(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 134 358**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 83305228.5

(51) Int. Cl.⁴: H 01 R 17/12

(22) Date of filing: 08.09.83

(43) Date of publication of application:
20.03.85 Bulletin 85/12

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

(71) Applicant: Gilbert Engineering Company Inc.
5310 West Camelback Road
Glendale Arizona 85301-7597(US)

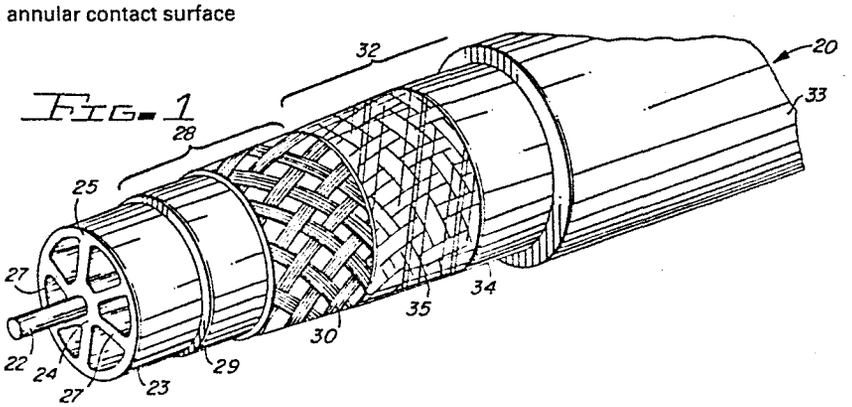
(72) Inventor: Hayward, Robert D.
6142 North 18th Avenue
Phoenix, Arizona 85015(US)

(74) Representative: Loven, Keith James et al,
Eric Potter & Clarkson 14 Oxford Street
Nottingham NG1 5BP(GB)

(54) Cable connector assembly for semi-air spaced television distribution cable.

(57) A cable connector assembly, especially adapted for use with semi-air spaced television distribution cable, includes a body and a threadedly engageable nut. A ferrule, carried by the nut and having a plurality of internal teeth for mechanically engaging the sheath of the cable, is compressed about the cable in response to engagement of the nut with the body. The outer conductor of the cable, being flared outwardly, is received between an annular contact surface carried by the body and an opposing annular contact surface carried by the nut.

Fig. 1



./...

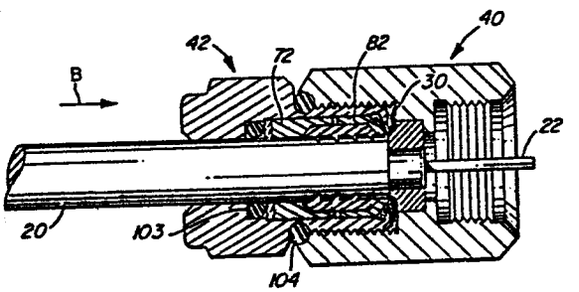


FIG-12

CABLE CONNECTOR ASSEMBLY FOR SEMI-AIR SPACED TELEVISION DISTRIBUTION CABLE

0134358

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to cable transmission systems.

More particularly, the instart invention relates to connector assemblies for electrical and mechanical securement to the terminal portion of a coaxial cable.

In a further and more specific aspect, the present invention concerns an improved connector assembly especially adapted for use with the type of coaxial known as semi-air spaced television distribution cable.

Description of the Prior Art

Coaxial cable systems are commonly employed media for the transmission of signals from one terminus to another. Exemplary, is the transmission of television signals from a common antenna to a plurality of dispersed remotely located receiver sets. The system, which may be either aerial or

underground, generally includes various auxiliary devices, such as directional taps, couplers and amplifiers, intermediate the ultimate terminals.

Coaxial cable commonly consists of a solid center conductor and a tubular outer conductor with a dielectric therebetween. The conductive elements are metalic, usually copper or aluminum. The dielectric is commonly a foamed or expanded plastic material, such as polyethelene. The components may be encased in a protective sheath or jacket.

Commonly, the cable is coupled to the termini and the auxiliary devices by a connector assembly. One end of the connector assembly is mechanically and electrically connected to the terminal portion of the cable, while the other end is especially adapted for attachment to the selected device.

Although various specific types of connector assemblies are known, the means for union with the cable are generally analagous. The cable is prepared by removing all of the outer components to reveal a length of exposed center conductor. A measured length of the protective sheath is stripped away from the outer conductor.

The typical prior art connector assembly comprises two main components, a body and a nut. The body includes a central aperture for receiving the center conductor and a tubular element which is received between the dielectric and the outer conductor. The nut, which includes a bore for receiving the entire cable therethrough, is threadably engagable with the body.

Also included is a ferrule which encircles the exposed portion of the outer conductor. The ferrule and the tubular element cooperate as gripping means for mechanical securement with the cable and electrical connection with the outer conductor. In response to engagement of the nut with the body, the ferrule is swaged inwardly opposing the tubular element and constricting the outer conductor. Although relatively thin, the outer conductor is of sufficient thickness and strength to acommodate the mechanical union with the gripping means.

There is now known a diverse type of coaxial cable which has achieved substantial popularity in certain geographic locales. Termed "semi-air spaced television distribution cable", the embodiment shares the solid wire center conductor in common with conventional coaxial cable. The other elements, however, are peculiarly unique.

The dielectric, for example, which is fabricated of a relatively rigid plastic material includes a coaxial pair of tubular elements held in spaced relationship by a plurality of radially patterned spacers. The center conductor extends through the inner tubular element. Embracing the outer tubular element is a two-ply, pliant outer conductor having a relatively thin foil-like inner layer and an encircling loosely woven, spiral-wound, wire plait.

The sheath or jacket is a three-ply structure. The outer or protective sheath is fabricated of fluid impervious, insulative material such as polyethelene. The intermediate sheath is a relatively rigid metallic member which has an electrically conductive characteristic. An insulative sheath, typically mylar film, resides between the conductive sheath and the outer conductor.

Conventional connector assemblies are rendered useless by the latter type of cable. For example, the rigidity of the dielectric and the fragility of the outer conductor prohibit insertion of the customary tubular member there between. The fragility of the outer conductor also forbids the use thereof as means for mechanically securing the connector assembly to the cable.

Coaxial cable, especially of the type under immediate consideration, is frequently buried in contaminated soil. A common contaminate is methane, a highly flamable gas, which is capable of traveling throught the air space in the dielectric and presenting a fire hazard at the receiver set. Hermetic sealing between the connector assembly and the cable, therefore, is a further consideration not adequately treated by the prior art.

