use.



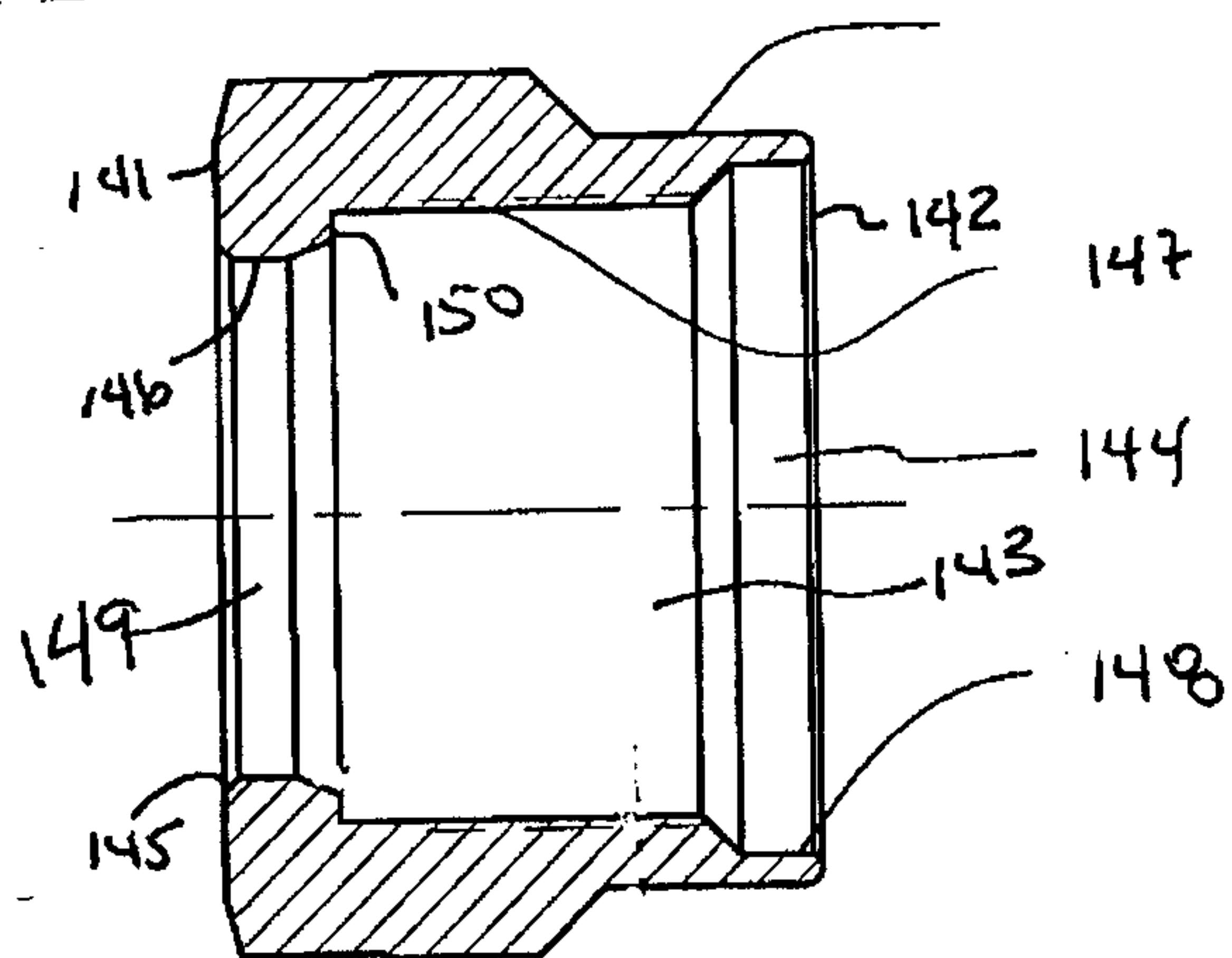


FIG. 3

