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COAXIAL CONNECTOR SOCKET ASSEMBLY

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Fig. 1.

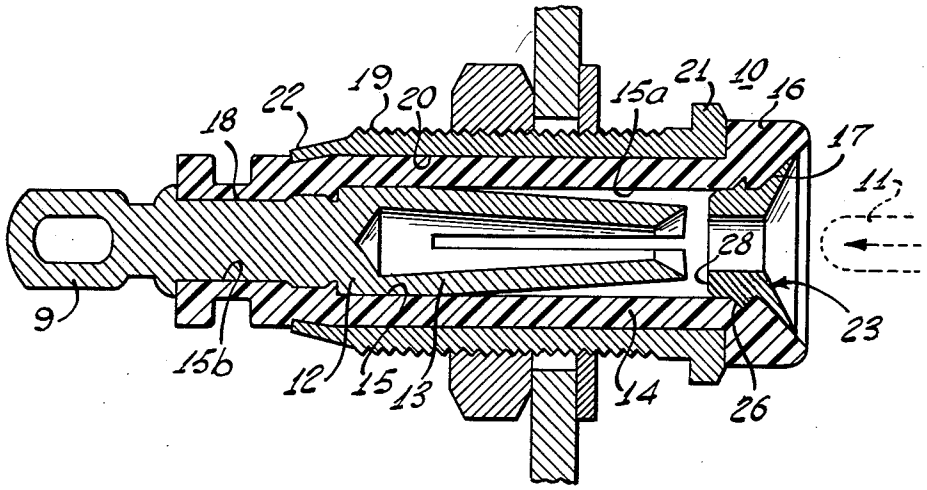
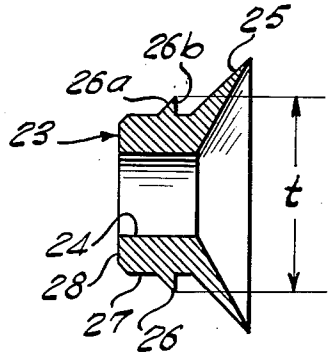


Fig. 2.



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COAXIAL CONNECTOR SOCKET ASSEMBLY

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This invention relates to electrical connector sockets and, in particular, a coaxial connector for making electrical connection with a prong-like contact member.

It is an object of the instant invention to provide a coaxial connector adapted, in particular, for connection with a prong-like contact member and which connector may be extremely small in physical size and which offers the further advantage of simplicity and economy with respect to fabrication and use.

It is a further object of the invention to provide an improved coaxial connector which offers the advantage of long life operation and, in particular, a connector made up of an insulator shell mounted between inner and outer conductors and which incorporates a sleeve element in the entrance end of the connector. The sleeve is aligned in front of the connector inner conductor so as to prevent insertion of oversized prong contact members into the connector to eliminate this cause of connector breakage. The sleeve also serves to align the prong contact member for proper insertion into the connector to eliminate connector breakage caused by the insertion of misaligned prong members into the connector.

Further objects and advantages will become apparent from the following description of the invention taken in conjunction with the figures, in which:

FIG. 1 is a sectional view in elevation of a connector embodying the features of the invention; and

FIG. 2 is a sectional view in elevation of the novel sleeve element of the improved connector.

Reference is made to the figures which illustrate a coaxial connector **10** embodying the principles of the invention. Connector **10** is specifically designed to effect electrical contact with a prong-like contact member **11** upon insertion of member **11** into connector **10**. The prong-like portion of member **11** is shown in dashed outline in FIG. 1. Connector **10** involves a substantially cylindrical inner conductor **12** made of conducting material and has flat and pierced terminal means **9** at its rearward end to which an electrical contact lead wire (not shown) may be connected. The forward or entrance end of inner conductor **12** is provided with a hollow socket formed by thin elongated resilient expandable fingers **13** to receive the prong-like contact **11** upon slidably inserting the latter into socket **13** in a manner familiar with the art. A cylindrical shell **14** made of electrical insulating and resilient plastic material is mounted coaxially over inner conductor **12**. In a preferred embodiment, shell **14** is a molded hollow tubular body made of nylon. However, it will be understood that shell **14** may be molded or otherwise formed of other insulator material having like resilient characteristics for accomplishing the assembly of connector **10** in a manner to be described hereinafter.

Shell **14** has a longitudinal through bore **15** provided with a uniform diameter forward portion **15***a* and a restricted or smaller diameter rearward bore portion **15***b*. Shell **14** is provided with an enlarged and thus structural re-enforced annular flange **16** at the forward or entrance end of connector **10**. A counterbore **17** surrounds the entrance mouth of shell bore **15**.

