# United States Patent

[11] 3,581,269


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[54] **CONNECTOR FOR COAXIAL CABLE**
**4 Claims, 7 Drawing Figs.**


[52] **U.S. Cl.** ..... **339/94,** 339/177
[51] **Int. Cl.** ..... **H01r 17/04,** H01r 33/34
[50] **Field of Search** ..... 339/94 A,C,M, 94, 103, 104, 177 E, 273 R,F



[56] **References Cited**

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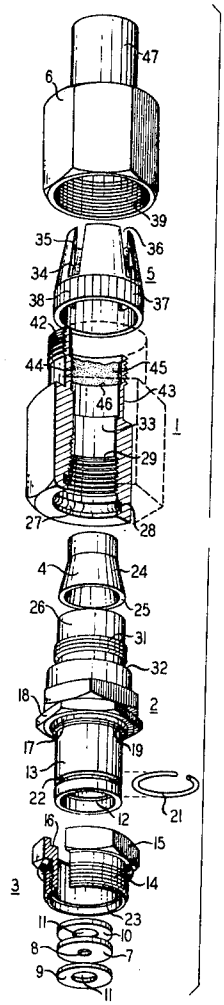
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*Assistant Examiner*—Lawrence J. Staab
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**ABSTRACT:** This disclosure describes a connector for a communications coaxial cable. The connector structure includes a collapsible bushing which is wedged into a positive grip with the cable jacket, and a separate wedge-type bushing to grip the outer conductor. A resilient seal is afforded around the center conductor. Placement of the cable in the connector and of the latter onto equipment housing requires no special tools.

