Dec. 12, 1967 A. G. BREJCHA, JR 3,358,264

COAXIAL CABLE CONNECTOR

Filed June 14, 1966 3 Sheets-Sheet 1

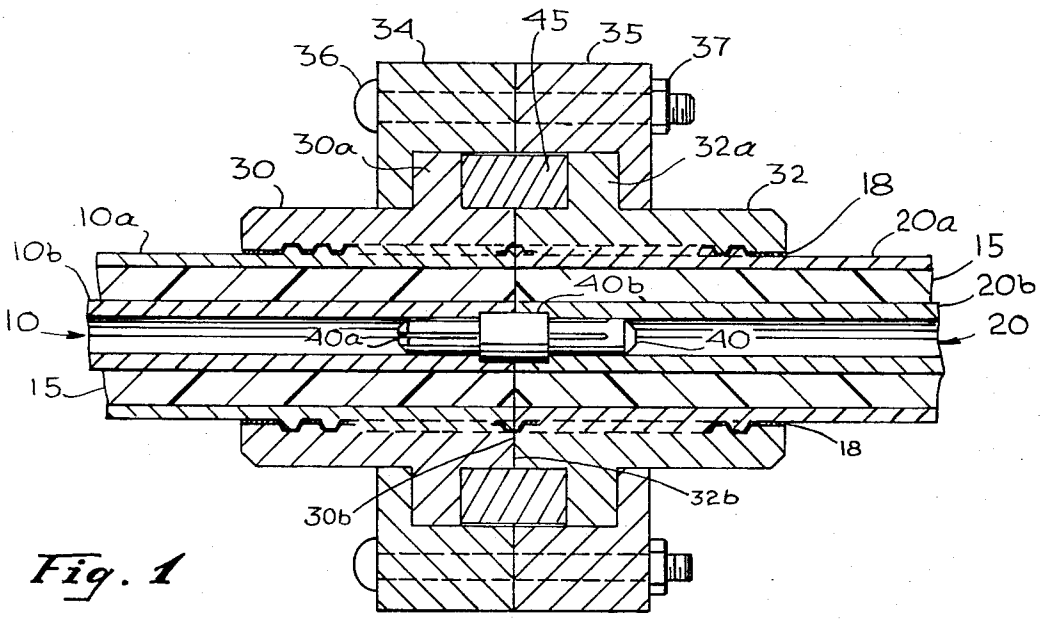

Fig. 1

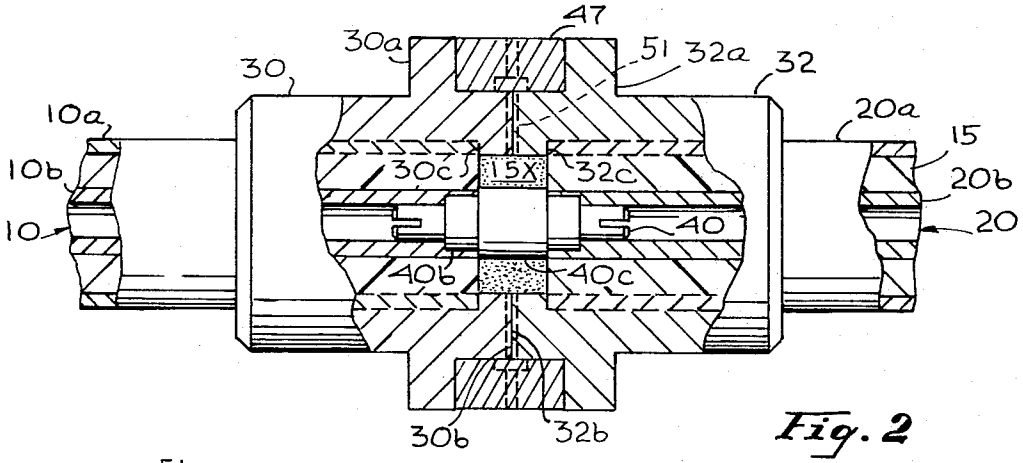

Fig. 2

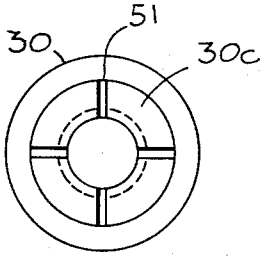

Fig. 3

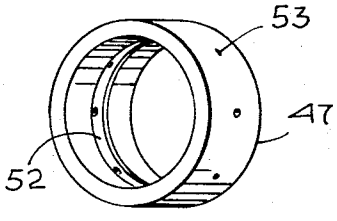

Fig. 4

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COAXIAL CABLE CONNECTOR