Other considerations, such as preserving radio frequencey integrity, preventing signal ingress and egress, and loose easily misplaced components, will be appreciated by those skilled in the art. It would be hightly advantageous, therefore, to remedy the foregoing and other deficiencies inherent in the prior art.

Accordingly, it is an object of the present invention to provide an improved connector assembly for coaxial cable.

Another object of the invention is the provision of a connector assembly especially adapted for use in connection with semi-air spaced television distribution cable.

Another object of the invention is to provide a connector assembly having distinct and separate means for mechanical and for electrical connection with the terminal portion of a coaxial cable.

Still another object of the immediate invention is the provision of a connector assembly having improved electrical contact means.

Yet another object of the invention is to provide electrical contact means especially adapted for connection with a pliant, yet fragile, tubular conductor.

Yet still another object of the instant invention is the provision of the connector assembly having improved gripping means for mechanical securement to a coaxial cable.

A further object of the invention is to provide means for mechanically securing a connector assembly to the protective sheath of a coaxial cable.

And a further object of this invention is the provision of a connector assembly having means for achieving a hermetic seal with a coaxial cable.

Yet a further object of the invention is to provide a connector assembly in which the component parts are captively assembled.

Still a further object of the invention is the provision of a connector assembly, according to the above, which is relatively inexpensive to manufacture and exceedingly simple to use.

SUMMARY OF THE INVENTION

Briefly, to achieve the desired objects of the instant invention, in accordance with a preferred embodiment thereof, provided is a body and a nut having an element and a complemental element, respectively of a male/female engagement pair. The male/female engagement pair, preferrably mating helical threads, provide for the engagement of the nut with the body and for axial advancement of the nut relative the body in response to relative rotation of the nut and the body.

The body and the nut are fabricated of a conductive material, such as aluminum. An axial bore, sized to at least receive the center conductor of a coaxial cable therethrough, extends through the body. At the forward end, the body is adapted to be secured to a selected device. The element of the male/female engagement pair resides at the rearward end.

The nut includes an axial bore for receiving the sheath therethrough from the rearward end. The complemental element of the male/female engagement pair is carried at the forward end. Gripping means, for mechanical securement with the sheath, reside intermediate the ends. Contact means for electrical connection with the outer conductor of the coaxial cable interacts between the nut and the body.

In a more specific embodiment, the gripping means includes a ferrule having a bore for receiving the outer sheath of the cable therethrough. A plurality of inwardly projecting teeth are carried within the bore. A compression ring, coaxial with the ferrule, compressively restricts the ferrule urging the teeth into the outer sheath in response to engagement of the nut with the body. Detent means are provided for retaining the ferrule and the compression ring in assembly with the nut. When the ferrule is fully compressed, the teeth are spaced from the intermediate sheath.

In a further specific embodiment, the contact means includes a contact surface carried by the body and an opposing contact surface carried by the nut. Each of the contact surfaces are generally annular and generally radially disposed with respect to the respective axial bores. The outer conductor, being pliant, is flared outwardly to be received between the contact surfaces and is compressively embraced therebetween in response to engagement of the nut with the body.

Further provided are flaring means carried by the body for urging the outer conductor outwardly in a direction to reside between the contact surfaces. In an immediately preferred embodiment, the flaring means includes a frustoconical projection carried by the body and extending

from the contact surface coaxial with the axial bore. Additionally , an isolator in the form of a dielectric collar is received over the outer conductor prior to the flaring of the outer conductor for electrically insolating the outer conductor from the intermediate sheath.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and further and more specific objects and advantages of the instant invention will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment of the invention taken in conjunction with the drawings in which:

Fig. 1 is a fragmentary perspective view of the terminal portion of a coaxial cable, representative of the type known as semi-air spaced television distribution cable, provided for purposes of orientation and having successive coaxial elements thereof being stripped away for purposes of illustration;

Fig. 2 is an exploded perspective view of an improved connector assembly embodying the teachings of the instant invention;

Fig. 3 is a vertical sectional view of the assembled components of Fig. 2, the section being taken along the longitudinal axis thereof;

Fig. 4 is a perspective view of an isolator, an insulative element useful in connection with the embodiment of Figs. 2 and 3;

Fig. 5 is a side elevation view of the fragmentary terminal portion of a coaxial cable of the type depicted in Fig. 1 and especially showing an initial step in the preparation of same for attachment to the cable connector assembly of the instant invention;

Fig. 6 is a view generally corresponding to the view of Fig. 5 and illustrating the cable at a subsequent step of preparation;

Fig. 7 is a view generally corresponding to the view of Fig. 6 and showing a further step in the preparation;

Fig. 8 is an enlarged intermediate fragmentary portion of the view of Fig. 7, portions thereof being broken away for purposes of illustration;

Fig. 9 is a view generally corresponding to the view of Fig. 7, at yet a subsequent phase of preparation;

Fig. 10 is a view generally corresponding to the view of Fig. 9 and illustrating the cable as it would appear in a final step of preparation;

Fig. 11 is a view generally corresponding to the illustration of Fig. 10, and showing the cable as it would appear when united with the body of the invention shown in Fig. 2 and 3, portions of the body being broken away for purposes of illustration;

Fig. 12 is a vertical sectional view of the device of Fig. 2 as it would appear when attached to the cable as prepared in Figs. 1-10, the assembly being sectioned along the longitudinal axis thereof;

Fig. 13 is a view generally corresponding to the view of Fig. 12 and further illustrating an adapter secured to the device thereof, said adapter comprising a further disclosure of the instant invention;

Fig. 14 is an exploded perspective view of the adapter of Fig. 13; and

Fig. 15 is a vertical sectional view generally corresponding to the view of Fig. 12 and illustrating yet another embodiment of the instant invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings, in which like reference characters indicate corresponding elements throughout the several views, attention is first directed to Fig. 1 which illustrates a coaxial cable generally representative of the type known as semi-air spaced television distribution cable generally designated by the reference character 20. The cable, herein set forth for purposes of reference, includes a center conductor 22 encircled by dielectric 23. Dielectric 23, being of the semi-air spaced type and fabricated of a relatively rigid plastic material, includes inner tubular element 24, through which center conductor 22 projects, and coaxial outer tubular element 25 held in spaced relationship by a plurality of radially patterned, longitudinally extending spacers 27.

