

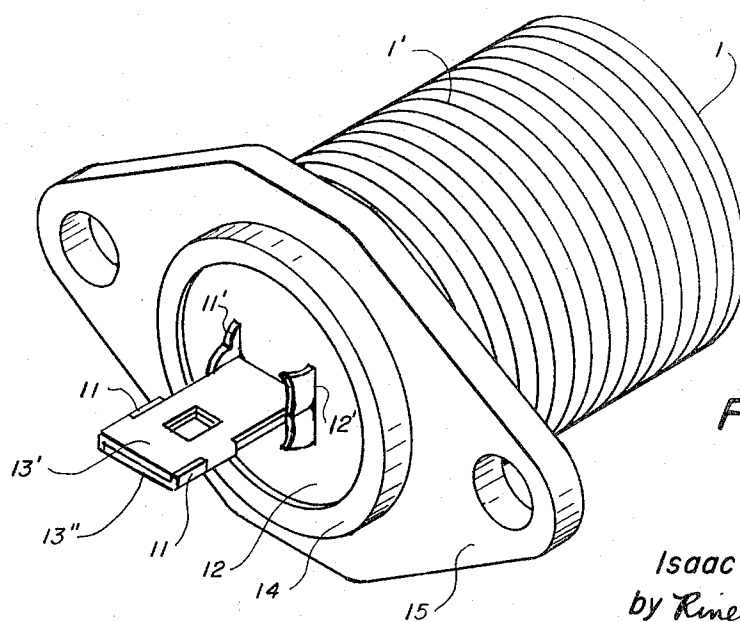
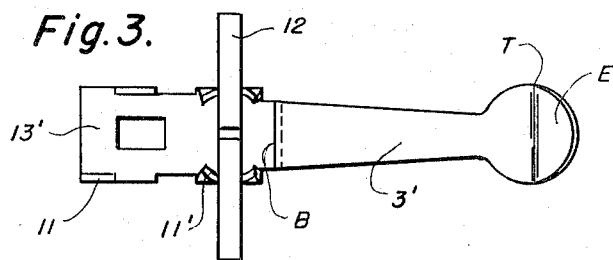
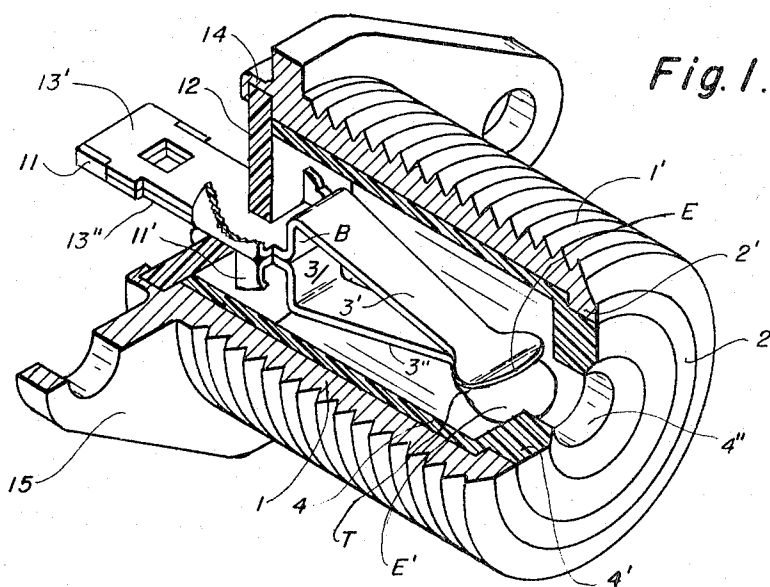
Dec. 20, 1966

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3,293,592

ELECTRICAL COAXIAL CONNECTOR

Filed May 18, 1965



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ELECTRICAL COAXIAL CONNECTOR

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Filed May 18, 1965, Ser. No. 456,614

7 Claims. (Cl. 339-177)

The present invention relates to electrical coaxial connectors and, more particularly, to connectors adapted to receive coaxial plugs of widely varying inner-conductor cross dimension.