Filed June 14, 1966 3 Sheets-Sheet 2

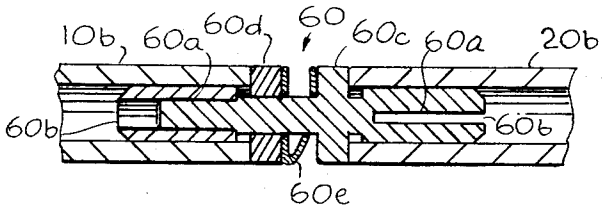


Fig. 5

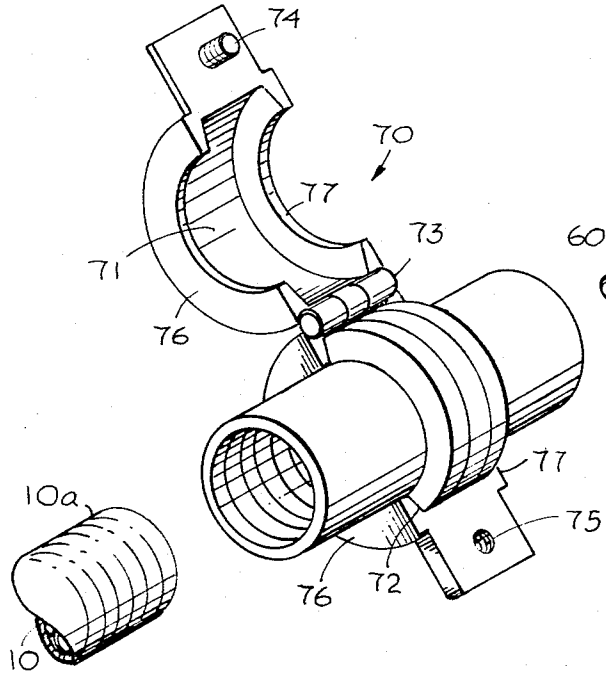
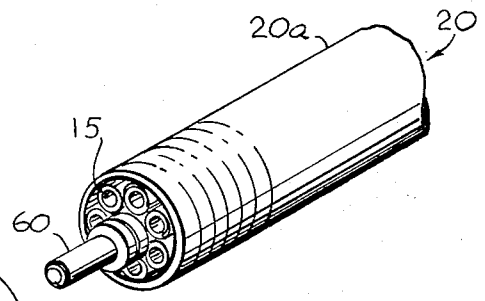


Fig. 6



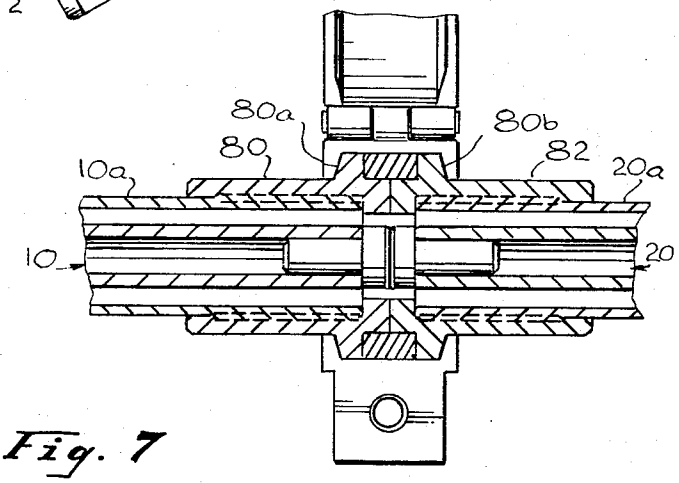


Fig. 7

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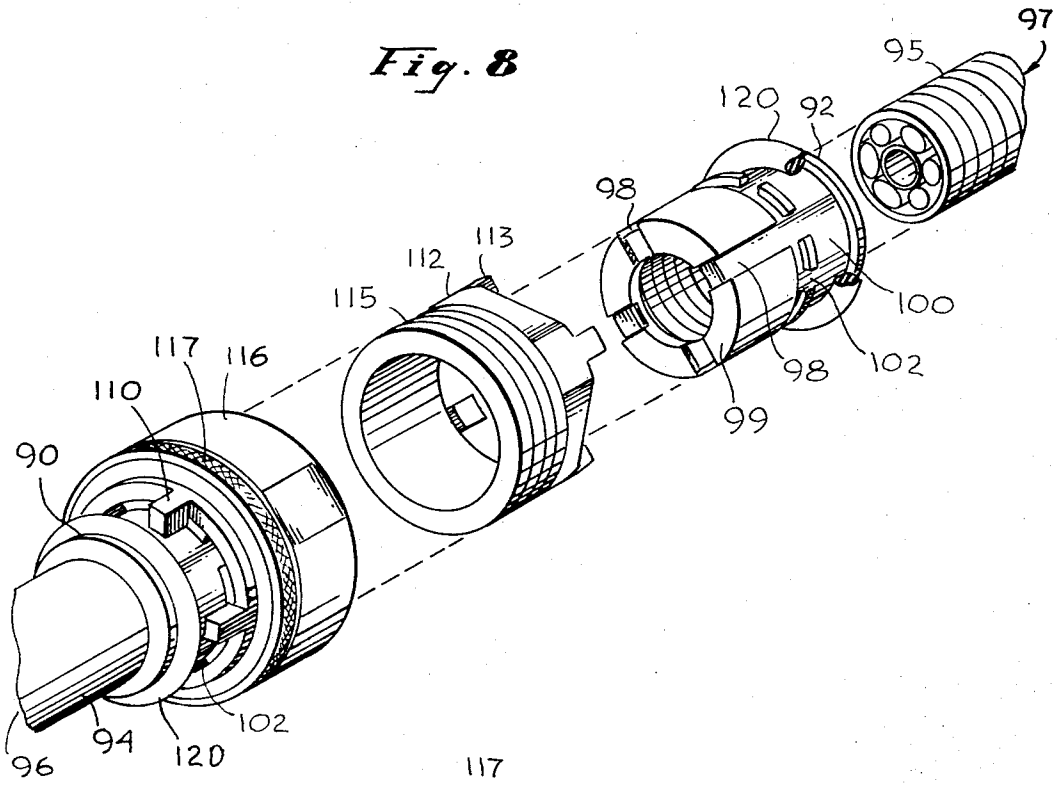
Dec. 12, 1967 A. G. BREJCHA, JR 3,358,264