The outside diameter of inner conductor **12** is formed with an annular recess **18** near terminal means **9**, which recess **18** serves as a keyway designed for operative association with restricted portion **15***b* upon mounting shell **14** coaxially on inner conductor **12**. The restricted

bore portion **15***b* of shell **14** is shaped to snap into recess **18** by reason of the resiliency of the nylon material constituting shell **14** when the latter is assembled on conductor **12**. The resiliency of nylon permits the shell material to flow against and substantially fill recess **18**, whereby a wedge action takes place in keyway **18** for locking shell **14** permanently on conductor **12** as shown in FIG. 1. Upon assembly of these elements, it will be understood that relative axial movement of one with respect to the other is prevented.

Connector **10** also includes a cylindrical outer conductor **19**. Outer conductor **19** is a tubular body made of conducting material and has a hollow through bore **20** for mounting conductor **19** coaxially on shell **14**. Forward end of conductor **19** has an annular flange **21** which abuts against a contiguous wall of shell flange **16**. The rearward end of conductor **19** is crimped or squeezed at **22** to bite into the nylon shell **14** for permanently locking outer conductor **19** in coaxial assembly on shell **14** as shown in FIG. 1. It will be understood that after carrying out the foregoing assembly, axial movement of outer conductor **19** with respect to shell **14** is prevented.

It will be readily understood that after assemblying a connector such as the type illustrated herein, that the connector is not capable of disassembly if for any reason the connector or some component thereof, such as the socket fingers, break during use of the connector. Not infrequently, such connector and, in particular, the socket fingers thereof are damaged upon inserting a prong contact therein by reason of carelessness or lack of attention by the person making the connection. For example, damage to a connector is not infrequently caused by the careless attempt to insert an oversized prong contact member into the connector. Sometimes this results in the prong member becoming stuck in the connector; other times it crushes the socket fingers against the wall of bore portion **15***b*. Socket fingers **13** in FIG. 1 are shown in contracted position, i.e., prior to insertion of contact **11**. It will be understood that fingers **13** are extended to grip contact prong **11** upon insertion therein. In other instances, damage or breakage occur when the prong contact **11** is out of axial alignment with the socket axis as one is making connection. In this situation, the narrow end of prong **11** jams or wedges one or more of the socket fingers thereby causing the damage.

The instant improvement contemplates the use of a sleeve member **23** in connector **10**. In the assembled connector, it is seen from FIG. 1 that shell flange **16** axially overlaps beyond the forward end of socket fingers **13**. Sleeve **23** is designed to be permanently mounted in the forward or entrance mouth portion of shell **14**, that is to say, the portion re-enforced by flange **16** and in front of socket fingers **13**. In preferred form, sleeve **23** is a substantially cylindrical shaped body of conducting material, such as brass. Sleeve **23** is provided with an axial through bore **24** aligned with the axis of the contact socket defined by fingers **13**. A dish-shaped flange **25** is provided at the forward end of sleeve **23**. The outer cylindrical surface **27** of sleeve **23** includes a radially extending and annular tooth **26** defined in cross-section by two faces **26***a*, **26***b* as shown in the figures. The rear tooth face **26***a* confronts socket fingers **13** and is inclined inwardly from a maximum radial dimension to a minimum radial dimension. The front tooth face **26***b* extends substantially perpendicular to the axial dimension of bore **15** and confronts the entrance mouth of connector **10**. The triangular shape of tooth **26** as viewed in the figures permits insertion of sleeve **23** into the nylon material bore **15** upon assemblying sleeve **23** into shell **14** without damaging connector **10** or, in particular, shell **14**. The resiliency of nylon provides enough flow to

allow the foregoing described insertion. When sleeve **23** is fully inserted, its flange **25** engages counterbore **17**.

The fully inserted sleeve **23** is permanently locked in shell **14** as illustrated herein because the resiliency of nylon permits same to flow around tooth **26** during and after assembly of sleeve **23** into shell **14**, whereby the nylon material fills the space between the front perpendicular tooth face **26***b* and sleeve flange **25**. In cross section, it is seen that tooth **26** in effect positively bites into the nylon shell material to create a "wedge-like lock" with shell **14**. Since tooth face **26***b* is substantially perpendicular to the axis of shell **14**, the "wedge lock" formed thereby resists pull out or escape of sleeve **23** from connector **10** after assembly and during use of the connector. It is also noted that the rearward face **28** of assembled sleeve **23** is spaced from and in front of the inward ends of socket fingers **13** to permit freedom of movement of the latter.

