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Malik

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[54] **CONNECTOR MEANS FOR CABLES WITH SEMI-RIGID SHEATHS**

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[52] **U.S. Cl.** ..... **174/75 C,** 174/89, 285/323, 285/354

[51] **Int. Cl.** **H02g 15/08**

[58] **Field of Search** ..... 174/75 C, 88 C, 89, 174/84 S, 88 S, 94 S; 339/177 R, 177 E, 176 R; 285/353, 354, 321, 332.3, 333, 323

[56] **References Cited**

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[57] **ABSTRACT**

Connector means for a coaxial cable having a semi-rigid sheath and having a sleeve on the rearward end of the cable, said sleeve being provided with a forwardly directed frusto-conical end that forms a wedge, the sheath, on its end directed toward the sleeve being frusto-conically flared and with a circumferentially enlarged abutment forward of the flare. Two threadedly engaged members, one having end abutment with the sleeve and the other in opposed abutment with the abutment on the sheath, said members, when threadedly engaged and drawn together, drawing the sleeve forwardly, while the member in abutment with the sheath abutment remains stationary, thereby creating a clamping engagement of the flare on the sheath between the frusto-conical end of the sleeve and a frusto-conical bore on said stationary member. The sheath may be initially provided with such a flare or the flare may be formed when the connector is assembled on the cable.

7 Claims, 3 Drawing Figures

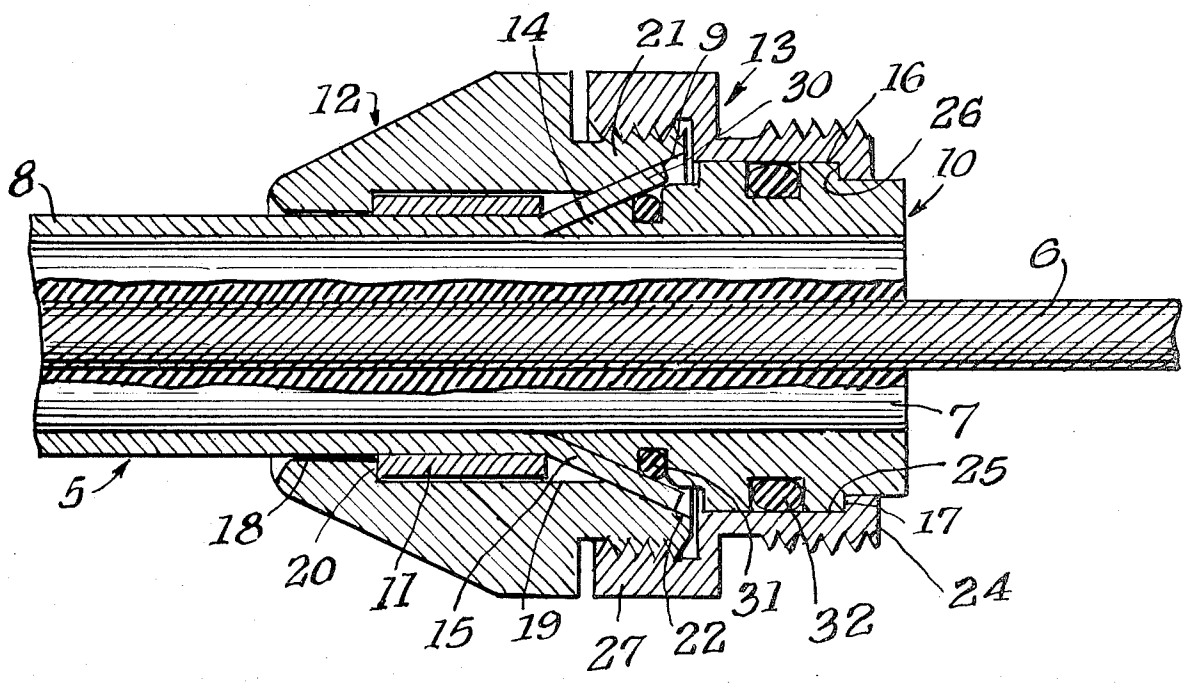


Fig. 1.