COAXIAL CABLE CONNECTOR

Filed June 14, 1966 3 Sheets-Sheet 3

Fig. 8



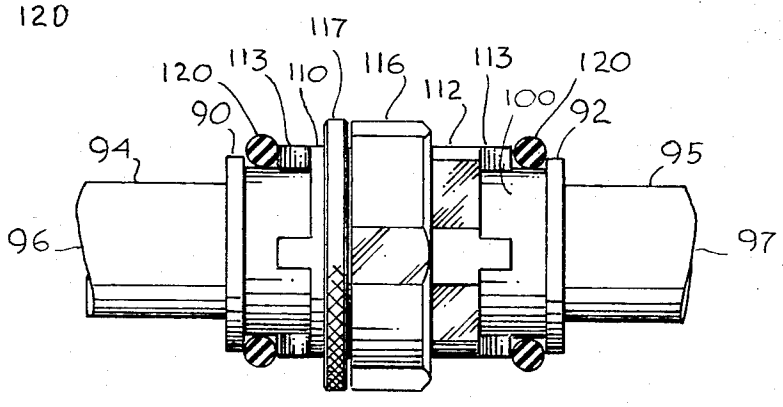


Fig. 9

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3,358,264

COAXIAL CABLE CONNECTOR

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Filed June 14, 1966, Ser. No. 557,584
12 Claims. (Cl. 339—177)

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85–568 (72 Stat. 435; 42 USC 4257).

This invention relates to connectors and more particularly to connectors for rigid and semirigid coaxial cables. Customarily, coaxial cables, of the type comprising two coaxially disposed thin walled tubes of conducting material, are interconnected by means of mating male and female connectors to which the cables are generally soldered, crimped or wedged in order to form the mechanical and electrical connection therebetween. Various clamping arrangements have been devised to connect the opposite ends of the outer tubes or conductors, while various fastening devices are used to couple the ends of inner conductors. Generally, these devices include some conducting member which is wedged into the end of the inner conductors and secured in place by means of one or more set screws.

Prior art devices, though adequate for connecting coaxial cables of relatively large diameters in which the outer and inner conductors are thick enough to support the wedging devices and set screws, are quite inadequate for use with small diameter coaxial cables, extensively used in space exploration equipment. Also, the manner in which cables are interconnected by prior art connectors results in electrical characteristics such as high loss, high voltage standing wave ratio, which are often unsatisfactory in highly accurate applications such as space exploration. In addition, since in such latter mentioned applications, the number of coaxial cable connections is quite large, it is desirable that any two cable ends could be connected without regard to the type of connector coupled to each end. Such a capability is not realizable when connectors of different sexes, i.e., male or female, are used since only connectors of opposite sexes can be intercoupled. Thus, the flexibility of freely intercoupling different cable ends is limited.

Accordingly, it is an object of the invention to provide a new coaxial cable connector which is not limited by the limitation of prior art connectors.

Another object is to provide a new connector for interconnecting opposite ends of coaxial cables with a minimum of losses and voltage standing wave ratio.

A further object is the provision of a novel, small connector for interconnecting opposite ends of relatively small diameter cables comprising rigid or semirigid coaxially disposed tubular electrical conductors.

Still another object is to provide a small sexless connector whereby any two opposite ends of coaxial cables in a system are conveniently intercoupled irrespective of the connector portion coupled to either end.

Still a further object is the provision of a coaxial cable connector including members mating the cross-sectional configuration of the coaxially disposed tubular conductors to attain electrical characteristics of low loss low voltage standing wave ratios, in addition to strong mechanical intercoupling.