In order to provide, for example, female-type audio, radio or television cable coaxial connectors for receiving male coaxial connectors of differing inner-conductor diameter or cross-dimension, several types of resilient constructions have been proposed and utilized, but with less than complete satisfaction. Female cylindrical inner-conductor receptacles, slit to provide resilient action, have been employed. If inserted within insulating supports, these devices not only are limited in the range of sizes of plugs that can be resiliently gripped with reliable electrical contact, but they provide too much insulation material between inner and outer conductor to enable even a close impedance match to, for example, a 75-ohm coaxial line. Typical impedances presented by such devices, as an illustration, are of the order of 25 ohms, more or less. If, however, the amount of insulation material is reduced to substitute air therefor and increase the impedance, increases only to the order of 55 ohms are generally feasible, and the resilient inner cylinder is then left exposed, unprotected and readily susceptible to fracture in use.

Leaf-spring inner conductor devices have also been proposed to accommodate varying dimension inner conductors, but prior-art holding constructions for such devices have required an insulating supporting sleeve closely positioned to and overlying part of the length of the spring device, again deleteriously increasing capacitance to the outer conductor and not only making a close impedance match unfeasible, but limiting the strength and degree of the resilient gripping action of the leaf-spring elements.

An object of the present invention, accordingly, is to provide a new and improved electrical connector of the character described that not only establishes excellent impedance match through utilization in great measure of air as the dielectric medium between inner and outer conductors, but enables protected wide-range resilient inner conductor gripping action devoid of the disadvantages of prior-art connectors, above delineated. In summary, this end is achieved through a novel substantially triangular resilient inner conductor member, a rigid rearward insulating mount therefor, the use of air as the principal inner-outer conductor dielectric medium, and a novel thin sleeve and apertured washer protective member. Preferred details of construction are hereinafter set forth.

A further object is to provide a novel electrical connector of more general use, also.

Other and further objects will be later discussed and more definitely pointed out in the appended claims.

The invention will now be described with reference to the accompanying drawing:

FIG. 1 of which is an isometric view of a preferred embodiment, partly cut away to illustrate details of construction;

FIG. 2 is a similar isometric view of the rearward end of the connector, and

FIG. 3 is a top elevation of the disassembled inner conductor member employed in the connector of FIGS. 1 and 2.

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Referring to the drawing, the coaxial connector comprises an outer cylindrical conductor 1, shown externally threaded at 1', if desired, to enable connection with the outer conductor of a male connector or portion of a coaxial line, as is well known, and an inner resilient conductive member 3. The outer conductor 1 is provided at its forward or right-hand end with an inwardly extending annular flange 2 for a stop or limiting purpose later explained; the annulus of the flange 2 extending forward a short distance at 2'.

A thin-walled insulating cylindrical sleeve 4, shown of wall thickness preferably much less than that of the outer cylindrical conductor 1 and occupying only a small fraction of the space between the inner-diameter wall of the outer cylindrical conductor 1 and the inner conductor 3, is fitted within the cylindrical conductor 1. The length of the sleeve 4 preferably corresponds substantially to that of the outer conductor 1, and its outer diameter is just slightly less than the inner diameter of the outer conductor 1. At its forward end, the inner sleeve 4 is provided with an apertured washer 4' of diameter just less than that of the flange annulus 2' to fit therewithin, with the flange 2 acting as a forward stop or limit for the sleeve 4. The aperture 4'' in the forward washer 4' extends through a washer to a point near the inner conductor member 3.

That inner conductor member 3 is illustrated as formed of a pair of flat, resilient L-shaped elements 3' and 3'' as of sheet metal, disposed facing each other in the form of a substantially isosceles triangle, with the respective shorter arms of the L-shaped elements 3' and 3'' touching substantially in-line to form the base B, and the longer arms inclining toward each other and resiliently touching at the free ends T. Rearward of the elements 3', 3'' are flat conductive extensions 13' and 13'' that pass through and are held by a thin insulating circular plate 12. The extensions 13' and 13'' are shown juxtaposed and interlocked by a rearward set of upward and downward flanges 11, extending rearward of the plate 12, for enabling electrical connection to the inner-conductor terminal of the circuit, line or other systems to be connected by the connector of the present invention. By means of an H-shaped slot 12' in the insulating plate 12, a further set of flanges 11' near the forward end of the extensions 13', 13'' may be slightly twisted into locking engagement, rigidly holding the inner conductor member 3 rearward of the resilient connector elements 3', 3'' thereof, with only air dielectric surrounding the same. The plate 12, in turn, is locked against the rearward or left-hand ends of the juxtaposed outer conductor cylinder 1 and internal sleeve 4 by a rearward mounting ring 14, bent or crimped over the rear face of the plate 12, as more particularly shown in FIG. 2. The ring 14, indeed, may be disposed on the rear surface of a panel mounting bracket 15 integrally connected with the outer conductor 1.

