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ELECTRICAL CONNECTOR

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The present invention relates to electrical connectors, and particularly to improvements in the construction of manually separable connectors of high efficiency for conducting feeble currents which may be at high frequencies, with minimum losses. An important application of the invention is in connection with lead-in conductors for radio receiving antennas and the like.

In making electrical connections to radio antennas located in positions exposed to the weather, as for example, antennas installed upon motor vehicles, it is necessary to provide readily disconnectable, highly efficient and absolutely weather and moisture-proof means for connecting the lead-in to the aerial. Such connecting means must also incorporate highly efficient means for completing a ground connection to a shielding loom surrounding the insulating sheathing of the lead-in wire. Among objects of this invention are to provide a connector which maintains such effective insulating characteristics under all conditions, which incorporates efficient sealing means arranged to prevent access of moisture to the separable connecting parts under all conditions, but the parts of which are readily separable to permit convenient connection and disconnection. Another object is to provide in such a connector an effective ground connection to the shielding loom at all times when the parts are assembled.

It is also an object of this invention to provide such an improved connector having lower loss characteristics in proportion to its cost and complexity than previously known connectors designed for analogous purposes.

Another object is to provide such a connector of simple and rugged construction and which is well adapted to large scale manufacturing methods despite its improved operating characteristics.

Other objects and advantages of the invention will become apparent upon consideration of the present disclosure in its entirety.

In the drawings:

Fig. 1 is a view principally in diametric longitudinal section, but partly in side elevation, showing a connector incorporating the principles of this invention and fragmentarily showing a lead-in conductor associated therewith, the connector parts being shown fully assembled and engaged;

Fig. 2 is a view partly in side elevation and partly in longitudinal section of the plug portion of the connector and an adjacent part of the lead-in conductor, certain of the elements being partly separated from one another; and

Fig. 3 is a cross-sectional view taken substantially on the line 3-3 of Fig. 1 and looking in the direction of the arrows.

My improved connector is adapted to be employed in conjunction with a lead-in conductor which may be essentially conventional in construction. The precise construction of the lead-in conductor is subject to variation, the details of the conductor illustrated being merely representative. The lead-in wire 10 may be of small gauge if the antenna is to be used only for reception, and is shown as provided with laterally offset portions 12 which are angularly spaced from one another by approximately 120°, so that they serve to hold the wire substantially centered with respect to the flexible insulating tube 14 which encloses the wire and which is of materially greater diameter than the wire. The insulating tubing 14 may be covered by a metallic webbing or loom 15 which is adapted to be grounded to shield the wire. The tubing 14 may be formed of a plastic of the so-called "Vynlite" type.

At its end to which a connection is to be made, the wire

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projects beyond the tubing 14 through a cup-shaped insulating plug bushing 16 formed of dielectric material such as a polystyrene plastic. The opening 18 formed in bushing 16 for passage of the wire 10 is also substantially larger than the wire but smaller than the diameter of the tubing 14. A metallic sleeve 20 extends through the opening 18 and may be fitted relatively tightly in the bushing. The sleeve 20 projects beyond the bushing 16, and an insulating washer 22 is fitted on the end of the sleeve. Washer 22 may be formed of laminated plastic or fibre. A conductive button 24 which may be formed of solder holds the end of the wire and overlaps the washer and sleeve.

A portion of the bushing 16 is fitted over the tube 14 and near its outer extremity the bushing is tapered to truncated conic form, as indicated at 25. A tubular metal shell 26 embraces the periphery of the bushing 16 and its outer end is spun or otherwise formed inwardly, as indicated at 28, to overlie the tapered portion 25. Behind the inner end of the plug bushing 16, the shell is also formed inwardly to provide a shoulder 30 coacting with the flange 28 to tightly hold the bushing 16. An integral tubular collar portion 32 extends rearwardly over and in relatively tight engagement with the shielding loom 15 and at its outer end is sealed with respect thereto as by means of solder, as indicated at 34. The solder preferably fills the interstices of the wire loom and engages the surface of the tube 14 to provide a substantial seal. Supplemental protective means is provided in the form of a sleeve 35 of soft rubber or the like which embraces the outer end of collar 32 and the loom 15.