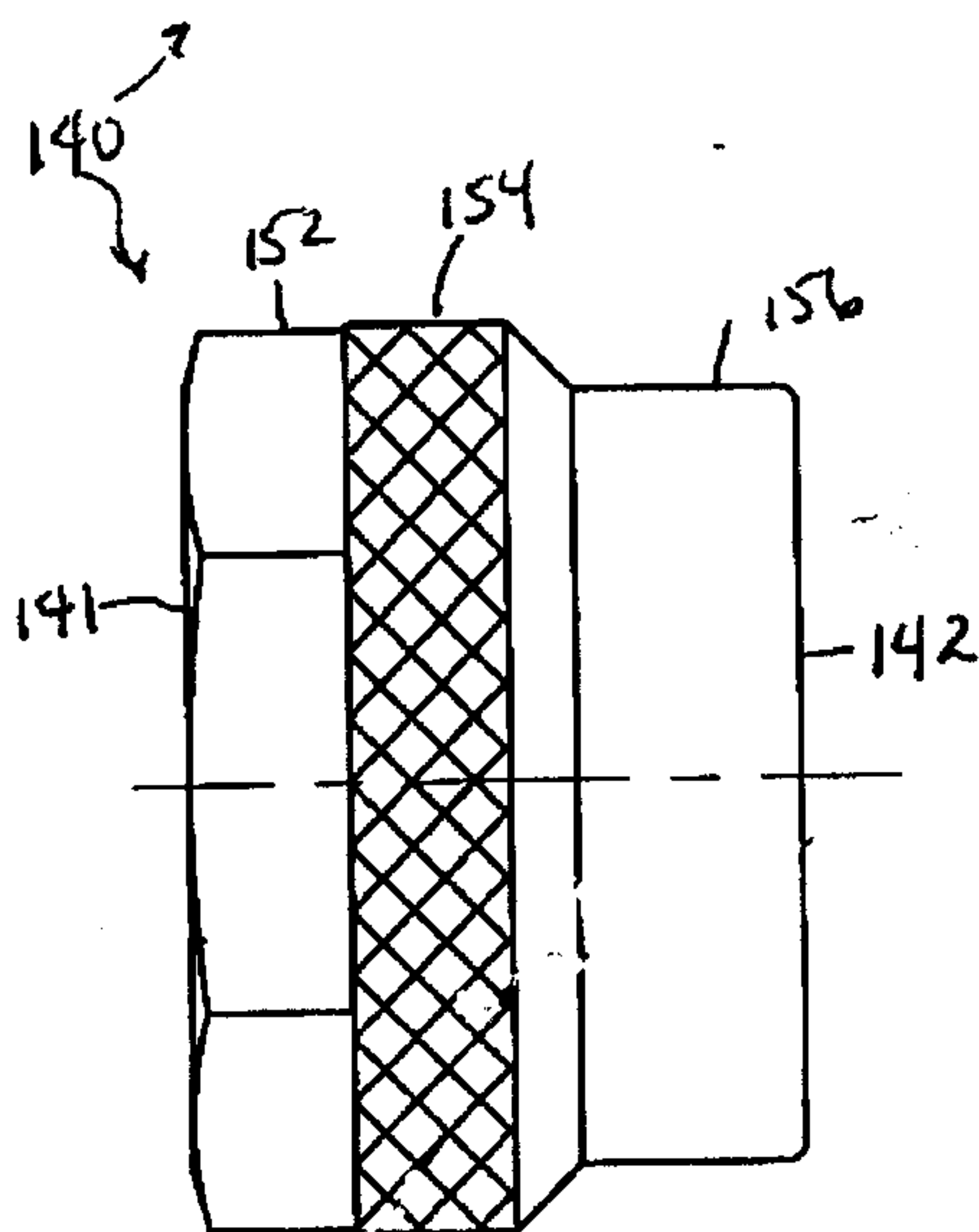


FIG. 4

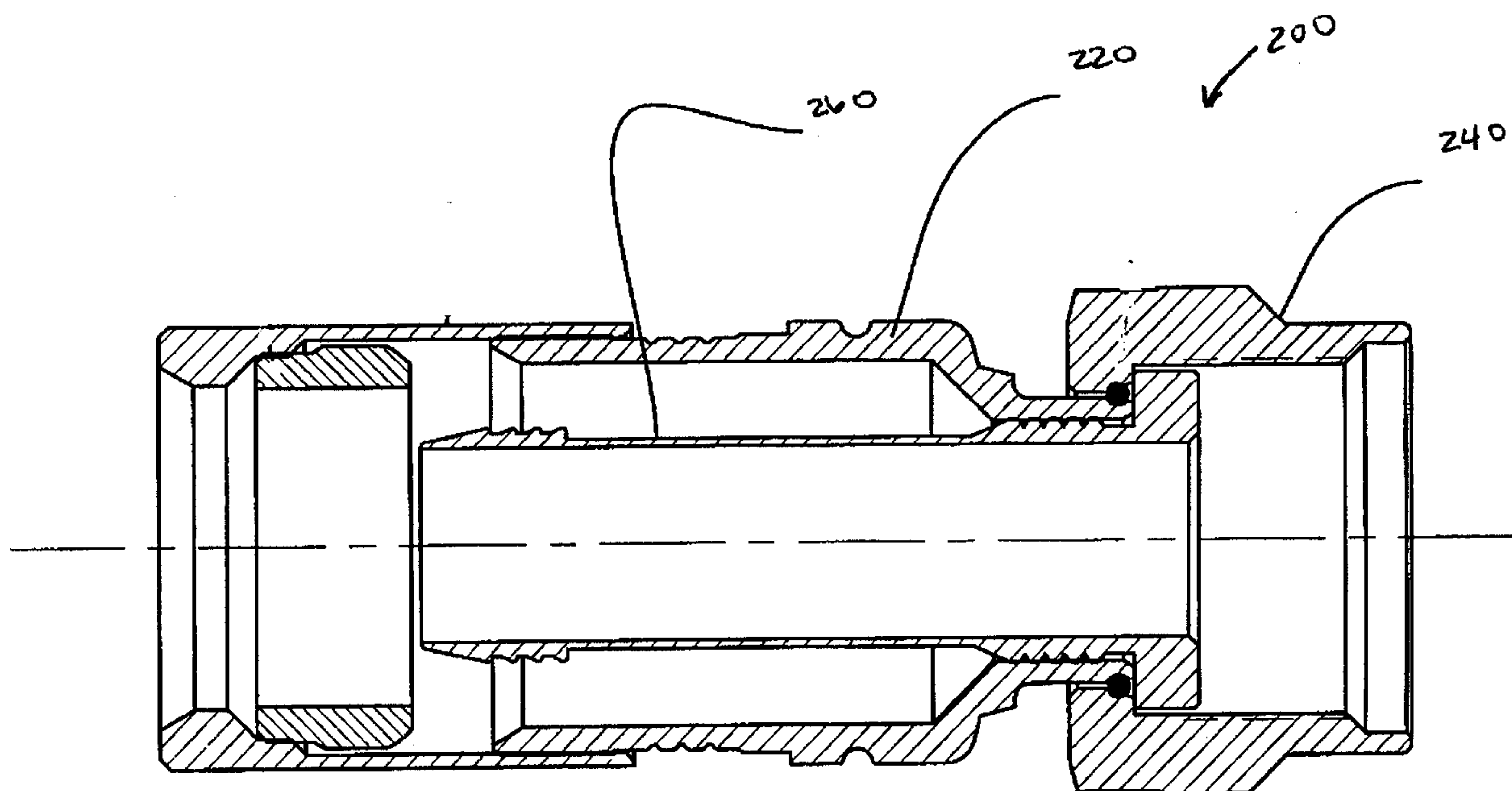


