June 9, 1964 M. W. POMERANTZ ETAL 3,136,843

CABLE CONNECTOR

Filed Dec. 15, 1961

FIG. 1

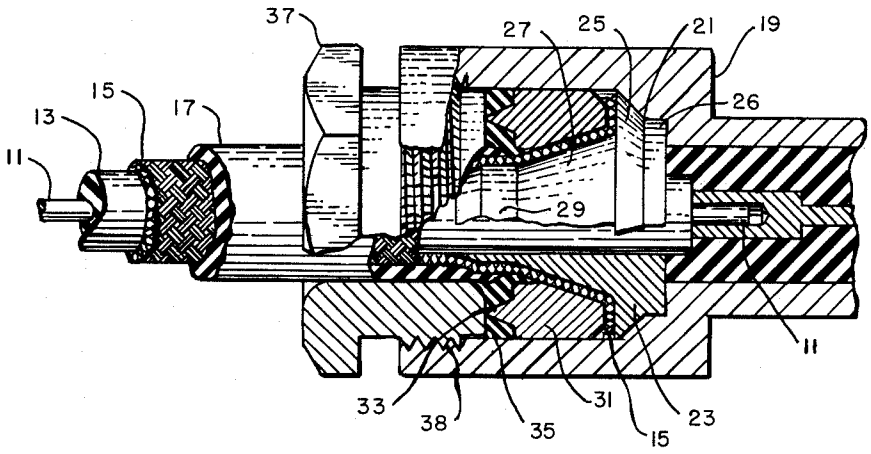


FIG. 2

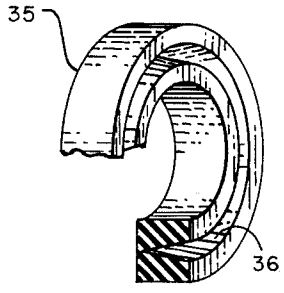


FIG. 3

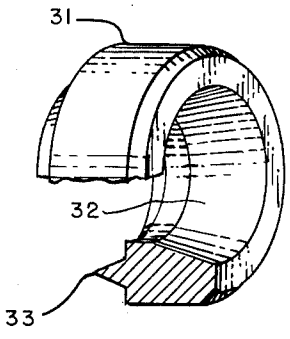
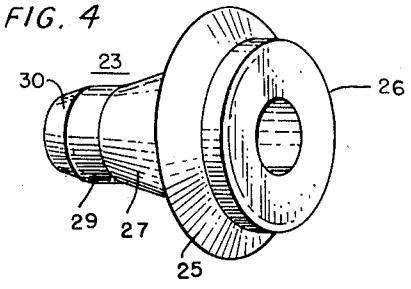


FIG. 4



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CABLE CONNECTOR

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

The present invention relates to improvements in electrical connectors, and more specifically to an improved cable clamp adapted for use with flexible coaxial cable.

The need for a simple and effifficient coupling and clamping device for coaxial cable has become more pronounced with the increase in the application of high frequency currents to communications and other fields. For example, in mobile radio equipments, such as mounted on trucks or the like, the antenna mast must be made flexible so that it will give and bend readily when meeting obstructions, etc. Such requirements make it necessary that the coupling and clamping devices utilized be of strong and of secure construction.