A two-ply pliant outer conductor 28, including a relatively thin foil-like inner layer 29 and an encircling loosely woven spiral-wound wire plait 30. Inner layer 28 encircles dielectric 23. The outermost component of cable 20

is sheath 32, a three-ply structure including outer sheath 33, intermediate sheath 34 and inner sheath 35. Outer sheath 33 is a protective element fabricated of a fluid impervious material, such as polyethelene. Intermediate sheath 34, a reinforcing element, is generally fabricated of metal, such as aluminum, a conductive material. Inner sheath 35, fabricated of a thin plastic material such as mylar, electrically insulates outer conductor 28 from intermediate sheath 34.

Referring now to Figs. 2 and 3 there is seen an improved connector assembly constructed in accordance with the teachings of the instant invention and including a body and a nut, generally designated by the reference characters 40 and 42, respectively. Body 40, which for purposes of reference is considered to have a forward end 43 and a rearward end 44, is preferably fabricated of a conductive material, such as aluminum. External flats 45 impart the familiar hexagonal configuration for receiving a conventional spanner.

Bore 47 extends through body 40. Bore 47 is axial, and in the immediately preferred embodiment, is sized to receive inner layer 28 of outer conductor 29 therethrough. As a manufacturing expediency, bore 47 is carried by insert 48

which is press fitted into bore 49. Accordingly, a selection of inserts 48, having variously sized bores 47, may be incorporated into a single nut 40. In the immediate embodiment, insert 48 is conductive. In an alternate embodiment, insert 48 may be fabricated of an insulative material and include a bore 47 sized to receive center conductor 22 therethrough. It is also noted that insert 48 terminates at the rearward end, with a frustoconical projection 50 coaxial with bore 47. Further discussion of frustoconical projection 50 will be had presently.

Counter bore 52, terminating with radially extending annular shoulder 53, extends inwardly from rearward end 44. Frustoconical projection 50 is contiguous with shoulder 53 for purposes which will be explained presently. At the rearward end, bore 52 is enlarged to form O-ring seat 54. Female thread 55 resides intermediate O-ring seat 54 and shoulder 53. Female thread 55 functions as an element of a male/female engagement pair, the complemental element thereof being carried by nut 42.

In the immediate embodiment of the instant invention chosen for purposes of illustration, counter bore 57 terminating with annular shoulder 56 and carrying internal thread 58 is formed into forward end 43. Counter bore 57 and

internal thread 58 function as means for attachment to a selected device. One such device, an adapter comprising an intergal portion of the instant invention will be described as the description proceeds. Further to be described is an alternate embodiment of a body terminating with a male thread.

Nut 42, in general similarity to body 40, is fabricated of a conductive material and includes a forward end 60 and rearward end 62. Male thread 63, the complemental element of the previously indicated male/female engagement pair and carried proximate forward end 60, is matingly engageable with female thread 55. Flats 64, proximate rearward 62, define an external hexagonal section for attachment of a conventional spanner as will be appreciated by those skilled in the art.

Bore 65, sized to receive sheath 32, extends axially through nut 42. First counter bore 67, terminating with radial shoulder 68, extends inwardly from forward end 60. Second counter bore 69, terminating with radial shoulder 70, also extends inwardly from forward end 60.

First compression ring 72 having a forward end 73 and rearward end 74 and cylindrical external surface 75 is sized to be rotatably received within bore 69. Axial bore 77,

being of a diameter being somewhat greater than the diameter of sheath 32, extends through first compression ring 72. Counter bore 78 extends inwardly from forward end 73. Frustoconical or bevelled shoulder 79 extends between bore 77 and counter bore 78.

Second compression ring 82, a virtual mirror image of first compression ring 72, includes forward end 83, rearward end 84 and external surface 85, the latter being sized to be rotatably received within counter bore 69. Bore 87 extends through compression ring 82. Counter bore 88 extends inwardly from rearward end 84. Bevelled shoulder 89 extends between bore 87 and counter bore 88. Bores 77 and 87 have a corresponding diameter while a similar analogy exists between counter bores 78 and 88. Second compression ring 82 further includes external reduced diameter portion 90 terminating with shoulder 92 extending to external surface 85.

Ferrule 94, having outer cylindrical surface 95 and bevelled ends 97 and 98, is sized to be concurrently rotatably received within counter bores 78 and 88. Axial bore 99 extends through ferrule 94. A plurality of teeth 100 project inwardly from bore 99. Longitudinal slit 102 extends through ferrule 94.

.Teeth 100 may assume various specific configurations as will be apparent to those skilled in the art. In the immediately preferred embodiment, each tooth 100 has a cross section generally in the shape of a right triangle. Considering one leg as being parallel to the axis of bore 99, the other leg is radial to the bore 99. The hypotenuse or angled side extends rearwardly from the inwardly directed apex. Further, the several teeth 100 are arranged into radially spaced axially aligned rows.

The immediate embodiment of the invention also includes internal annular seal 103, external annular seal 104 and thrust washer 105. Seals 103 and 104 may be in the form of conventional commercially available O-rings. In the assembled configuration, thrust washer 105 resides within counter bore 69 intermediate shoulder 70 and rearward end 74 of first compression ring 72. Seal 103 resides within first counter bore 67, being retained by thrust washer 105. Ferulle 94 resides within compression rings 72 and 82 with bevelled ends 97 and 98 matingly engaged with bevelled shoulders 79 and 89 respectively. Ferulle 94 is of sufficient length that a space resides between the ends 73 and 84 of compression rings 72 and 82 respectively. The terminal portion of nut 42 adjacent end 60 is crimped inwardly into reduced diameter portion 90 to retain the several components in the assembled

configuration. Annular seal 104 resides in annular groove 107 intermediate thread 63 and flats 64.

Isolator 110, a generally cylindrical element fabricated of a dielectric material, is a separable component of the connector assembly described in connection with Figs. 2 and 3. Isolator 110 having forward end 112 and rearward end 113. Cylindrical outer surface 114 adjacent forward end 112 is of a diameter approximately equal to the outer diameter of cable 20. Axial bore 115, extending therethrough, is sized to be received over the insulative inner sheath 35. Bevelled or frustoconical surface 117 extends between outer surface 114 and rearward end 113.

The securement of the connector assembly of the instant invention to coaxial cable 20 is initiated by passing nut 40 rearwardly in the direction of arrowed line A from the free end 118 as seen in Fig. 5. Subsequently, as seen in Fig. 6, a measured length of the outer and intermediate sheaths, 33 and 34, respectively, are removed from the terminal portion of cable 20 to reveal the insulative inner sheath 35. Isolator 110 as seen with reference to Figs. 7 and 8, is then passed over inner sheath 35. Movement in the direction of arrow

A is continued until rearward edge 113 is wedged between inner sheath 35 and conductive intermediate sheath 34, the latter being wedged outwardly by surface 117.

