United States Patent

Smith

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[54] ELECTRICAL CONNECTOR

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[73] Assignee: **Ostby & Barton Co.**

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[52] **U.S. Cl.** .....**339/221 R,** 339/205, 339/215 R, 339/256 R

[51] **Int. Cl.** **H01r 9/08**

[58] **Field of Search** 337/221, 248, 256, 214, 215, 337/217, 204, 205; 24/213, 214

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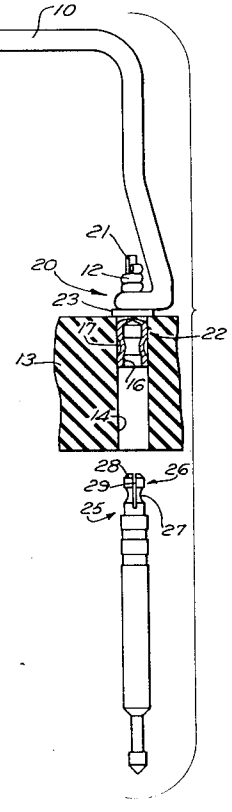
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Primary Examiner—Marvin A. Champion
Assistant Examiner—Robert A. Hafer
Attorney—Barlow and Barlow

[57] **ABSTRACT**

An electrical connector comprising in combination a panel having an opening extending therethrough, an electrical receptacle, and an elongated male connector. The electrical receptacle has its lower section fixedly held in the top portion of said opening with its bottom edge positioned inwardly from the bottom of said opening. The lower section forms a female connector and conductor securing means are formed on the upper section of the receptacle. The elongated male connector has an external diameter just slightly less than the diameter of the opening in the panel to provide lateral support and the tip of the connector is provided with means to mate with the female connector.