With the inner conductor member 3 inserted to the position shown in FIG. 1, the touching free ends T are adjacent the aperture 4'' in the front washer 4', along the longitudinal axis of the outer cylinder 1. By this construction, air is substantially the only dielectric between inner and outer conductor and no insulating or other structures are anywhere close to or enveloping the inner conductor member 3. Thus, the characteristic impedance very closely approximates to the said 75 ohms, for example, and the inner conductor member 3 is free resiliently to expand and grip a wide variety of different-size inner conductors or plugs inserted in aperture 4''. Aperture 4'' not only serves to guide such inner conductors to the point T, where they are gripped between elements 3' and 3'' as they resiliently expand open, with

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strong cantilever spring action, but the washer 4' covers and protects the inner conductor member 3.

Through providing ears E, E' at the spring-element terminal portions near T, more clearly shown in FIG. 3, of width greater than that of the elements 3', 3'', and rounding the contour of the same, with the forward or right-hand portion of the ears beyond the touching region T bent to diverge outward, the ears may be brought very close to the aperture 4'' and may readily resiliently separate in response to the insertion of inner conductors of widely varying cross dimensions. Further, by tapering the width of the flat arms of the elements 3' and 3'' from the region B toward the region T, FIG. 3, a high pressure contact at T is provided, enabling long life of resilient gripping action without substantial fatigue.

Further modifications will also occur to those skilled in this art, and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. An electrical coaxial connector having, in combination, an outer conductive cylinder having forward and rearward ends, the former of which is provided with an inwardly extending annular flange; a thin-walled insulating cylindrical sleeve of length substantially equal to that of the outer cylinder and of outer diameter just less than the inner diameter of the outer cylinder, open at its rearward end and provided at its forward end with an apertured washer of outer diameter just less than the diameter of the annulus of the said annular flange, such that the insulating sleeve fits within the outer cylinder with their respective rearward ends juxtaposed and with the forward end of the insulating sleeve limited by the said annular flange and with its apertured washer disposed within the said annulus of the flange; an inner conductive member comprising a pair of resilient L-shaped elements disposed facing each other with their shorter arms touching substantially in-line to form the base of a substantially isosceles triangle, the sides of which are formed by the longer arms inclining toward each other and resiliently touching at their free ends, the elements having rearward juxtaposed conductive extensions; and

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a thin insulating plate covering the rearward end of the outer conductive cylinder and provided with slot means for receiving the said juxtaposed extensions of the inner member and rigidly mounting the same, the L-shaped elements extending within the outer cylinder and sleeve with their said touching free ends terminating near the aperture of the said washer, substantially on the longitudinal axis of the outer cylinder.

2. A connector as claimed in claim 1 and in which a mounting ring is provided at the rearward end of the outer cylinder, bent over to lock the said insulating plate against the rearward end of the outer cylinder.

3. A connector as claimed in claim 1 and in which the said extensions are formed with interlocking flanges.

4. A connector as claimed in claim 3 and in which the slot means of the said insulating plate is of substantially H-shape and receives the said extensions therein with flanges thereof slightly twisted therein to secure the inner member rigidly rearward of the L-shaped resilient elements.

5. A connector as claimed in claim 1 and in which the said longer inclining arms of the L-shaped elements are tapered in width toward their said free touching ends.

6. A connector as claimed in claim 1 and in which the said longer inclining arms of the L-shaped elements are provided at their said free touching ends with terminal ears, the portion of the ears forward of the touching ends diverging outwards.

7. A connector as claimed in claim 6 and in which the said ears are wider than the said elements and are rounded in contour.

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