With isolator 110 wedged firmly in place, as seen in Fig. 9, inner sheath 35 is then removed from the terminal portion of cable 20 to approximately forward edge 112 of isolator 110. Outer layer 30, the plait, of outer conductor 28 is now flared outwardly. Isolator 110 functions to electrically insulate outer layer 30 of outer conductor 28 from the conductive intermediate sheath 34. In the final step of the preparation of the cable, as viewed in Fig. 10, the inner layer 29 of conductor 28 and the dielectric 23 are removed to expose a length of the center conductor 22. There remains a length of inner layer 29 and dielectric 23 approximately equal to the length of bore 47 adjacent the flared outer layer 30. The length of exposed center conductor 22 is commensurate with the intended use of the cable as will be readily appreciated by those skilled in the art.

The penultimate step in the procedure of coupling the cable connector assembly of the instant invention with the terminal portion of the coaxial cable 20, prepared as described in connection with Figs. 5-10, is the insertion of

the terminal portion of the cable into body 40 from rearward end 44. At the completion of the immediate step, the inner layer 29 of outer conductor 28 resides within bore 47 and frustoconical projection 50 is firmly inserted between the inner and outer layers, 29 and 30, respectively, of outer conductor 28. Frustoconical projection 50 functions as flaring means for urging the outer layer 30 outwardly in a direction to reside adjacent surface 53.

Finally, nut 42 is moved in a direction of arrowed line B and threadably coupled with body 40. As the engagement continues, nut 42 is advanced in a direction toward body 40 as indicated by the arrowed line B. In response thereto, the outwardly flared portion of the outer layer 30 of outer conductor 28 is compressed between surface 53 of body 40 and surface 83 of second compression ring 82, now functioning as the forward end of nut 42. It is seen that surfaces 53 and 83 function as contact surface and provide means for electrical connection of the connector assembly of the instant invention with the outer conductor of coaxial cable 20.

Concurrently, as the threaded advancement of nut 40 continues in the direction of arrowed line B, first compression ring 72 is urged in a direction toward second

compression ring 82 thereby, as a result of the respective bevelled surfaces, compressively restricting ferrule 94 and urging teeth 100 into outer sheath 33. At the limit of compression of ferrule 94, teeth 100 are spaced from the intermediate sheath 34. Accordingly, body 40 remains electrically insulated from the conductive intermediate sheath 34. From the foregoing description, it is immediately apparent that ferrule 94, the compression rings 72 and 82, and the associated components function as gripping means for mechanical securement of the cable connector assembly to the coaxial cable.

It is important that the connector assembly remains electrically isolated from the intermediate sheath 34. This may be accomplished in either of two ways in accordance with the immediately preferred embodiment of the instant invention. In accordance with one preferred mode, the heighth of teeth 100, as viewed in cross section, may be less than the wall of thickness of outer sheath 33. Alternately, the compression of ferrule 94 may be controlled to limit the depth to which teeth 100 are embedded into outer sheath 33.

As further seen in Fig. 12, annular seal 103 provides hermetic sealing between cable 20 and the connector assembly

of the instant invention. Hermetic sealing between body 40 and nut 42 is provided by annular seal 104. A further annular seal (not herein specifically illustrated) is used in connection with the attachment of body 40 to the selected device. A similar connector assembly is used at each end of the cable. Accordingly, contaminants cannot enter the cable system.

Turning now to Fig. 13 there is seen an adapter, generally designated by the reference character 120 which is securable to the embodiment of the invention previously described in connection with Fig. 12. Functioning as an interface for coupling the previously described embodiment of the instant invention to a selected device, adapter 120 includes a body portion 122 having forward and rearward ends 123 and 124, respectively, as further seen with respect to Fig. 14.

Intermediate ends 123 and 124, body portion 122 is provided with a plurality of flats 125, each lying in a plane parallel to the longitudinal axis of body portion 122 and forming means for receiving a spanner as will be appreciated by those skilled in the art. An external thread 127,

residing intermediate end 123 and the spanner receiving portion defined by flats 125, provides means for attaching the device of the instant invention to a selected device. An annular seal 128, such as a conventional O-ring, residing within external annular groove 129, hermetically seals adapter 120 to the selected device. A second external thread 130, residing intermediate flats 125 and rearward end 124, is matingly engageable with internal thread 58 extending inwardly from the forward end 43 of body 40. Annular seal 132, which may also be in the form of a conventional O-ring, is carried within annular groove 133 at the terminous of external thread 130. Annular seal 132 engages counter bore 57 to effect a hermetic seal between adapter 120 and body 40.

Axial bore 134 extends through body portion 122, being open at forward end 123 and rearward end 124. First counter bore 135 and second counter bore 137, each coaxial with bore 134, extend inwardly from rearward end 124. Counter bores 135 and 137 terminate at the forward end with annular shoulders 138 and 139 respectively. Internal annular groove 140 is formed in second counter bore 137 proximate rearward end 124.

Insert 142, fabricated of a dielectric material and having forward end 143, rearward end 144 and axial bore 145,

resides within bore 135. End 143 of abuts shoulder 138. The overall length of insert 142 is approximately equal to the overall length of counter bore 135. Second insert 147 having forward end 148, rearward end 149 and bore 150 therethrough resides within second counter bore 137. Second insert 147, having a length substanially less than the length of counter bore 137, resides in the forward portion thereof with surface 148 abutting shoulder 139.

Center conductor element 152, carried by inserts 142 and 147 coaxial with external thread 127, is electrically isolated from body portion 122. Center conductor element 152 includes three cylindrical portions 153, 154 and 155 which function as connector pin, support section and collet, respectively. Support section 154, being intermediate in size and location, resides within bore 150 of second insert 147. Connector pin 153 projects forwardly therefrom through bore 145 in first insert 142 to terminate with the forward portion thereof forward of forward end 123 of body portion 122. For purposes of electrical insulation between connector pin 153 and body portion 122, bore 134 is substantially larger than connector pin 153. Insert 142 and 147 also function as hermetic seals between center connector element 150 and body portion 122. Collet 155, the largest of the cylindrical sections, terminates with rearward end 157.

Axial bore 158, sized to receive center conductor 22 of coaxial cable 20 therein, extends inwardly from rearward end 157. Radially patterned, longitudinally extending slits 159 sever collet 155.