A coupling nut 38 is slidably fitted upon the collar portion 32 between sleeve 35 and shoulder 30. The internally threaded outer extremity of the nut, which threaded extremity is designated 40, is of substantially greater diameter than the shell 26 to allow the coacting socketed and externally threaded coupling portion 42 to project between the shell and nut when threadedly interengaged therewith as shown in Fig. 1. Between the back wall 39 of the nut and the shoulder 30 are a metallic washer 44 and a flexible gasket washer 45 formed of soft rubber or the like. The metallic washer 44 is initially dished, as best shown in Fig. 3, and is sufficiently resilient to reassume its dished shape after being flattened. The center opening 46 in the washer 44 fits the collar 32 snugly but slidably when the washer is in its relaxed dished condition. When the nut is tightened down upon the coacting coupling portion 42, the back wall 39 of the nut flattens the washer 44 and compresses the gasket washer 45 against the shoulder 30. Such flattening of the dished washer 44 drives one edge of the portion thereof defining the opening 46 inwardly to grip the surface of the collar portion 32. It will be noted that the opening 46 is substantially cylindrical when the washer is in its initial dished condition, and that the concave side of the washer faces the open end of the cupped nut 38. Thus when the washer 44 is flattened, the opening 46 becomes conical in shape, with the larger end of such conical hole toward the open end of the nut. By virtue of this arrangement, when the nut is tightened, the washer can be forced inwardly over the surface of the collar portion 32. The gasketing washer 45 tends to bulge out between the threaded portion 40 and the periphery of the shell 26 and is thereby urged into tight sealing engagement with the end of the coacting coupling portion 42, but such part which tends to bulge is also compressed between the end of coupling portion 42 and the end wall 39 of the nut. This also tends to hold the washer 44 in the flattened condition.

The coupling portion 42 is ordinarily grounded, and it will be appreciated that by virtue of the arrangement of the cupped washer 44, which causes it to bite into the surface of the neck portion 32, a very effective electrically conductive ground connection is completed between the loom 15 and the nut portion 38, so that grounding is provided for in an efficient manner, while the aerial wire and parts in conductive relation thereto are carried by insulating material of high efficiency and minimum cross-sectional area.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the

invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In combination with an electrically conductive wire and an insulating tube substantially greater in diameter than the wire, the wire extending through the tube but projecting from an end thereof, a coupling device for detachably connecting the wire to another electrical conductor comprising a cupped insulating plug member fitted over and substantially closing said end of the tube and having an axial aperture through which the projecting end of the wire extends, a conductive button substantially closing said aperture and secured to the end of the wire in substantially coaxial position upon the end of said plug member, said plug member having a portion overlying said tube, a sheet metal shell having a collar part encircling and substantially sealed with respect to said tube and also encircling and interlocked with respect to said overlying part of the plug member, a laterally extending portion of said shell defining a shoulder upon the opposite side of said plug member from said button, a cup-shaped coupling nut slidably fitted over the collar part of said shell and having a retaining wall portion engageable with said shoulder and a securing portion spacedly encircling and extending outwardly around said overlying part of the plug and interlocked shell portion, and a sealing gasket arranged between said shoulder and retaining wall portion and adapted to be compressed therebetween when said nut is interengaged and tightened with respect to a cooperatively threaded portion.

2. A connector as defined in claim 1 including a tubular coupling portion adapted to coact with the nut and to extend between said interlocked shell portion and the securing portion of the nut and of sufficient length to engage said gasket when the gasket is so compressed.

3. A coupling as defined in claim 1 wherein said collar part is of substantially cylindrical form, said retaining wall of the nut being slidably fitted upon said collar part, and a resiliently deformable sheet metal washer also slidably encircling said collar part within the nut and arranged between said wall and gasket whereby said washer may be deformed when the gasket is compressed.

4. A coupling device as defined in claim 1 wherein said nut is slidably fitted upon said collar part, a substantially frusto-conic resiliently deformable sheet metal washer arranged in said nut between said wall and gasket and having a central opening therein slidably fitted upon said col-

lar part, the opening being substantially cylindrical when the washer is relaxed.

5. A coupling device as defined in claim 1 wherein said nut is slidably fitted upon said collar part, a substantially dished resiliently deformable sheet metal washer arranged in said nut between said wall and gasket and having a central opening therein slidably fitted upon said collar part, the opening being substantially cylindrical when the washer is relaxed, the concave side of said dished washer facing in the same direction as the open end of the cupped nut.

6. Coupling means including a tubular electrically conductive portion having a radially extending abutment appurtenant to one end thereof, a conductive coupling element slidable over the tubular conductive portion on the side of the abutment farther from said end, releasable holding means whereby said coupling element may be pulled longitudinally over the tubular portion toward said abutment, a conductive resilient concavo-convex washer-like member also slidably fitted over said tubular portion between said coupling member and abutment, said washer-like member being deformable to more nearly flattened condition by the coupling member and due to its resiliency biased to tend to resume its concavo-convex form, a portion of said washer-like member on the normally convex side thereof fitting relatively snugly against the surface of the tubular portion when said washer-like member is relaxed, whereby said portion may be driven inwardly against the tubular portion when the washer-like member is flattened and urged toward the abutment by the coupling member to effect electrical contact between said tubular portion and said coupling element.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
505,839	Mills	Oct. 3, 1893
2,169,182	Kost	Aug. 8, 1939
2,272,379	Loukota et al.	Feb. 10, 1942
2,274,422	Mahoney et al.	Feb. 24, 1942
2,294,432	Weidner	Sept. 1, 1942
2,294,738	Bruno	Sept. 1, 1942

FOREIGN PATENTS

Number	Country	Date
498,505	Great Britain	Apr. 3, 1936