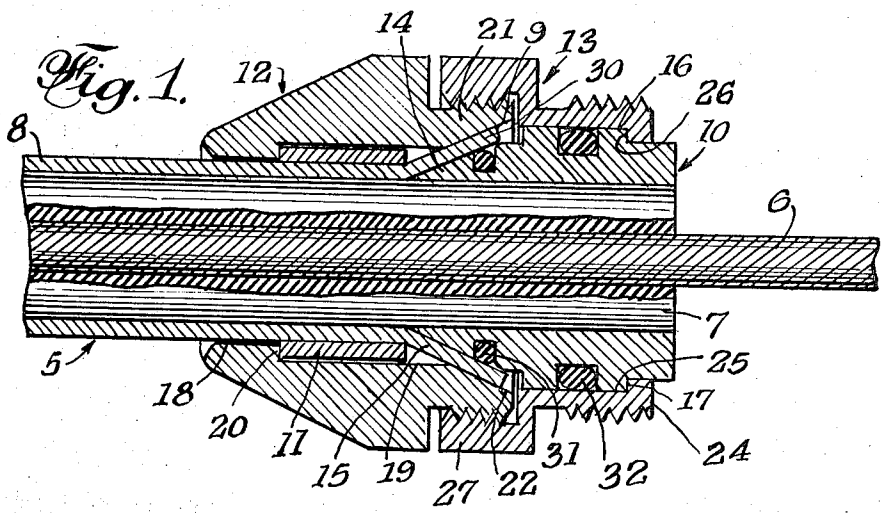


Fig. 2.

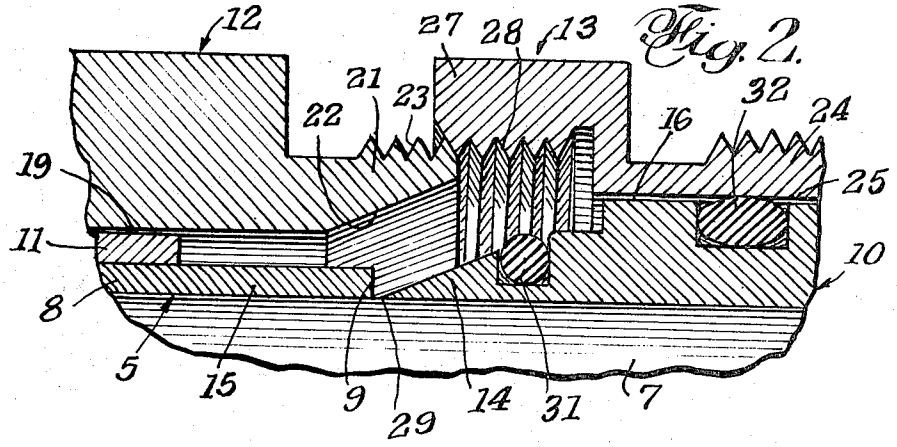
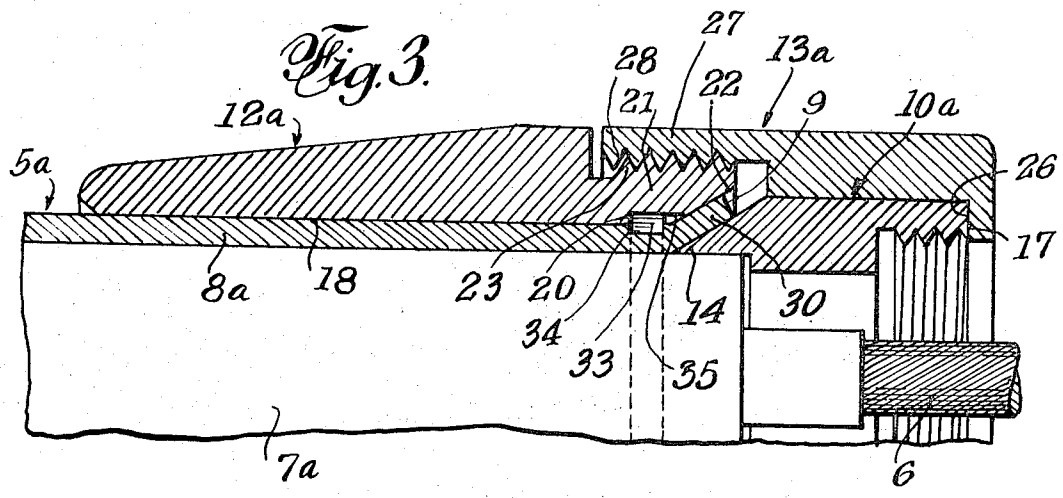


Fig. 3.



CONNECTOR MEANS FOR CABLES WITH SEMI-RIGID SHEATHS

BACKGROUND OF THE INVENTION

High frequency electrically conducting and analogous installations.

1. Field of the Invention

Aeronautics.

2. Description of the Prior Art

The prior art falls within a wide range of connectors of which tube and pipe connectors of the union fitting type are prime examples. The present connector varies in that the connector, when assembled on a cable, clamps the flared end of a sheath enclosing the cable to cause an inter-lock of said parts that firmly resists separation and, moreover, provides efficient electrical conductivity over a wide range of frequencies.