Collet closer 160, having forward end 162 and rearward end 163, resides within second counter bore 137 coaxial with center connector element 152. Axial bore 164, for closely receiving collet 155 therein, extends through collet closer 160. Forward end 162 resides in juxtaposition with rearward end 149 of second insert 147. Radial flange 165, proximate forward end 162, includes outer cylindrical surface 167 sized to be closely received within second counter bore 137. Reduced dioder portion 168 extends from radial flange 165 and terminates with inwardly rearwardly directed frustoconical surface 169. In general similarity to collet 155, reduced diameter portion 168 is severed by slits 170.

Compression ring 172 having forward end 173, rearward end 174 and outer cylindrical surface 175, resides within second counter bore 137 coaxial with center connector element 152 and collet closer 160. Tapered bore 177 matingly receives frustoconical surface 169 of collet closer 160. Counter bore 178 extends inwardly from rearward end 174. Annular ridge 179, being generally triangular in cross

section and projecting from surface 175, is captively retained within internal annular groove 140 to maintain the several previously described elements in assembled relationship with body portion 122. Being fabricated of a plastic material of dielectric properties, compression ring 172 is assembled with body portion 122 by snap engagement.

Adapter 120 is assembled with body 40 by engagement of external thread 130 with female thread 58 in accordance with conventional technique. During the relative rotation, adapter 120 advances in the direction of arrowed line C relative to body 40. In the assembled configuration, prior to the union of adapter 120 with body 40, rearward end 174 of compression ring 172 projects rearward from rearward end 124 of body portion 122. During the initial step of attaching adapter 120 to body 40, that portion of center conductor 22 residing within counter bore 57 is entered through compression ring 172 into bore 158 of collet 155. Subsequently, adapter 120 is rotated engaging thread 130 with thread 58 and advancing adapter 120 in the direction of arrowed line C. As the advancement continues, rearward end 174 of compression ring 172 abuts the shoulder 56 at the rearward end of counter bore 57. In response to continued rotation compression ring 172 is urged forwardly relative body portion 122 in a direction indicated by the arrowed line D. Resultingly,

as will be appreciated by those having understanding of camming movements and collet structures, reduced diameter section 168 of collet closer 160 is constricted reducing the diameter of bore 164, which in turn constricts collet 155 reducing the diameter of bore 158 to grip center conductor 122. The signal from center conductor 122 is transmitted through connector pin 53 and the electrical signal from outer conductor 28 is transmitted through body 40 and body portion 122 in accordance with conventional practice.

An alternate body generally designated by the reference character 190 having forward end 192 and rearward end 193 and combining certain features of body 40 and adapter 120, is illustrated in Fig. 15. In general analogy to the previously described body 40, the immediate body 190 includes counter bore 52 extending inwardly from rearward end 93. Counter bore 53 which carries female thread 55 terminates with shoulder 53.

An alternate insert 194 carrying the previously described frustoconical projection 50 resides within counter bore 49. For use in connection with the immediate embodiment, coaxial cable 20 is prepared as previously described except with a slight variation in the step previously described

in connection with Fig. 10. In contrast, a shortened length of the terminal portion of center conductor 22 adjacent end 118 is bared. Further, the inner layer 29 of outer conductor 28 is removed from the dielectric 23.

In general analogy to adapter 120, alternate body 190 includes bore 134, of substantially larger diameter than center conductor 22, external thread 127 and groove 129 supporting O-ring 128. Counter bore 194 terminating at the forward end with annular shoulder 195 replaces the previously described counter bores 47 and 145. Counter bore 194 is sized to receive outer tubular element 25 of dielectric 23.

Body 190 receives nut 42 and is electrically and mechanically secured to coaxial cable 20 as previously described in connection with Fig. 12. Body 190 is also adapted for securement to a selected device having a female thread in accordance with conventional practice, as is the embodiment illustrated in Fig. 13. In all other respects not specifically described, body 190 is analagous to description previously made.

Various changes and modifications to the embodiment herein chosen for purposes of illustration will readily occur to those skilled in the art. To the extent that such modifications and variations do not depart from the spirit of the invention, they are intended to be included with the scope thereof which is limited by a fair assessment of the following claims.

Having fully disclosed the instant invention in such clear and concise terms as to enable those skilled in the art to understand and practice the same, the invention claimed is:

.1. A cable connector assembly for attachment to the terminal position a coaxial cable, which cable includes

a center conductor,

a pliant outer conductor coaxial with said center conductor,

a dielectric intermediate said center and said outer conductors, and

a sheath including a protective outer sheath a conductive intermediate sheath, and an insulative inner sheath

and for mechanical securement to said sheath and for ameliorated electrical connection to said outer conductor, said cable connector assembly comprising:

a. an electrically conductive body including

i. an axial bore for receiving at least said center conductor therethrough, and

(Claim 1 continued) **0134358**

ii. an element of a male/female engagement pair;

b. a nut including

i. an axial bore for receiving said sheath therethrough, and

ii. a complemental element of said male/female engagement pair;

c. gripping means for mechanical securement with said sheath; and

d. contact means for electrical connection with said outer conductor.

2. The cable connector assembly of Claim 1, wherein contact means includes:

a. a contact surface carried by said body; and

b. an opposing contact surface carried by said nut, said outer conductor being compressively embraced between said contact surface and said opposing contact surface in response to engagement of said element with said complemental element of said male/female engagement pair.

3. The cable connector assembly of Claim 2, wherein said contact surface and said opposing contact surface are generally radially disposed with respect to the respective axial bores.

.4. The cable connector assembly of Claim 3, wherein said contact surface and said opposing contact surface are annular.

5. The cable connector assembly of Claim 3, further including flaring means carried by said body for urging said outer conductor outwardly in a direction to reside between said contact surface and said opposing contact surface.

6. The cable connector assembly of Claim 3 wherein said flaring means includes a frustro-coaxial projection carried by said body and extending from said contact surface coaxial with said axial bore.

7. The connector assembly of Claim 1 wherein said gripping means includes:

a. a generally cylindrical ferrule carried by said nut and having

i. a coaxial bore for receiving said outer sheath therethrough, and

ii. a plurality of inwardly projecting teeth carried within said bore;

b. a compression ring coaxial with said ferrule; and

c. detent means for retaining said ferrule and said compression ring in assembly with said nut,

said compression ring compressively restricting said ferrule and urging said teeth into said outer sheath in response to engagement of said element with said complemental element of said male/female engagement pair.

.8. The cable connector of Claim 7, wherein said teeth are spaced from said intermediate sheath when urged into said outer sheath.

9. The cable connector of Claim 5, further including isolator means for electrically insulating said outer conductor from said intermediate sheath when said outer conductor is urged outwardly.