These and other objects are achieved by providing a connector comprising a pair of flanged shells, each threadably mounted on the outer conductor at the end of one

of the cables to be connected. Preferably, a sealant is used to fill the space between the threads so that each shell is integrally connected to the outer conductor. The shells have milled sides or faces in a direction perpendicular to their longitudinal axes, so that the opposite faces can be brought into mating contact, thus providing electrical and mechanical continuity for the outer conductors.

A bullet-like member is insertable into the opposite ends of the inner conductors of the two cables to provide electrical continuity therefor. The shells are identical and the bullet-like member is symmetrical so that the connector may be thought of as sexless. The connector also includes a set of clamping means which are releasably couplable to the two shells. The clamping means are used to interconnect the opposite ends of the cables by urging the shell flanges towards one another. The coupling means may be rigidly fastened to one another by means of exterior fastening screws, or by being threaded into one another. An alignement ring may also be used to insure the alignment of the outer and inner conductors of the opposite ends of the cables when the cables are interconnected.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

FIGURE 1 is a cross-sectional view of one embodiment of the present invention;

FIGURE 2 is a cross-sectional view of another embodiment of the invention;

FIGURE 3 is a front view of cable shells, utilized in the embodiment shown in FIGURE 2;

FIGURE 4 is an isometric view of an alignment ring diagrammed in FIGURE 2;

FIGURE 5 is a cross-sectional view of another embodiment of a bullet-like member, forming part of some of the embodiments of the present invention;

FIGURES 6 and 7 are perspective and cross-sectional views respectively of another embodiment of the present invention; and

FIGURES 8 and 9 are exploded perspective and front views respectively of an embodiment of the invention, utilizing releasably fastenable fastening shells.

Attention is now directed to FIGURE 1 which is a cross-sectional view of one embodiment of the novel connector of the present invention. Therein, reference numerals **10**, **20** designate adjacent ends of two coaxial cable sections which are to be interconnected. Each section consists of a respective tubular outer conductor **10***a*, **20***a*, a respective, coaxially disposed, inner tubular conductor **10***b*, **20***b*. The inner and outer conductors of each cable section are held in concentric, spaced relation, throughout their lengths by suitable rods or beads of insulation, generally designated by numeral **15**. The outer conductors **10***a* and **20***a* are threaded about their exterior surfaces adjacent the section ends, to enable respective cylindrical shells **30** and **32** to be threadably coupled thereto. Shells **30** and **32** have respective flanges **30***a* and **32***a* disposed adjacent the cable ends.

The inner diameter of the shells is controlled with respect to the outer diameter of outer conductors **10***a* and **20***a* so that the shells may be securely threaded thereon without materially affecting the physical characteristics of the outer conductors. Thereafter, each cable end with the shell mounted thereon is milled to provide a mating surface, in a direction perpendicular to the longitudinal axis of the outer conductor. The two surfaces may be brought into mating contact so that the outer

conductors **10***a* and **20***a* are substantially aligned with one another, to form a substantially continuous outer conductor. In FIGURE 1 the milled faces of shells **30** and **32** are designated by reference numerals **30***b* and **32***b*, respectively.

The two shells (**30** and **32**) may be brought into contact by means of a fastening assembly, comprising flanges **34** and **35** and a plurality of screws **36** and fastening nuts **37**. The screws **36** are insertable through openings in the flanges **34** and **35**. By tightening the ends of the screws by means of nuts **37**, the two flanges are urged towards one another, forcing shoulders **30***a* and **32***a* toward one another which in turn urge shells **30** and **32** into contact. Thus, by tightening nuts **37**, the flanges **34** and **35** are urged to be in physical mechanical contact, providing mechanical as well as electrical continuity between the outer conductors **10***a* and **20***a* and inner conductors **10***b* and **20***b*, respectively.

The electrical and mechanical continuity between the inner conductors may further be improved by providing a bullet-like member **40** which, prior to connecting the two cable ends, is insertable into the inner conductors of the two adjacent cable ends. As seen from FIGURE 1, in one embodiment of the invention, the bullet-like member **40** defines a plurality of longitudinal slots **40***a*, on opposite ends thereof, to further enhance the mechanical coupling of the ends to the respective inner conductor ends. The bullet-like member may also include a central portion **40***b* of a diameter slightly greater than the inside diameter of the inner conductor, but smaller than the outer diameter thereof. The portion **40***b* is set in counter-bored ends of the inner conductor to enhance the electrical and mechanical coupling between the ends thereof. An alignment ring **45** may also be included in the connector, with the ring being placed between the outer surfaces of shoulders **30***a* and **32***a* to further enhance the alignment of the shells **30** and **32** which in turn enhances the alignment of the two cable ends **10** and **20** when the two are interconnected.

As seen from FIGURE 1, when the two cable ends (**10** and **20**) are interconnected, the ends thereof are in mating contact, preventing any atmosphere from being entrapped therebetween. This characteristic is most significant in certain applications, since it prevents the discharge of secondary emission in the gap which may result in short circuiting or breakdown fo the coaxial cable. To strengthen connector-cable attachment, a sealant **18**, such as epoxy, is used in the space between the threads on the outer surface of the outer conductors **10***a* and **20***a* and the threads along the inner faces of shells **30** and **32**, respectively.