SUMMARY OF THE INVENTION

The combination of a semi-rigid metal tube of sufficient ductility so its end is adapted to be conically flared, a stopper ring located on said tube in spaced adjacency to said end, two parts provided with conical faces in opposed engagement with the outer and inner faces of the flared end of the tube, one said part being in abutment with the end of the stopper ring remote from the flared end thereof, and, the second said part being in end abutment with a third part that is in threaded engagement with said one part.

The conical face of the mentioned second part forming a conical wedge directed toward the end of the tube and swaging or flaring said tube end when the threadedly connected parts are threadedly drawn toward each other. The flare thus formed extends from the stopper ring to the adjacent end of the tube. When tightly drawn up, the mentioned parallel faces of the first and third parts tightly engage the inner and outer surface of said flared part.

An object of the present invention is to connect the back body of a coaxial connector to the end of the tubular semi-rigid sheath of said cable and on which a conical flare is formed, by clamping said flare between the elements of said body as the same are assembled, thereby firmly inter-locking said sheath and the body elements.

This invention also has for its object to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description, which is based on the accompanying drawing. However, said drawing merely shows, and the following specification merely describes preferred embodiments of the present invention, which are given by way of illustration or example only.

In the drawing, like reference characters designate similar parts in several views.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal sectional view of the back end of a coaxial cable showing a preferred form of sheath and back body connector according to the present invention.

FIG. 2 is an enlarged and fragmentary longitudinal sectional view showing parts of the connector partially connected preparatory to effecting connection of one form of sheath to the back body of the connector.

FIG. 3 is a fragmentary longitudinal sectional view showing a modification related especially to the abutment member on the sheath.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A coaxial cable **5** is shown in FIG. **1**, the same conventionally comprising an axial cable or conductor **6** enclosed in an insulator body **7**, the latter extending longitudinally in a metal tube **8** that, initially, has a squared end **9**. The above generally conventional cable, in the present case, is slidingly fitted with a metallic sleeve **10**. Insofar as the present invention is concerned, the foregoing is intended as conventional of coaxial cable construction.

Referring now to the embodiment shown in FIGS. **1** and **2**, a stopper ring or element **11** is provided on the tube **8** forward of the latter's end **9**, said ring being permanently affixed to the tube **8** as by a suitable sealant of which silicone adhesive and epoxy resin are prime examples.

In combination with the above-described tube **8** and the sleeve **10**, the above connector is provided with a back body **12** and a bridge body **13**.

The sleeve **10**, at its forward end, is formed to have a conically tapered portion that serves as a wedge **14** for imparting a flare to the portion **15** of the tube **8** that extends from the ring **11** to the squared end **9** of said tube in the manner hereinafter described. The outer circumferential face **16** of said sleeve is provided with a rearwardly facing annular shoulder **17**.

The back body **12** is a metallic member that is formed with a bore **18** having a loose sliding engagement over the tube **8**, a counterbore **19** extending rearwardly from the bore **18** in clearance over the stopper element **11** and defining a rearwardly facing annular shoulder **20**. The rearward end **21** of said back body **12** has a conical bore **22** that extends rearwardly from the counterbore **19**. It will be noted that the conical surface of the wedge **14** on the sleeve **10** and of the conical bore **22** are on similar angles relative to the axis of the cable **5**, i.e., said surfaces on any radial plane being parallel. The outer circumferential surface of end **21** of the back body **12** is provided with an external thread **23**.

The bridge body **13**, also of metal, has a rearward portion **24** with a bore **25** having a clearance fit with the circumferential face **16** of the sleeve **10**, said bore **25** terminating in a forwardly facing shoulder **26** designated to engage the shoulder **17** on said sleeve **10**. Said body **13** is formed to have an enlarged forward portion **27** that is provided with an internal thread **28** for engagement with the threads **23** on the end **21** of the back body **12**.

It will be noted that the conductor **6**, insulator **7** and sheath **8** are so constructed that they cannot be moved relative to each other. As herein contemplated, assembly of the connector and the cable is as follows. The back body **12** is slid on to tube **8** as limited by the stopper or abutment ring **11**. The sleeve **10**, point **29** first, is slid rearwardly over the cable insulator **7** until the frustoconical face of the wedge **14** engages the inner face of the flare **30** of the sheath. As the threads **23** and **28** are joined as in FIG. **1**, the frusto-conical bore **22**

of the back body **12** and the frusto-conical surface of the wedge **14** come into opposed clamping engagement with the sheath and the connector assembly.