One type of coaxial cable employed, for the use heretofore mentioned, comprises an inner center conductor of stranded wire surrounded by a thickness of high insulation material, which in turn is surrounded by a braided outer conductor, the entire structure having an outer cover of insulation material. There have been many types of connectors and plugs designed and made for the purpose of connecting such cable to another plug line or similar cable. One such coaxial cable coupling is shown in Patent No. 2,615,953 to A. H. Waite Jr. which includes, in part, a body member **17** having a frusto conically shaped end portion **24**. There is also provided a clamp ring **21** that is slightly spaced from and that surrounds the sleeve member referred to above. The clamp ring has its inner surface tapered at the same slope as the frusto-conical surface of the sleeve member. In the utilization of such a coupling the braided outer conductor is confined and secured between the sleeve member and the clamp ring. Included as part of the assembly is a locking collar member **22** which is screwed on to the sleeve member **17** resulting in secure engagement of the braided outer conductor between the outer surface portion of the sleeve member and the inner surface of the clamp ring. In couplings of the type described above it has been found that there exists the possibility of damage to the braided outer conductor positioned between the sleeve member and the clamp ring. This may be due, in part, to the fact that when the collar **22** which has an inner tapered surface in the area adjacent to the tapered sleeve member, is tightened and moves lengthwise, the perpendicular distance between said collar and the tapered sleeve member will be shortened causing a pressing of the braided conductor against the tapered sharp end of the body member **17**. In such instances, the pressure against the braided conductor at the sharp end of the tapered grusto-conical end presents a serious breaking and tearing hazard to the braided conductor, thereby seriously reducing the effectiveness of such clamping devices.

An object of the present invention is to provide an easily assembled connector or coupling member for coaxial cable wherein the possibility of damage to any of the electrical conductors is eliminated.

Another object of the invention is to provide a coupling device for coaxial cable which is sturdy, simple and efficient and which may be applied with maximum ease.

Broadly our invention comprises a generally tapered ferrule that includes a cylindrical surface portion which is intermediate larger and smaller tapered surface portions, a clamping ring, a deformable gasket and an externally threaded lock nut having a bore of uniform diameter. Specifically the invention herein resides in the manner in which the component parts identified above cooperate so that any pressures exerted upon the braided outer conductor of a coaxial cable will be in an area of a flat surface rather than upon a sharp end of a tapered surface thereby eliminating the possibility of any damage to said conductor.

More specifically the inward pressure against the smaller tapered end surface of the ferrule, where there is a likelihood of damage to the braided conductor is kept and maintained within fixed predetermined limits. This is achieved by having the bore or inner surface of the lock nut of uniform diameter rather than of a tapering inner surface. Such means of lock nut avoids an increase in internal pressure against the end of the ferrule, and the braided conductor in abutment therewith, as the lock nut is moved in a longitudinal direction into the body of the conductor.

The invention can best be understood from the following detailed description and the illustrative embodiment shown in the accompanying drawing wherein the cable connector of the present invention is utilized for electrically and mechanically securing a coaxial cable, and in which:

FIG. 1 is a side view, partly in section and partly cut away of an embodiment of the improved connector shown applied to a coaxial cable,

FIGS. 2 and 3 are views respectively, in perspective and partly cut away of the gasket and clamping ring, and

FIG. 4 is a view in perspective of the ferrule member.

Referring to the drawing, and particularly to FIG. 1, there is shown a preferred embodiment of the connector in securing a coaxial cable. The cable comprises an inner conductor **11**, a surrounding dielectric **13** and an outer braided conductor **15** which in turn is surrounded by an insulating jacket **17**. In many applications it is necessary to join such coaxial cable to a connector so that the inner conductor **11** is in electrical engagement with an inner contact of the connector and the outer braided conductor **15** is in electrical engagement with an outer contact of said connector.

The connector as shown in FIG. 1 includes a connector body **19** having an internal shoulder **21** at one end thereof and provided with an opening at its other end. The open end of the connector body is provided with an internal threaded surface, as shown at **38**, which extends part way down the inside of the connector body **19**.

Contained and confined within the connector body **19** is a ferrule shown generally as **23** and serves, with a mating outer clamp, to secure the braided conductor **15** as hereinafter described. Since the configuration of the ferrule is critical to the effective utilization of the device of this invention it is shown in detail in FIG. 4. As is apparent, the ferrule **23** has a cylindrical bore to fit the cable dielectric **13** and has a generally conical exterior surface and includes a relatively large tapered surface portion as shown at **27**, a cylindrical portion **29**, and a smaller tapered end surface portion as shown at **30**. The ferrule **23** further includes an annular flange like portion **25** and a shoulder **26** that abut with the internal shoulder **21** of the connector body **19**. Serving as a means, in conjunction with the ferrule **23**, for securing the braided conductor **15**, is a clamp ring **31** shown in detail in FIG. 3. The clamp ring **31** has a tapered, conical bore **32** that, as can be seen in FIG. 1, mates with the tapered surface **27** of the ferrule **23**, but however slightly spaced therefrom to permit the insertion of the