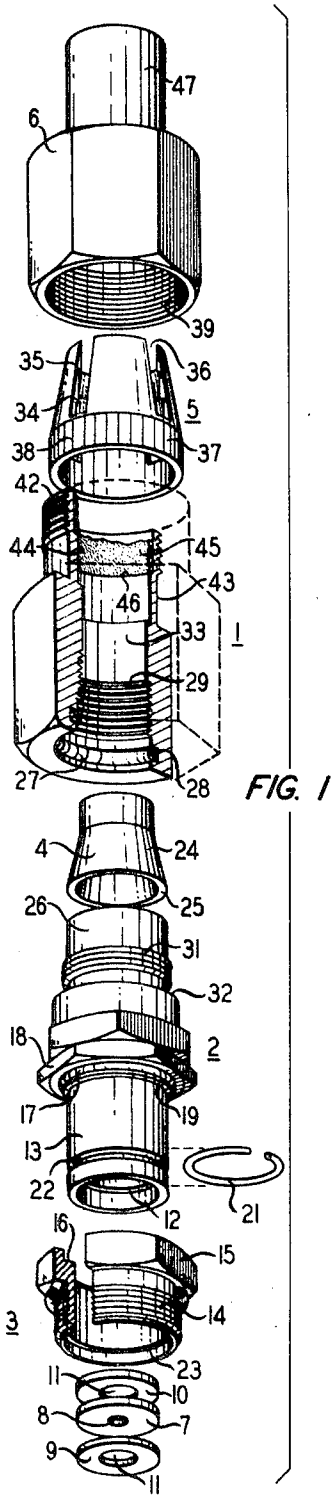



FIG. 1

FIG. 2

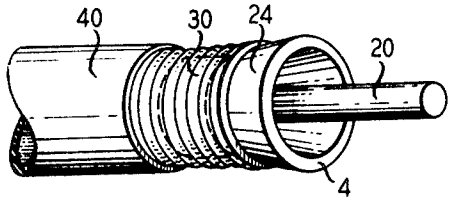



FIG. 3

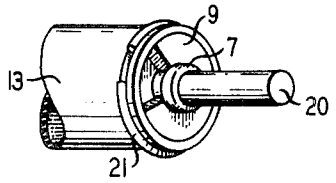



FIG. 4

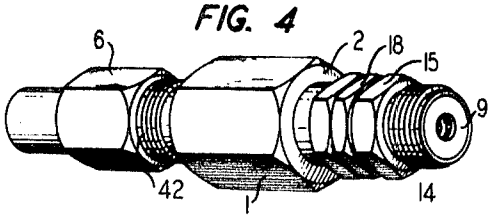



FIG. 5

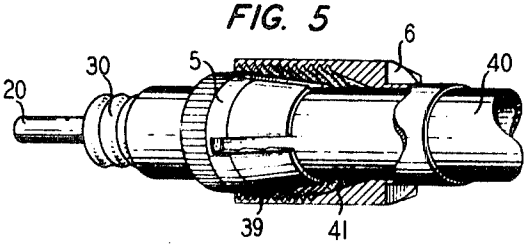



FIG. 6

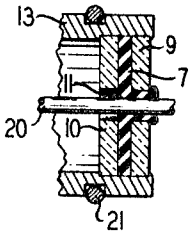
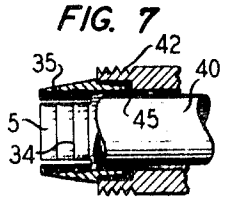



FIG. 7




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# CONNECTOR FOR COAXIAL CABLE

## FIELD OF THE INVENTION

This invention relates to coaxial cable terminations and more particularly to a coaxial cable connector suitable for use in high frequency coaxial systems using corrugated outer conductors.

## BACKGROUND OF THE INVENTION

The impending growth of communications coaxial cable systems having operating bandwidths in excess of 200MHz. has imposed requirements on the associated coaxial connectors that are not suitable met by existing connectors.

One principal defect of earlier coaxial cable connectors involves separation of the outer jacket from the connector, which subjects the outer conductor to corrosion and eventual malfunction. Additionally, because of irregularity in the outer jacket diameters, reliable air seals around the outer jacket have been difficult to achieve with the usual expedients of crimp-type or O-ring seals.

Further, in pressurized coaxial systems it is necessary to prevent air leaks around the center conductor. Earlier type connectors have been notably deficient in this respect.

It further is necessary to assure a mechanically strong link between the outer conductor and the connector to provide electric continuity and high structural reliability.

Numerous expedients can be enlisted in the separate solutions to the foregoing concerns, but the net result still is not practicable unless it is both inexpensive and simple to install in large numbers. Also to be met are the electrical requirements of approximately 75ohms impedance and overall compatibility with the new 0.375-inch diameter corrugated coaxial cable shortly to be adopted by the carriers.

Accordingly, one object of the invention is to assure greater reliability in the connection and splicing of corrugated coaxial cables.

A more specific object of the invention is to grip the polyethylene jacket of such cables with sufficient positive force to avoid jacket pullout.

A further object of the invention is to provide a reliable air seal around the center conductor.

Yet a further object of the invention is to achieve an airtight seal around the outer jacket regardless of the nonuniformity thereof.

An important object of the invention is to directly grip the outer conductor to the connector.

## SUMMARY OF THE INVENTION

In broadest terms the invention is characterized by the use in a coaxial cable connector of separate compression-type bushings to engage the outer jacket and the outer conductor respectively, and a compliant washer assembly to effect a seal around a central conductor.

In a specific embodiment, compression of the slotted bushing onto the outer plastic jacket is realized by engaging the bushing in the tapered interior of a fastening gland. As the bushing moves forward in response to tightening, it also causes sealing compound to be extruded into a sealing dam around the jacket, to thus achieve a positive air seal between the jacket and the connector.

The invention, its further objects, features, and advantages are more fully particularized in the below description of an illustrative embodiment.

## DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded side perspective diagram of the connector;

FIG. 2 is a side perspective view of a mounting detail for the outer conductor;

FIG. 3 is a side perspective view showing the inner conductor seal;

FIG. 4 is a side perspective assemble of the entire connector;



FIG. 5 is a side perspective diagram in partial breakaway showing the jacket gripping means;

FIG. 6 is a sectional side view of the center conductor sealing means; and

FIG. 7 is a sectional side view of the outer jacket sealing means.

## DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

FIG. 1 shows an exploded view of the inventive coaxial connector shown fully assembled in FIG. 4. The connector consists of the main body 1, a connector drive body 2, an anchor fitting 3, disposed on one side of drive body 2, a wedge bushing 4 abutting the other side of body 2, a slotted bushing 5 fitting in the far end of main body 1, and an internally tapered hex-nut 6.

Pursuant to one aspect of the invention, a washer 7 advantageously of brutal rubber and including a central orifice 8 is sandwiched between two dielectric discs 9, 10 which have much larger central orifices 11. The interior of drive body 2 includes a circumferential abutment 12, and the assembly of discs 9, 10, and washer 7 are seated into the fitting 3 to lodge against the abutment 12.

The central orifice of washer 7 is normally 0.070 inch in diameter, while the coaxial cable center conductor 20 shown in FIG. 3, for example, is 0.100 inch in diameter. Insertion of center conductor 20 through the disc and washer assembly, as seen in FIG. 6, produces a substantial outflexing of rubber washer 7, thus to achieve a very substantial airtight seal around conductor 20. A seal between the interior of the flange 13 and the outer diameter of the washer 7 also is afforded by the action of discs 9, 10. The edge of flange 13 advantageously is swaged circumferentially to lock the assembly of discs 9, 10 and washer 7 against abutment 12.

Anchor fitting 3 engages to equipment housing (not shown), through its threaded sleeve 14. The interior of fitting 3 rides on the flange 13 in a slight clearance fit. The interior face of anchor fitting 3 consists of a hexagonal nut 15 with a seat 16 to receive an O-ring seal 17 depicted in FIG. 1 as being at the far end of flange 13. Interior of the seal 17 is a locknut 18 engaged to a threaded portion 19 of the flange 13.

With anchor fitting 3 disposed on flange 13 in compressing relation with seal 17, a metal ring 21 is engaged in the end groove 22 of flange 13. As depicted in FIG. 3, ring 21 protrudes beyond flange 13 and serves as a lock to engage the shoulder 23 of anchor fitting 3 so that the latter is secured to flange 13. Thereafter, locknut 18 is tightened toward fitting 3 to further compress O-ring seal 17 and thus provide an airtight seal between the interior of anchor fitting 3 which communicates with equipment housing (not shown) and the outside environment to which flange 13 is partially exposed.

The positive engagement of corrugated outer conductor 30 to the connector will now be described. Wedge bushing 4, depicted in FIG. 1, has a flared section 24 with its end 25 diameter substantially equal to the outer diameter flange 26 of connector drive body 2. A section of plastic outer jacket 40 is removed as seen in FIG. 2, exposing the outer conductor 30. The latter in turn is cut back, exposing a section of inner conductor which as earlier described engages the washer 7. Prior to engagement, the wedge bushing 4 is inserted under the outer conductor 30 which by way of preparation is slit in three places approximately 120° apart. The main body 1, the slotted bushing 5, and tapered nut 6 are placed in position (not shown) on the coaxial cable in the sequence and orientation depicted in FIG. 1.

Main body 1 includes an O-ring 27 in an interior end seat 28, and a threaded interior portion 29 adjacent thereto. Threads 29 engage the exterior threads 31 of the flange 26. Further turning of drive body 2 brings the O-ring 27 into sealing engagement with flange 32 of connector drive body 2. In this process, the flared section 24 of wedge bushing 4 upon which the outer conductor 30 is lodged, is contacted by the internal tapered section 33 of main body 1. It is thus seen that

with the tightening of drive body 2 into connector main body 1, extreme compressive force is applied to the outer conductor 30 engaged between flared section 24 and the internal tapered section 33 of main body 1. This expedient provides very substantial electrical and mechanical engagement between the outer conductor 30 and the coaxial cable connector.

The seal afforded between O-ring 27 and flange 32 is a pressure seal as well as a moisture seal to make possible the application of gas pressure through suitable entrances (not shown) in one of the hexagonal sides of main body 1.