FIG. 5

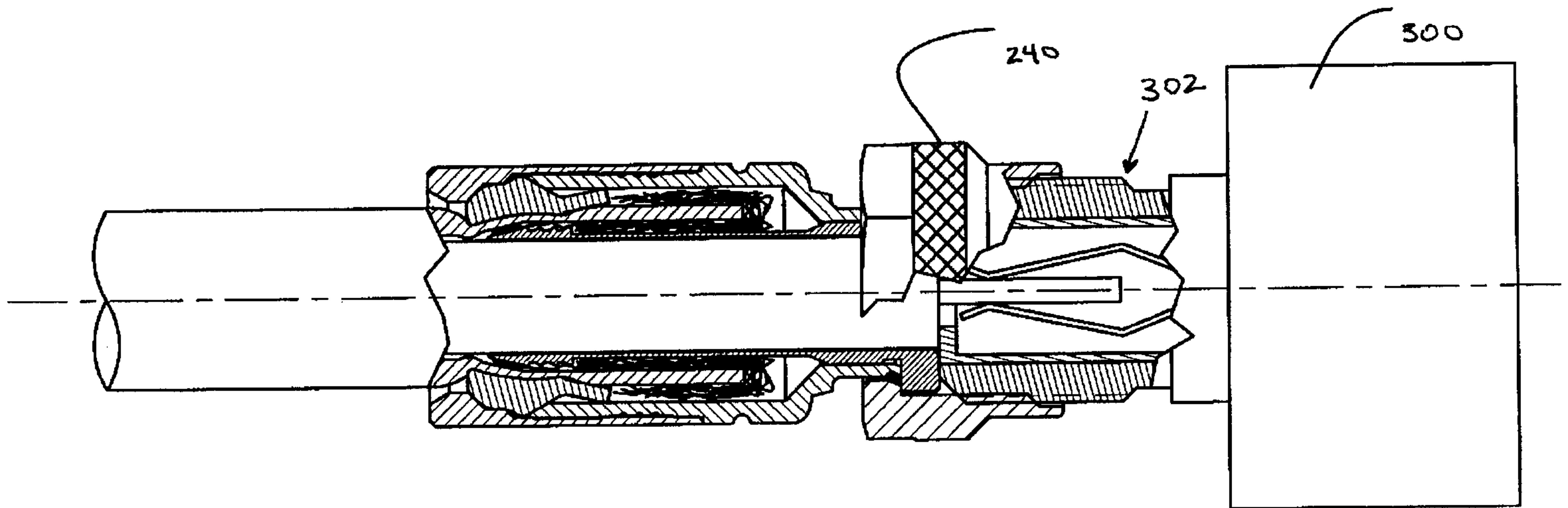