braided conductor **15** between the said clamp ring **31** and the ferrule **23**. The clamp ring **31** is further characterized in having one of its ends terminate in a ring knife as shown at **33**. Also included in the assembly is a deformable gasket **35**, preferably of rubber or the like and provided with a continuous V-shaped groove **36** in one end thereof. The contour of the groove **36** is such that it can readily accommodate the ring knife **33** of the clamp ring **31**. As can be seen in FIG. 1, the gasket **35** substantially engirdles the cylindrical portion **29** of the ferrule **23** when the coupling device is completely assembled. Completing the assembly of the coupling device is an externally threaded lock nut **37** which is threadably engageable in the threaded portion **38** of the connector body **19**. As heretofore pointed out, the lock nut **37** has a bore of uniform diameter, and characterized in that the diameter of said bore is slightly larger than the outside diameter of the cylindrical portion **29** of the ferrule **23**. When the connector of this invention is completely assembled, as seen in FIG. 1, the lock nut **37** is within the body connector to such depth that the tapered portion **30** of the ferrule **23** is completely confined within the bore of the lock nut **37** and the leading end of the nut will extend to the edge of the cylindrical portion **29** near the tapered portion **30**.

In one method of using the coupling herein described the lock nut **37**, the deformable gasket **35** and the clamp ring **31** are placed over the cable in the arrangement shown in FIG. 1, i.e., with the ring knife of the clamp ring within the groove **36** of the gasket **35**. The insulation **17** about the conductor is removed for a short length exposing the braided conductor **15**. The braided conductor is then fanned out and the ferrule **23** is slid beneath the braided conductor until the conductor extends to the flange portion **25** of said member. The lock nut is then threaded into the connector body **19**. As the lock nut **37** is screwed into the connector body, the forward or leading end of the lock nut presses against the deformable gasket **35** and the ring knife **33** of the clamp ring **31**. As the lock nut **37** is threaded further into the connector body the clamp ring **31** will be urged toward the flange portion **25** of the ferrule **23**. A slight additional thrust of the plug **37** will cause the gasket **35** to break at its narrow width, i.e., the apex of the groove **36**, causing a metal to metal engagement between the

edge of the lock nut and the clamp ring **31**. As the plug is urged forward slightly, the clamp ring **31** will be firmly wedged against the flange portion **25** and the braided conductor **15** will be securely held in position between the ferrule **23** and the clamp ring **31**.

What is claimed is:

A connector for coaxial cable made up of an axial inner conductor, a dielectric surrounding said conductor, an outer conductor and an outer compressible dielectric insulation surrounding said outer conductor, comprising a housing provided with a cavity having an internal shoulder at one end and an internal threaded portion extending partially into said cavity at its other end, a ferrule having a cylindrical bore and a general conical exterior surface comprising a first large conical portion, an adjacent cylindrical portion of a diameter substantially equal to the smallest diameter of said first conical portion, said cylindrical portion being continguous with the smallest diameter end of said first conical portion, and a second small conical portion adjacent to the cylindrical portion and having its largest diameter substantially equal to the diameter of said cylindrical portion, and having said largest diameter contiguous with said cylindrical portion, and so positioned in said cavity that the larger tapered portion is positioned inwardly therein, said ferrule being in abutment with the internal shoulder in said housing, and said ferrule having continuous surface portions upon which said outer conductor is supported, a clamp ring having a tapered bore which mates with the said larger tapered surface of said ferrule and the bore of said housing for confining a portion of the outer conductor, an externally threaded lock nut that is threadably engageable in the threaded portion of said housing and having a bore of uniform diameter that is slightly larger than the outside diameter of the cylindrical portion of said ferrule and a deformable gasket that engirdles the cylindrical portion of said ferrule intermediate said lock nut and said clamp ring.

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