It will be seen from FIG. **1** that the elements **10** and **12** and their respective frusto-conical surfaces are so proportioned that said surfaces clamp the flare **15** of the sheath **8** before the rearward end of the element **12** can encounter the forward portion of the member **13.** Due to the sloping nature of the frusto-conical surfaces of the sleeve and the back body, the encounter of said surfaces with the opposite faces of the flare results in such a firm connection of the sheath **8** and the connector assembly that accidental separation of the connector assembly from the sheath is unlikely. Nevertheless, if separation is desired, the same can easily be effected by reverse rotation of the bridge member **13.**

The above describes assembly of the connector to a sheath **8** which has the flare **15** pre-formed. As an alternative, as shown in FIG. **2,** the portion **15,** forward of the abutment ring **11,** may be assembled while the same is a continuously tubular end of the sheath **8.** In such case, when the connector elements **10, 12** and **13** are drawn together in the manner above described, the frusto-conical face of the wedge portion **14** of the sleeve **10** will outwardly swage said sheath portion **15** to form a flare **15** that is clamped in the manner hereinbefore described.

The end result is the same whether the flare is preformed or is formed by the mentioned frusto-conical surfaces.

The above-described connector may be provided with a hermetical seal between the insulator body **7** and the tube **8** forwardly of the sleeve **10.** If desired, additional sealing against air or moisture may be provided by an O-ring **31** engaged with the inner face of flare **30,** and an O-ring **32** engaged with the bore **25** of the bridge body **13.** In this case, both said O-rings are fitted onto the sleeve **10.**

The modification of FIG. **3** comprises a simplified form of the invention in which a cable **5***a* has an outer metal sheath or tube **8***a* substantially as hereinbefore described. In this form of the invention, a sleeve **10***a*, is fitted to the insulator body **7***a* as before. A back body **12***a* is slidingly fitted on the tube **8***a*, and a bridge body **13***a* is similarly fitted onto the sleeve **10***a*. In this modification, elements of parts **10***a*, **12***a* and **13***a* that are similar to those shown in FIGS. **1** and **2,** have been designated by numerals similar to those given in FIGS. **1** and **2.**

To insure that the split ring **33** is retained in its position in the groove **34,** the bore **18** is provided with a counterbore **35** into which said ring is fitted.

The primary difference between the two forms of the invention illustrated is that the stopper ring **11** as in FIGS. **1** and **2** is replaced by a snap ring **33** in FIG. **3,** said snap ring being retained in an annular groove **34** in sheath **5***a* and prevented from being displaced therefrom by the end **21** of the back body **12***a*. This form of stopper ring does not require cementing in place and performs the same function as does the previously described stopper ring **11** with the additional advantage of being replaceable.

While the present invention is disclosed in combination with a coaxial cable and the back end therefor, it will be understood that the same per se may be adapted for incorporation in any assemblage in which two threadedly engaged members, one affixed to a core and the other engaged with a tube or sheath around said core, may be operatively engaged, as herein described, to firmly connect an end of said tube or sheath to said core.

While the foregoing discloses what are now contemplated to be the best modes of carrying out the invention, the same are, of course, subject to modification without departing from the spirit and scope of the invention.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. Means connecting a semi-rigid metal sheath to a connector on the end of a cable, said cable having a sleeve on said end, said sleeve having a frusto-conical end directed toward said sheath end, said means comprising:

a circumferentially enlarged outer abutment member on the sheath in spaced adjacency to the end thereof that is directed toward the mentioned sleeve,

said sheath end having a frusto-conical flare that is directed toward said sleeve,

two threadedly engaged members in opposed end abutment with said abutment member and with said sleeve for drawing the inner surface of the flared end of the sheath and the frusto-conical end of the sleeve into engagement,

the threaded member that is engaged with the abutment member on the sheath having a frusto-conical bore surface that is drawn into clamping engagement with the outer surface of the sheath flare, thereby to clamp said sheath flare between the frusto-conical end of the sleeve and the frusto-conical bore surface.

2. Connector means according to claim **1** in which the surface of the frusto-conical end of the sleeve and the surface of the frusto-conical bore, above mentioned, at any radial plane of section are parallel.

3. Connector means according to claim **2** in which the circumferentially enlarged abutment member comprises a metal ring adhesively joined to the outer surface of the sheath.

4. Connector means according to claim **2** in which the circumferentially enlarged abutment member comprises a split ring disposed in a circumferential outer groove in the sheath.

5. Connector means according to claim **4** in which a portion of one of the threadedly engaged members is provided with a ccounterbore that encloses the abutment member to retain the same in the mentioned groove in the sheath.

6. Connector means according to claim **1** in which air and moisture sealing means is provided between the outer surface of the sleeve and one of the threadedly engaged members.

7. Connector means according to claim **1** in which air and moisture sealing means is provided between the sleeve rearwardly of its frusto-conical end and the inner surface of the frusto-conical flare of the sheath.

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