FIG. 6

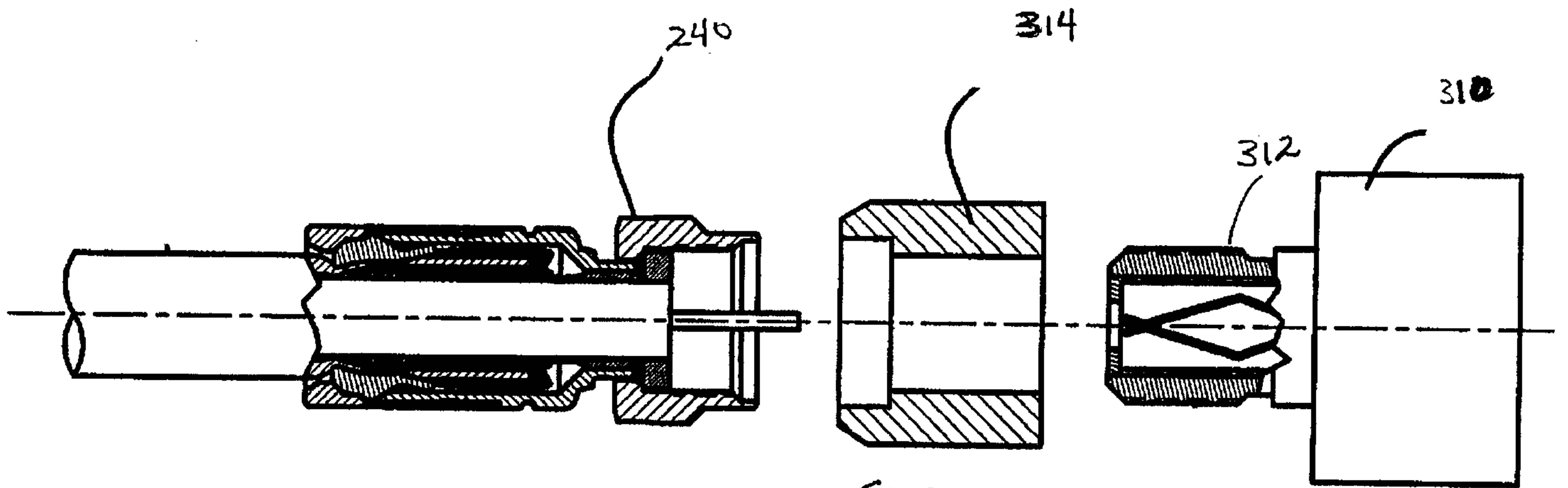


FIG. 7