It should become apparent from FIGURE 1 and the foregoing description that by using the connector of the present invention, the outer and inner conductors, as well as the insulating material therebetween, are brought into substantially perfect mating contact, forming a substantially continuous coaxial cable, thereby maintaining all its electrical and mechanical characteristics, without disruption. From the foregoing, it should further be appreciated that since the shells **30** and **32** are identical and the bullet-like member **40** is symmetrical, the connector may be thought of as sexless, since any two connector ends, having shells like shells **30** and **32** mounted thereon, may be interconnected.

The connector of the present invention has been found to be most advantageous in interconnecting rigid or semi-rigid coaxial cables of relatively small diameter such as cables having an outer conductor with an outer diameter of approximately one-half inch. By using threading to mount the shells to the outer conductors, the concentricity of the outer conductor is preserved and is not deformed or crimped which is the case when prior art connectors are coupled to such relatively small diameter cables.

In another embodiment of the present invention, diagrammed in FIG. 2, in which elements performing similar functions are designated by like numerals, shells **30** and **32** define respective apertures about their end faces **30***b* and **32***b* of diameters substantially equal to the inner diameter of the outer conductors **10***a* and **20***a*. Thus, when the two shells are urged together, by means of any coupling arrangement, such as hereinbefore described, the outer conductors, instead of being in physical contact with one another as in the embodiment of FIGURE 1, are provided with mechanical and electrical continuity through the lip-like portions **30***c* and **32***c* of shells **30** and **32**, respectively. That is, in their connected relationship, the outer conductors **10***a* and **20***a* are spaced from one another by a distance substantially equal to the combined thickness of lips **30***c* and **32***c*. Thus, a space is created between the two conductor ends.

To provide electrical and mechanical continuity for the inner conductors **10***b* and **20***b*, the bullet-like member **40** is preferably provided with a ridged portion **40***c* of an outer diameter substantially equal to the outer diameter of the inner conductors **10***b* and **20***b*. Consequently, electrical, as well as mechanical continuity for the inner conductors about their entire cross-sectional surface is provided. The space between the insulating material **15** created in such an arrangement may be filled with sealant material, generally designated **15***x*. Such material prevents the entrapment of any gases between the interconnected cable ends.

In another arrangement in which sealant material **15***x* is not used, the end lips **30***c* and **32***c* of shells **30** and **32** respectively may be machined to define a plurality of slots **51** as shown in FIGURE 3 to which reference is made herein. The function of these slots is to provide escape path for any gas entrapped in the space between the interconnected conductor cable ends. An alignment ring **47** placed between shoulders **30***a* and **32***a* of the two shells may define a centrally machined channel **52** as shown in FIGURE 4. A plurality of apertures **53** radially extend from the channel to the ring outer surface, so that any gas passing through slots **51** may pass therefrom into channel **52** and therefrom through the apertures to the outside atmosphere. Thus, the effect of changes in atmospheric conditions on any gases entrapped in the space between the interconnected cable ends is minimized by providing a path for the gas to escape therethrough. After placing the ring **47** between flanges **30***a* and **32***a*, the shells **30** and **32** may be urged towards one another to provide the electrical and mechanical continuity of the inner and outer conductors of the two cable ends, by means of the fastening arrangement herebefore described, which includes flanges **34** and **35** and the plurality of screws and nuts **36** and **37** respectively, or by means of other arrangements of fewer parts to be described hereafter.

From the foregoing description, it should thus be appreciated that whereas in the embodiment of the present invention diagrammed in FIGURE 1, the two cable ends are connected by means of mating faces **30***b* and **32***b* which, as previously explained, are carefully machined to provide substantially perfect mating therebetween, in the embodiment of the invention diagrammed in FIGURE 2. The cable ends may be connected with a space produced therebetween. In one arrangement, the space is filled with a sealant material (**15***x*). Lips **30***c* and **32***c* provide electrical and mechanical continuity for the outer conductors **10***a* and **20***a* and the ridge portion **40***c* of bullet-like member **40** provides continuity for the inner conductors **10***b* and **20***b*. From actual reduction to practice, it has been found that the arrangement of FIGURE 2, even though the two cable ends are not abutted against one another, provides similar satisfactory characteristics to the embodiment shown in FIGURE 1, without the need for careful machining of each cable end after its respective shell is mounted thereon.

As seen from both FIGURES 1 and 2, the bullet-like member **40** is preferably inserted in counter-bored portions

of the ends of inner conductors **10***b* and **20***b*, respectively. The counter-boring has been found necessary in order to insure the proper seating of the member **40** in the inner conductors. In another embodiment of the invention, the need for counter-boring the inner conductors is eliminated by utilizing a bullet-like member shown in FIGURE 5 to which reference is made herein. The member is generally designated by reference numeral **60**. The bullet-like member is shown inserted in the inner conductors **10***b* and **20***b* respectively.