Pursuant to a further aspect of the invention and as depicted in FIGS. 1, 5, and 7, a positive gripping of the outer jacket 40 is afforded by slotted bushing 5 in the following fashion. Bushing 5 has in its interior two annular teeth 34, 35. Bushing 5 also includes a number of slots 36 in its exterior end which is also slightly tapered inwardly. The end 37 of bushing 5 is provided with plural longitudinal ridges 38.

A sleeve 47 extends from the tapered nut 6 to form an electrical contact surface to the lightening and noise shield of multisheathe cables (not shown).

As seen in FIG. 5, the nut 6 interior includes a threaded end 39 and outward thereof a tapered portion 41. The slotted bushing 5 is initially loosely engaged to the outer jacket 40. When the bushing 5 is suitably located on the jacket 40, the nut 6 is moved over the bushing 5 and into engagement with the threaded end 42 of main body flange 43. It is readily seen that with tightening of the nut 6, the annular teeth 34, 35 of the slotted portion of bushing 5 are compressed and collapse onto and into the jacket 40, engaging it in the manner of a fishhook.

Destruction tests have indicated that the gripping force applied to the outer conductor 30 and to the outer jacket 40 by the expedients above described are so great that the pullout force required to dislodge the cable from the connector is 75 percent of the breaking strength of the cable itself.

The slotted bushing 5 fulfills the further inventive function of effecting a gas and watertight seal between the outer jacket 40 and the environment to which the connector is exposed, the manner of which is depicted in FIG. 7.

As shown therein, the bushing end 37 with its ridges 38, protrudes in a slight clearance fit into the interior of flange 43 of main body 1, which interior is designated 44. Prior to takeup of the nut 6, a strip of sealing compound 45 is placed into the interior section 44 where it lodges against the interior shoulder 46 of flange 43. Then, as nut 6 is taken up and the slotted bushing is engaged on the tapered interior 41 thereof, the edge of the slotted bushing 37 is forced end-first into the sealing compound 45, the latter in turn is caused to form a collar and be extruded along the interface between bushing 5, outer jacket 40, and interior 44 of the main body flange 43.

The above-described coaxial cable connector is seen to provide a positive gas and watertight seal to the inner conductor, a positive high strength electrical and mechanical joint between the outer conductor and the connector, a sturdy gripping of the outer jacket by the connector and an extruded seal between the outer jacket and the environment of the connector.

Various modifications will be obvious to those skilled in the art upon a study of the foregoing disclosure; and it is to be understood that the spirit and the scope of the invention are embraced in the claims to follow.

We claim:

1. For a coaxial communications cable consisting of a center conductor, a corrugated outer conductor and a plastic jacket surrounding said outer conductor, a connector comprising:

a chambered main body comprising a central internal tapered section and an inner sealing dam adjacent thereto containing a sealing compound;

a first bushing having a cylindrical section fitting under the surface of said outer conductor at a selected point and a conic section adjacent thereto;

a second bushing comprising a tapered body with plural interior annular teeth for gripping said jacket, and a cylindrical end comprising exterior longitudinal slots;

first means for driving said first bushing conic section into wedging engagement with said main body tapered section to grip said outer conductor therebetween; and

second means for compressing said second bushing teeth into gripping engagement with said jacket, said second means also driving said cylindrical end into said sealing dam to hydraulically disperse said sealing compound along the interfaces of said second bushing, said jacket and said second means.

2. A connector pursuant to claim 1, wherein said first means is a drive body comprising a first flanged end for threadably engaging said main body chamber and affecting said wedging engagement with its end face.

3. A connector pursuant to claim 2 wherein said drive body further comprises a second flanged end with an annular interior seat, a pair of plastic washers sealably engaged in said seat, and a compliant washer supported between said discs, the compliant washer having a central orifice less than the diameter of said central conductor for affecting a seal around the latter.

4. A connector pursuant to claim 3, wherein said drive body second flanged end further comprises a threaded interior section with a locking nut thereon and a depressed end groove for receiving a snap-mountable metal ring, and said connector further comprises a threaded anchor fitting slidably engaged on said flange between said ring and said locking nut, said fitting being held therebetween by action of said locking nut.