The use of sleeve **23** markedly improves durability of connectors of the type contemplated herein. For example, bore **24** may be made of selected diameter to prevent the insertion of an oversized prong contact **11** into connector **10**. Furthermore, the presence of sleeve **23** automatically aligns prong contact **11** properly as the contact is being pushed into sleeve bore **24** when connection is being made to prevent damage to socket fingers **13** by a misaligned connection. The same advantage obtains upon removal of the prong contact **11** from connector **10**. In addition, sleeve **23** provides an axial bearing support for the prong contact **11** inserted in connector **10**. As a result of the enumerated advantages, spring fingers **13** may be made of lighter material in comparison to the spring fingers of prior art connectors of like design because sleeve **23** supports the bearing load of the prong contact **11** and maintains same axially aligned.

As an illustration of one embodiment of a sleeve **23**, the O.D. of cylindrical sleeve surface **27** was dimensioned at approximately .128 inch for insertion into a nylon bore **15***a* of about .1285 inch. The maximum O.D. for tooth **26** (designated at *t* in FIG. 2) measured about .14 inch and face **26***a* was inclined at an angle of about 20° with respect to the horizontal, i.e., the axis of bore **24**.

It is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A coaxial connector for making electrical connection with a prong contact member comprising, a longitudinal inner conductor having opposed forward and rearward ends, terminal means at said rearward end for receiving an electrical lead wire, resilient socket means at said forward end for receiving the prong contact member inserted therein upon effecting electrical contact therewith, a shell having an axial through bore and formed of electrically insulating material, said shell being mounted axially over said inner conductor and having a radial flange at its forward end overlapping axially beyond the forward end of said socket means, said shell bore being counterbored at the forward end thereof, an outer conducting member mounted over said shell, means on said shell and said outer conductor for holding both in assembly, means on said shell and said inner conductor for holding same in assembly, and an annular sleeve having a cylindrical outer surface equipped to fit into said shell bore and having a funnel-shaped forward end for register against said shell counterbore upon assembly of said sleeve into said shell, said sleeve being spaced from and in front of said socket means, said sleeve defining the entrance end of said connector for inserting the prong contact member therein, said sleeve having a through bore aligned axially with said socket means and having tooth means extending radially from its cylindrical outer surface, said tooth means being in biting register with said insulating material shell and having a first face inwardly inclined in the direction towards said socket means and also having an opposite face substantially perpendicular to the axis of said shell and confronting the entrance end of said conductor, whereby said sleeve is readily insertable into said shell and resists pull-out therefrom upon assembly therein, said sleeve bore axially aligning said prong member for insertion of same into said socket means and preventing insertion of an oversized prong contact member into said socket means.

2. A coxial connector for making electrical connection with a prong contact member comprising, a longitudinal inner conductor having opposed forward and rearward ends, terminal means at said rearward end for receiving an electrical lead wire, resilient socket finger means at said forward end for receiving the prong contact member inserted therein upon effecting electrical contact therewith, a shell having an axial through bore and formed of electrically insulating and resilient material, said shell being mounted axially over said inner conductor and having a radial flange at its forward end overlapping axially beyond the forward end of said resilient finger means, an outer conducting member mounted over said shell, means on said shell and said outer conductor for holding both in assembly, means on said shell and said inner conductor for holding same in assembly, said shell bore being counterbored at its forward end and an annular sleeve of conducting material having a cylindrical outer surface equipped to fit into the bore of said shell and also having a funnel-shaped forward end for register against said shell counterbore upon assembly of said sleeve into said shell, said sleeve being spaced from and in front of said resilient finger means when assembled in said shell, said sleeve defining the entrance end of said connector for inserting the prong contact member therein, said sleeve having a through bore aligned axially with said resilient finger means and having an annular tooth extending radially from its cylindrical outer surface in biting register with contiguous portions of said insulating shell, said tooth having a downwardly inclined first face confronting said resilient finger means and also having an opposite face substantially perpendicular to the axis of said shell and confronting the entrance end of said connector, wherein said sleeve is readily insertable into said shell and resists pull-out therefrom upon assembly therein, said sleeve bore axially aligning said prong member for insertion of same into said resilient finger means and preventing insertion of an oversized prong contact member into said resilient finger means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,700,144	Flanagan	Jan. 18, 1955
2,805,406	Grovemiller et al.	Sept. 3, 1957
2,860,316	Watters	Nov. 11, 1958
2,972,730	Abrams	Feb. 21, 1961

FOREIGN PATENTS

614,012	Great Britain	Dec. 8, 1948
691,560	Great Britain	May 13, 1953