As seen from FIGURE 5, the member **60** comprises two end portions **60***a*, each insertable in another of the inner conductors of the two cable ends. Each end portion may define a plurality of slots **60***b* to provide sufficient resiliency for the ends to be properly mechanically coupled to the inner surface of the inner conductors. The member also includes a pair of discs **60***c* and **60***d*, each having an outer diameter equal to the outer diameter of the inner conductors. The two discs are placed about the center of the bullet-like member **60** with spring biasing means **60***e* placed therebetween. When the member **60** is utilized as part of the coaxial cable connector, the ends thereof are inserted into the inner conductors of the two cable ends to be connected and the two discs are placed in the place therebetween, with each disc being biased by means of spring bias **60***e* to in a sense seal the end of another of the inner conductors. For example, as seen in FIGURE 5, disc **60**c is seated so as to seal the end of inner conductor **20***b*, while disc **60***b* is biased by means of biasing means **60***e* to seal the end of inner conductor **10***b*. Thus proper termination of the inner conductors is accomplished without the need for counter-boring the conductor's ends as shown in FIGURES 1 and 2. Preferably, the bullet-like member **60** may be manufactured from a resilient material such as beryllium copper, with one of the discs, such as **60***c*, forming an integral part thereof. The other disc **60***d* may be manufactured out of another material such as aluminum to prevent gouging or scraping when the bullet-like member is utilized as part of a coaxial cable connector.

In some applications, it is important that the fastening arrangement, used to unite the two cable ends comprise a minimum number of components. This is necessary in order to minimize the danger that any of these components may get lost or fall into adjacently located equipment, resulting in damaging effects. Thus, in accordance with the teachings of the present invention, another fastening arrangement is provided shown in perspective view in FIGURE 6 and in cross-sectional view in FIGURE 7, to which reference is made herein. Briefly, the fastening arrangement **70** comprises two semi-circular ring members **71** and **72** hinged at one end by means of a hinge pin **73**. The other ends of members **71** and **72** are coupled by means of a screw **74** connected to member **71** and threadable into a threaded opening **75** of the member **72**. The ring members **71** and **72** also define opposite end faces **76** and **77** which as shown from FIGURE 6, and in particular from FIGURE 7, have interior wedged-shaped sides.

When using the fastening arrangement **70**, the flanges or shoulders of the shells mounted on the cable ends are also wedge-shaped, so that as the upper ring member **71** is placed on top of ring member **72** and screw **74** tightened into the threaded opening **75**, the wedged-shaped interior sides of faces **76** and **77** draw the shell shoulders and thereby the shells themselves toward one another, providing mechanical coupling between the two cable ends. As seen in FIGURE 7, shells **80** and **82**, threaded on outer conductors **10***a* and **20***a*, respectively, include wedged-shaped shoulders **80***a* and **80***b*, so that the wedged-shaped inner sides of faces **76** and **77** urge the two shells and thereby the two end cables threaded thereon to be mechanically securely coupled to one another.

In another embodiment of the present invention, the fastening arrangement comprises a pair of fastening shells each releasably fastenable to the shell threaded onto the outer conductor of another end cable. The pair of fastening shells are threadably coupled to one another, so that as the two fastening shells are drawn towards one another, the shells threaded onto the outer conductor are similarly drawn in the same direction, providing the mechanical and electrical continuity between the two end cables threaded thereto. Hereafter, in order to more clearly distinguish between the shells threaded onto the outer conductors of the end cables and the shells used for fastening the two cables together, the latter mentioned shells will be referred to as the inner and outer fastening shells, while those members, such as **30** and **32** in FIGURES 1 and 2, and **80** and **82** in FIGURES 6 and 7, threaded onto the outer conductors, will be referred to as the cable shells.

Attention is now directed to FIGURES 8 and 9 which are useful in explaining the novel cable connector of the present invention, utilizing releasably fastenable fastening shells. In accordance with the teachings of the present invention, cable shells **90** and ends **92** are provided with internal threads, so as to threadably engage the threaded outer conductors **94** and **95**, respectively, of end cables **96** and **97**. As seen from FIGURE 8, each cable shell defines a plurality of channels or grooves, generally designated by numeral **98**, which extend in a longitudinal direction from a contact end **99** toward an annularly disposed channel **100** located adjacent the other end of the cable shell end **92**. A plurality of locking channels, generally designated by numeral **102**, are annularly disposed between channels **98**.

A pair of fastening shells **110** and **112** are provided, each defining a plurality of locking fingers **113** located near one end thereof. The number of locking fingers is equal to the number of channels **98**. The fastening shells are so machined that the fingers are insertable into channels **98** and switchable by means of channel **100** into the locking channels **102** so that the fastening shells become releasably locked onto the cable shells. For example, fastening shell **112** is mounted onto the cable shell end **92** by sliding the fastening shell over the cable shell until the fingers **113** are in the channel **100**. Then, after the fastening shell is rotated slightly about the cable shell until fingers **113** are located adjacent locking channels **102** by pulling the fastening shell forward so that each finger is located in another locking channel, the fastening shell becomes locked over the cable shell.