10. The cable connector assembly of Claim 9, wherein said isolator includes a dielectric collar received over said outer conductor before said outer conductor is urged outwardly.

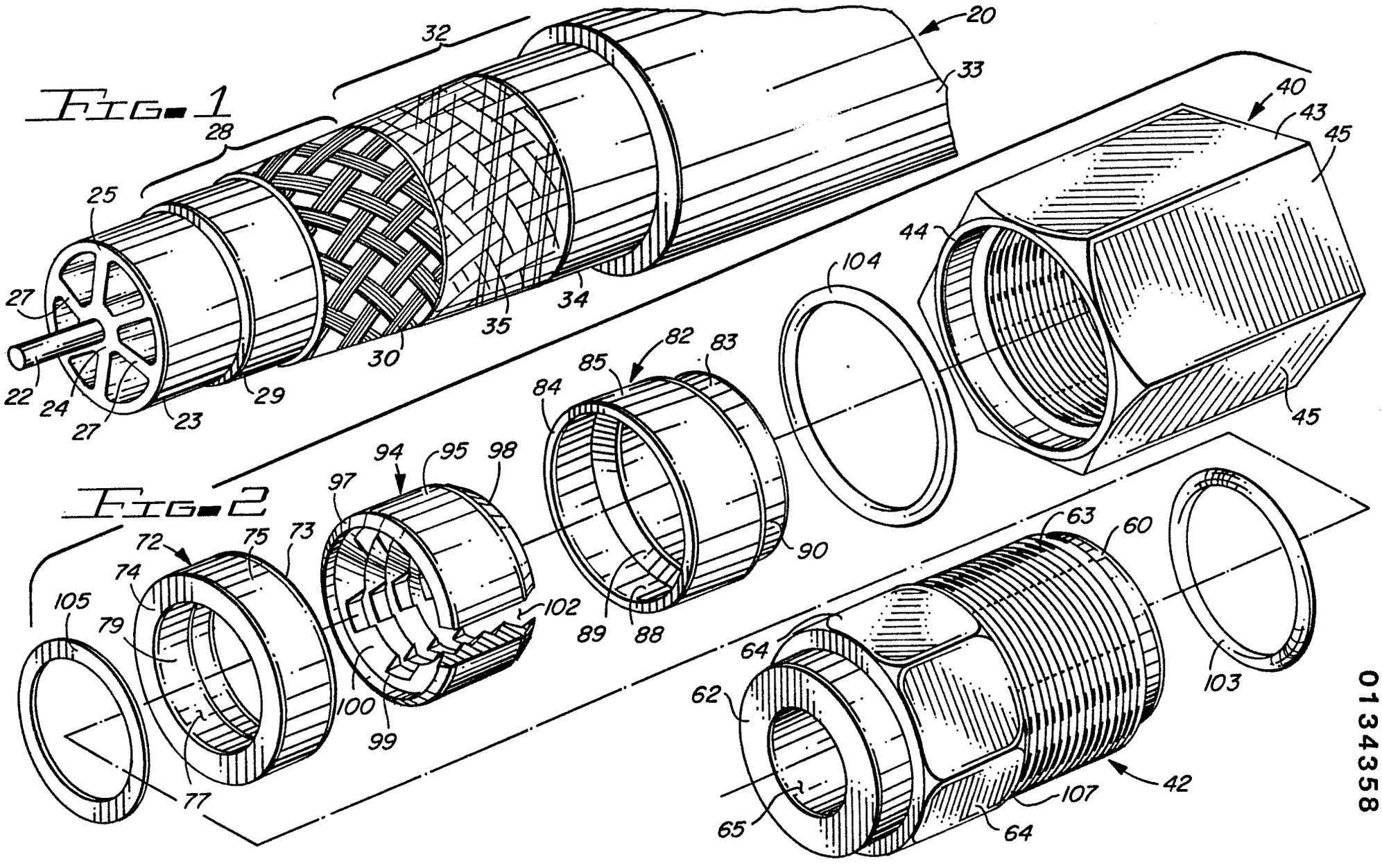
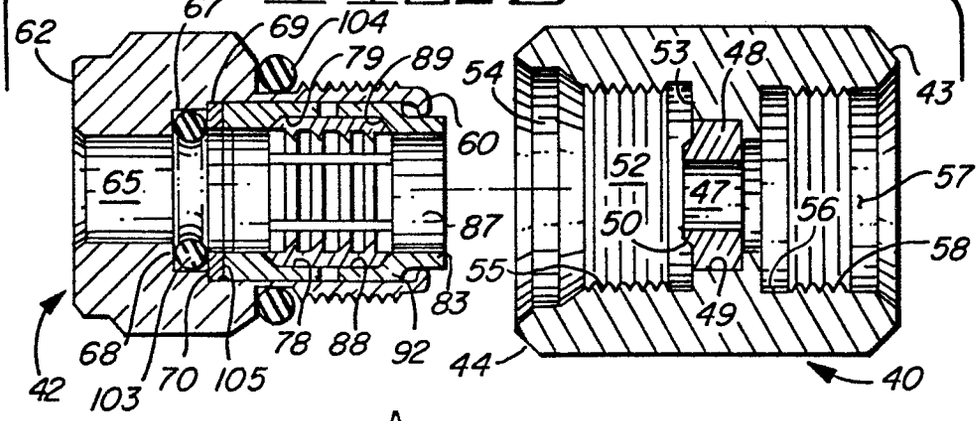


Fig-1
Fig-2
20
32
33
28
25
27
22
24
27
23
29
30
35
34
40
43
45
44
104
45
82
83
85
84
90
89
88
94
95
98
97
102
100
99
72
75
73
74
105
79
77
63
60
64
62
65
107
42
64
103