As may be seen from FIGURE 8, the fastening shell **112** has threads **115** about its exterior surface, near the end opposite the end where the locking fingers are located. On the other hand, fastening shell **110** has a ring **116** mounted thereon. The ring is threaded about its interior surface. The ring is mechanically secured to the fastening shell by means of a retaining ring **117**. The two fastening shells (**110** and **112**) may be mechanically coupled to one another by the threads **115** being threaded about the interior surface of the ring **116**, thereby mechanically coupling the two fastening shells to one another. The two fastening shells are thus used to mechanically couple the cable shells **90** and **92** to one another and thereby provide mechanical and electrical coupling between cables **96** and **97**.

It should be appreciated that although the fastening shells **110** and **112** are coupled to one another by means of shell **112** being threaded into ring **116** of shell **110**, the connector nevertheless should be thought of as sexless, since the cable shells **90** and **92** are identical. In practice, when two cable ends are to be connected, and fastening shells of the same type, such as for example fastening shell **112**, are mounted thereon, all that is necessary to provide mechanical and electrical coupling between the two end cables, is to releasably unfasten one of the fastening shells and replace it with a shell of the type designated by numeral **110**, so that the two fastening shells may be connected to one another. As seen from FIGURES 8 and 9, protective flexible O-rings **120** may be inserted into

channels **100** of the two fastening shells, to prevent the fastening shells from accidentally sliding over the outer conductors of the two end cables. The ring **120** further protects the ends of the cable shells by providing a flexible covering therefor. The latter described fastening arrangement, including the fastening shells **110** and **112**, has been found to be very advantageous, since these shells are releasably locked onto the cable shells, which are threaded onto the cable ends, so that when any two cable ends are disconnected, there are no loose parts of the fastening arrangement which may get lost or fall into adjacently located equipment.

There has accordingly been shown and described herein several embodiments of a novel coaxial cable connector, finding particular utility in interconnecting adjacent ends of relatively small rigid and semirigid coaxial cables. It is appreciated that those familiar with the art may make modifications in the arrangements as shown without departing from the true spirit of the invention. Therefore, all such modifications and/or equivalents are deemed to fall within the scope of the invention as claimed in the appended claims.

What is claimed is:

1. A coupling assembly for uniting two sections of a coaxial transmission line having adjacent threaded ends to be connected, said transmission line having an outer tubular conductor and an inner tubular conductor concentric with said outer conductor, the assembly comprising:

a pair of cylindrical shells each having an opening along the longitudinal axis thereof, the interior surfaces of said openings being threaded, each shell being threadable on the outer conductor of a section of said line about the end thereof;

means for sealing the space between the outer conductor of each section and the shell threaded thereon;

means for urging said pair of shells into abutting contact to electrically couple the outer conductors of the two transmission line sections; and

a member insertable in the inner conductors of each of said line sections about said adjacent ends for electrically coupling the ends of said inner conductors, said member comprising a solid tubular rod of electrically conducting material for frictionally engaging the inner surfaces of the inner conductors adjacent said ends to be connected.

2. A coupling assembly for uniting two sections of a coaxial transmission line having adjacent ends to be connected, said transmission line having an outer tubular conductor and an inner tubular conductor concentric with said outer conductor, the assembly comprising:

a pair of cylindrical shells each threadably coupled to another section about the outer conductor thereof by threads on the interior surface of an opening defined by said shell along its longitudinal axis;

a substantially solid cylindrical electrically conducting member having longitudinal slots along at least a portion of its length for frictionally engaging at least the inner conductor of one of said sections about the inner surface thereof, the diameter of said solid member being not greater than the inner diameter of said inner conductor; and

outer means for mechanically coupling said shells to one another to provide electrical contact between the outer conductors of said section, with the solid member frictionally coupled to said inner conductors providing electrical contact therebetween.

3. The assembly defined in claim **2** wherein each shell includes a ring-like flange radially extending from the periphery thereof adjacent the end threaded on the end of said section;

an alignment ring;

clamping means for urging said shells towards one another by clamping said ring-like flanges with said alignment ring therebetween, whereby the inner and outer conductors of one transmission line section are substantially in contact with the respective conductors of the other section; and

the inner conductor of each section being counter-bored to form an opening of an enlarged diameter in between the inner and outer diameters of said inner conductor, said member having a central section of a diameter equal to said enlarged diameter, whereby the opposite ends of said member are inserted in the inner conductors and frictionally engaged thereto about the surface of its inner diameter, and the central portion of said member is in contact with said inner conductors at the surfaces of the counter-bored portions thereof.