0134358

FIG-3



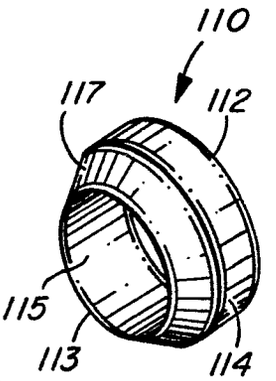


FIG-4

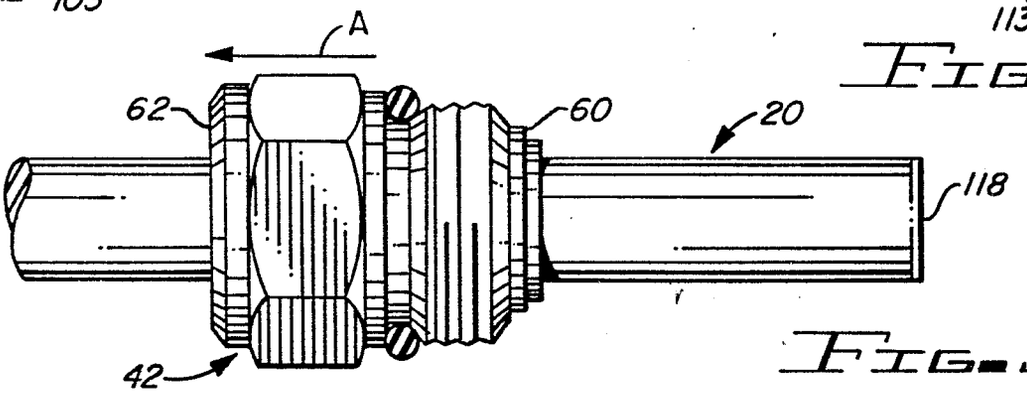


FIG-5

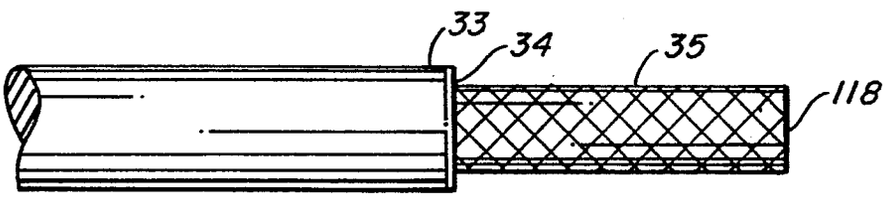


FIG-6

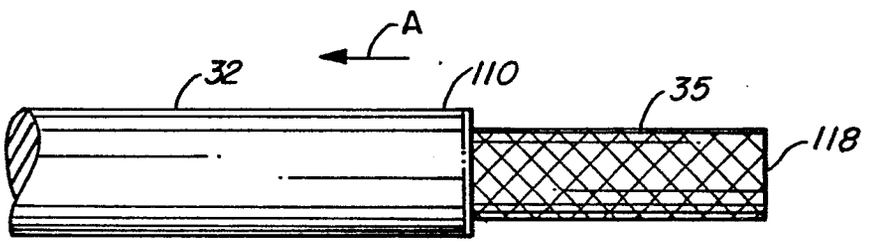


FIG-7

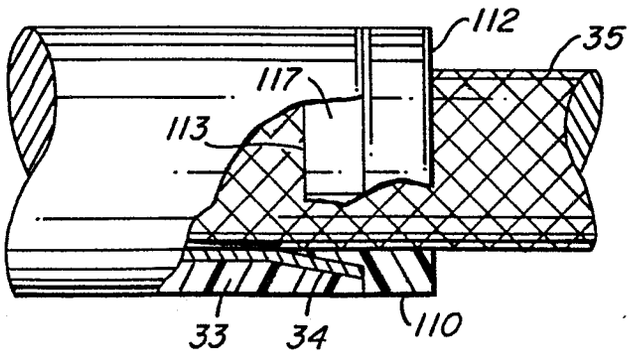


FIG-8

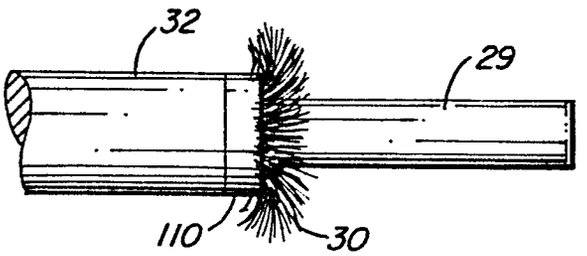


Fig.9

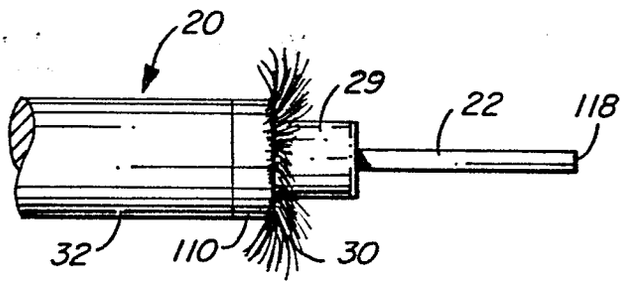


Fig.10

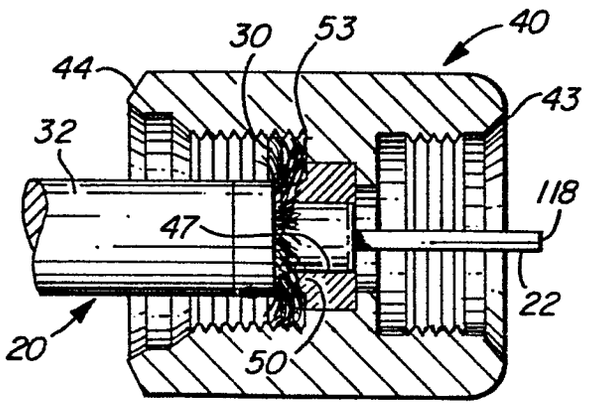


Fig.11

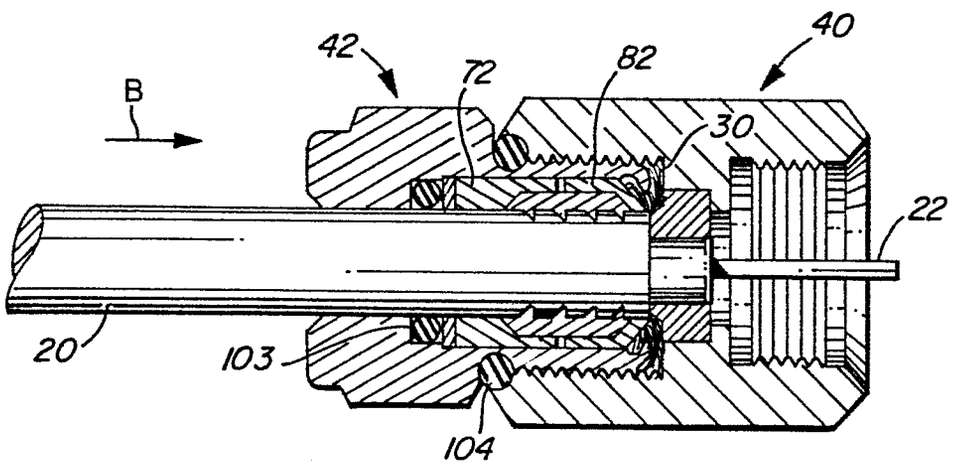


Fig.12

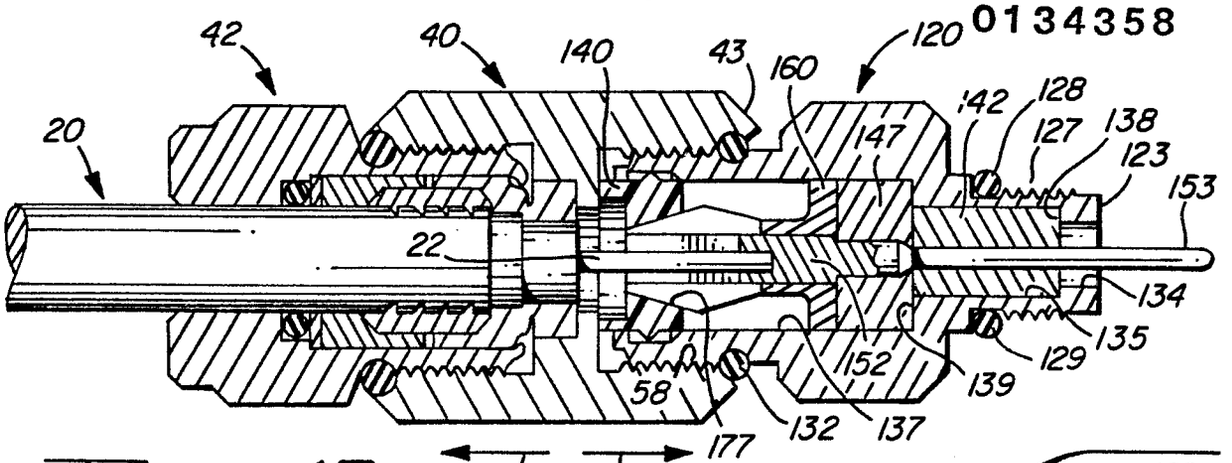


FIG. 13

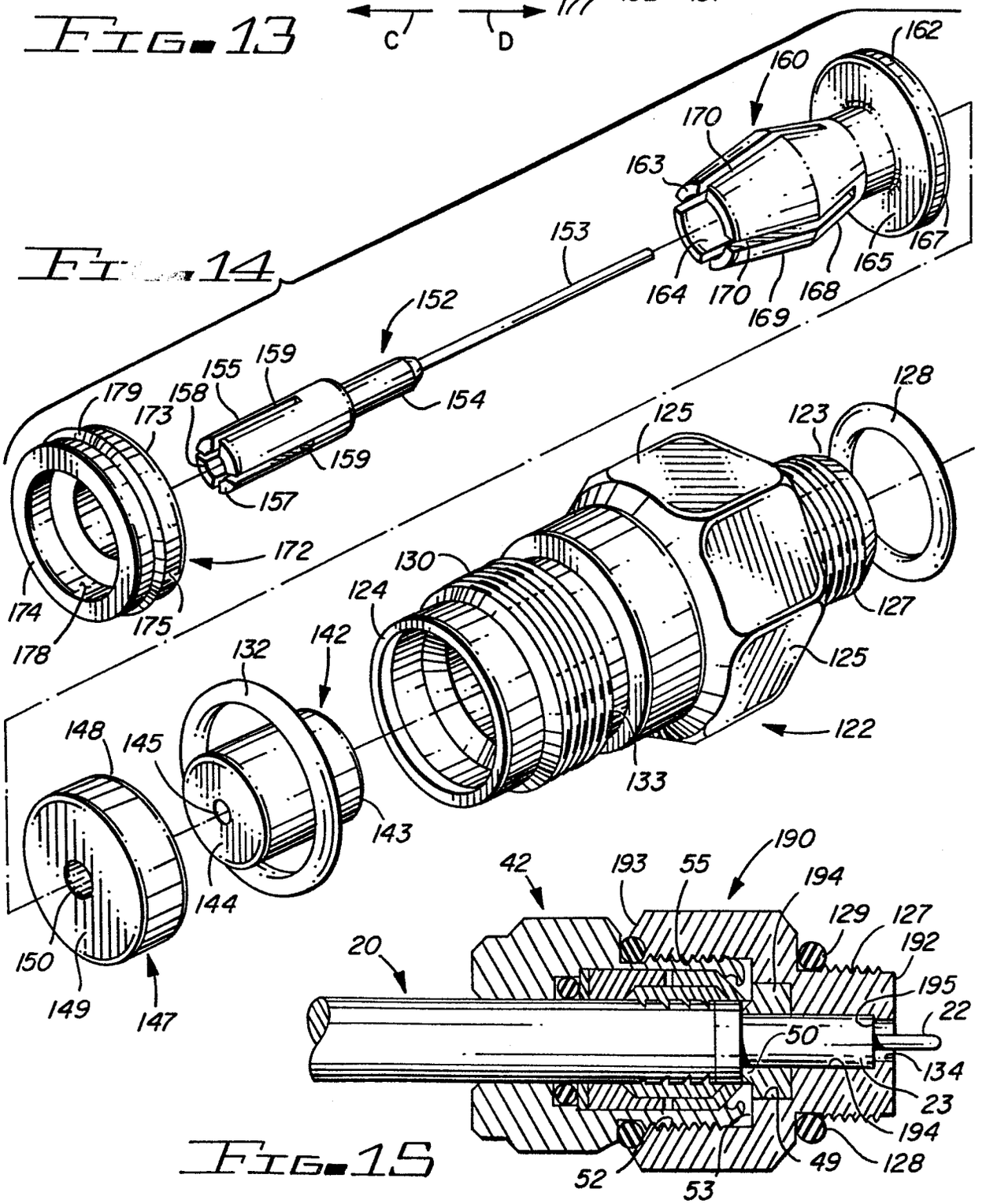


FIG. 14

FIG. 15

European Patent Office

EUROPEAN SEARCH REPORT

0134358

Application number

EP 83 30 5228

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	US-A-2 173 643 (MOSER) * Page 2, lines 7-31; figures *	1,2	H 01 R 17/12
A		7,8	

Y	US-A-4 255 011 (SPERRY) * Column 2, lines 16-54; figures *	1,2	

A	GB-A-2 019 665 (BUNKER RAMO) * Page 2, line 97 - page 3, line 14; figures *	2-6	

A	US-A-4 331 374 (R.J. PHILLIPS) * Abstract; figures *	7	
	-----		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 01 R H 01 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08-05-1984	RAMBOER P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03 82