4. The coupling assembly defined in claim **2** wherein each of said shells has one machined end substantially perpendicular to the longitudinal axis thereof, defining a lip-like end portion with an opening therethrough having a diameter not greater than the inner diameter of said outer conductor, whereby said machined surfaces are in physical abutting contact when said shells are mechanically coupled by said outer means, with the lip-like end portions being disposed between the outer conductors to provide electrical and mechanical continuity therebetween.

5. The coupling assembly defined in claim **4** wherein said member includes a pair of electrically conducting rings disposed about the central portion of the periphery thereof, and electrically conducting spring means for spring biasing said rings from one another, thereby each ring is in physical contact with the inner conductor of another of said sections to seal the end thereof, when the pair of shells are coupled to one another by said outer means.

6. The coupling assembly defined in claim **5** wherein each shell includes a ring-like flange having a first side adjacent to said machined end and parallelly disposed with respect thereto and a second wedged side, and wherein said outer means comprise two semicircular clamps pivotably coupled at one perpheral end thereof and clampable at the other end and having wedge circumferential shoulders, said clamps being placeable over said ring-like flanges for wedgeably urging the flanges of said two shells towards one another, when said semicircular clamps are clamped at said other ends thereof, said assembly further including an alignment ring disposed between the first sides of said ring-like flanges when the shells thereof are urged into abutting contact.

7. The coupling assembly defined in claim **5** wherein each shell defines a first plurality of longitudinal slots equally circumferentially spaced about the exterior surface thereof and a second plurality of locking slots, and first and second ring-like threadably lockable fastening shells, each defining a central opening having a diameter equal to the outer diameter of either of said shells and a plurality of locking fingers equal in number to said plurality of longitudinal slots and similarly, equally circumferentially spaced about the interior surface of said central opening, whereby either said first or said second members are insertable through said longitudinal slots over either shell and lockable thereon with said fingers in said locking slots, with said machined ends of said shells being urged into abutting contact when said first and second members are threadably locked into one another.

8. The coupling assembly defined in claim **7** wherein said first ring-like threadably lockable member is threaded about a portion of the outer surface thereof adjacent one end, said locking fingers being disposed about the opposite end thereof, and said second member defines said central opening about a portion of its length adjacent one end wherein said fingers are disposed and defining a larger internally threaded opening of a diameter related to the diameter of the outer surface of said first member, said first member being threadable by means of the exterior threads thereof into the larger internally threaded opening of said second member.

9. An assembly for coupling two sections of a coaxial cable having adjacent ends to be connected, each section

having an outer tubular conductor, and an inner tubular conductor concentric with said outer conductor and insulatably disposed therefrom, the assembly comprising:

a pair of substantially cylindrical cable shells of electrically conducting material, each defining an opening with an interior surface about the longitudinal axis thereof, first and second end faces, each shell being threaded about the interior surface of said opening near said first end face, and defining a channel in its outer surface about the circumference thereof near said second end face, each shell further defining a first plurality of longitudinal slots in its outer surface extending from said first end face to said channel equidistantly disposed about the circumference, and a second plurality of locking slots extending from said channel towards said first end face, equidistantly disposed about the circumference, whereby each locking slot is disposed between another pair of adjacent longitudinal slots, each cable shell being threadable on the outer conductor of another of said cable sections;

a bullet-like member of electrically conducting material having at least first and second ends insertable in the inner conductors of said two sections; and

first and second fastening shells, each comprising a hollow cylinder with a plurality of finger-like members circumferentially disposed at a first end thereof, whereby each of said fastening shells is insertable over another of said cable shells, with the fingers thereof inserted through said longitudinal slots and said fastening shell being releasably lockable over its respective cable shell when said fingers are in said locking slots, said first and second fastening shells further including means for releasably coupling one to the other, whereby said cable shells and the cable sections threaded thereto are urged into electrical and mechanical contact.

10. The assembly defined in claim **9** wherein said first fastening shell further includes threads on the outer surface thereof near a second end opposite said first end and said second fastening shell further comprises an internally threaded ring coupled adjacent its second end opposite said first end, whereby said first and second fastening shells are coupled to one another by threading the second end of said first fastening shell into the internally threaded ring of said second fastening shell, and sealant means for sealing the space between each cable section and the cable shell threaded thereon.

11. The assembly defined in claim **10** wherein said bullet-like member further includes a pair of discs vertically positioned, with respect to its longitudinal axis at the center thereof and means for biasing said discs with respect to one another, whereby each disc substantially seals the end of the inner conductor of another of said cable sections when said two sections are coupled to one another and insulating means disposed between the inner and outer conductors of said cable sections for substantially filling the space between said sections when said sections are coupled to one another.

12. The assembly defined in claim **10** wherein said bullet-like member further includes a pair of discs vertically positioned, with respect to its longitudinal axis at the center thereof and means for biasing said discs with respect to one another, whereby each disc substantially seals the end of the inner conductor of another of said cable sections when said two sections are coupled to one another, and a plurality of slots defined in the first end face of each of said cable shells for providing an air path between the space between the two intercoupled cable sections and the exterior of said assembly.

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