1 Claim, 5 Drawing Figures



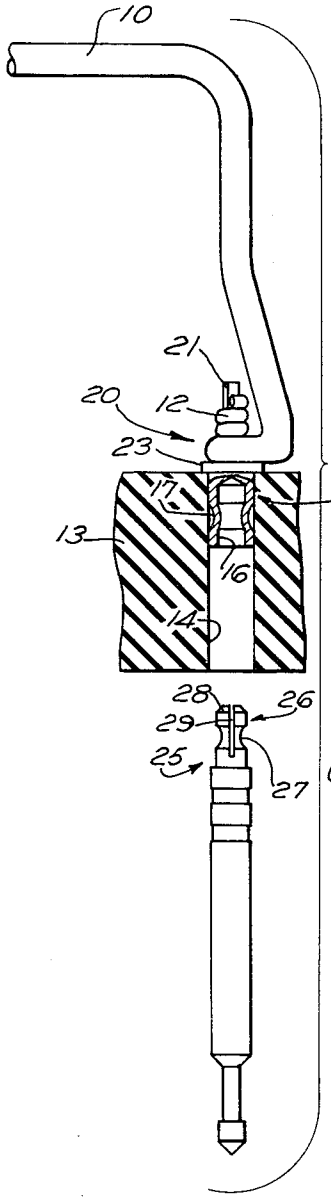


FIG. 1

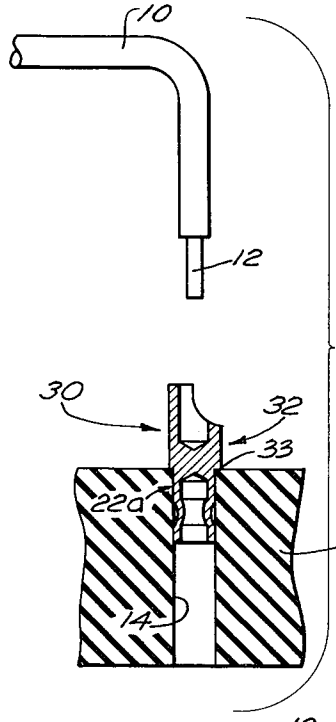


FIG. 3

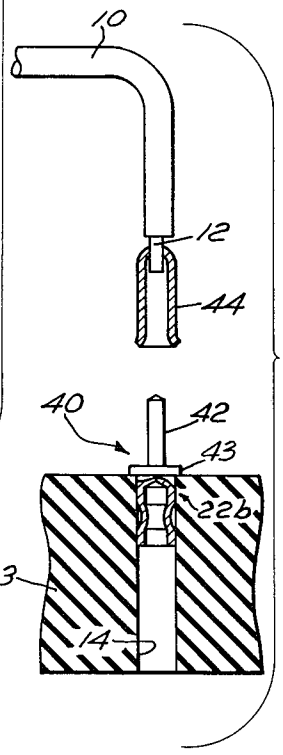


FIG. 4

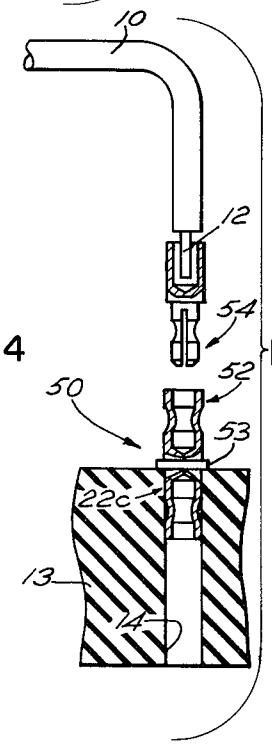


FIG. 5

FIG. 2

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ELECTRICAL CONNECTOR

BACKGROUND OF THE INVENTION

The invention relates to an electrical connector commonly used in plug boards, circuit connecting panels of an electroresponsive device, circuit testing panels, and other electrical devices. For example, in circuit test panels it is often necessary to replace spring contact probes as the probes become bent and otherwise unserviceable. Certain types of interchangeable contact probes have been provided but for the most part they have been made in such a fashion that insufficient support has been given to the contact probe and reliance has been solely on the electrical contact connection for the mechanical connection. As the probe deflects, failure can therefore be experienced by loosening the electro mechanical connection and the probe may fall out.

SUMMARY OF THE INVENTION

The present invention is an electrical connector which provides a strong mechanical connection while still permitting a simple movement to disconnect the male connector from the female receptacle. The male connector offers excellent wipe characteristics as it is plugged into the female receptacle. The knob end of the male connector insures constant mechanical contact after plug-in with the receptacle.

Advantages to be gained when the connectors are used in multi-wire closely spaced test fixtures are 1) the probes can be replaced without rewiring from the front of the fixture, 2) only holes need be drilled in the panel since no reaming or counterboring is necessary, and 3) probes with different tips for different functions (i.e. pin testing, hole testing, pad testing) can be intermixed and/or interchanged in the same fixture.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational illustrating the lower section of the electrical receptacle in cross sectional view and illustrating the mating elongated male connector;

FIG. 2 is an enlarged top plan view of the male connector;

FIG. 3 is a side elevational illustrating a first alternative embodiment of an electrical receptacle;

FIG. 4 is a side elevational illustrating a second alternative embodiment of an electrical receptacle; and

FIG. 5 is a side elevational illustrating a third alternative embodiment of an electrical receptacle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Looking to FIG. 1, the combination comprising the electrical connector is illustrated. A hook-up wire **10** having a portion of its conductor **12** bared at its end is spiral wrapped on the square rod **21** extending upwardly from receptacle **20** which is formed on the upper section of the electrical connector. This type of receptacle is known as a wire wrapping receptacle. Formed at the bottom of the upper section is a flange **23** that separates the upper and lower sections and which limits the extent that the electrical connector can be inserted into bore **14** of housing **13**. The lower section **22** is fixedly held in the top portion of bore **14**. This lower section also has a bore **16** which functions as a female connector and has a restricted neck portion **17** whose function will be next explained.

Elongated male connector **25** is illustrated having a test probe attached to its one end, however it could have many other devices attached to its end. The outside diameter of the housing gripping the male connector is just slightly smaller than the diameter of bore **14** so that the male connector may be freely slid into and out of the bore and still provide lateral support to help maintain the strong mechanical grip between the female and male connectors. In the form illustrated, the tip of the male connector is in the form of a knob **26** having a reduced diameter section **27** adjacent thereto. Said knob has longitudinally extending fingers **28** formed by cutting slots **29** along two crossing longitudinal planes.

As the male connector is slid into the bore of the housing and the bore of the female connector, its tip is compressed into a smaller cross-section than the internal diameter of the restricted neck portion. Continued travel inwardly of the tip results in its expansion to its stress free diameter and results in the mating of the restricted neck portion around the reduced diameter section adjacent the tip of the male connector.

It is essential that a strong mechanical connection be derived. In the preferred form, the lower section of the electrical receptacle has a bore therein forming the female connector and adjacent its mouth is a restricted neck portion. Acting in combination to provide strong mechanical connection then are the fingers of the tip which have expanded into gripping relation with the internal walls of the bore of the female connector. Also close dimensional tolerance between the external diameter of the reduced diameter section and the restricted neck portion restrict lateral rocking movement of the male connector with respect to the female connector. Lastly the walls of the opening in the housing restrict lateral movement of the test probe due to the close dimensional tolerances between the diameter of the hole and outside diameter of the male connector along its elongated length.

The same structure that helps provide such an improved mechanical grip also functions to produce an easily disassembled connection. That is, the compressible knob on the tip of the male connector, by being longitudinally slotted along two crossing planes allows the fingers formed thereby to function equally well when it is necessary to withdraw the tip of the male connector from the female connector. FIG. 2 is a view looking down on the top of knob **26** and showing the slots **29** and their crossing planes.

The embodiment seen in FIG. 3 illustrates a solder cup type receptacle **30** into which a male connector **25** such as seen in FIG. 1 would be inserted. The receptacle has a standard lower section **22***a* with a female socket **32** formed at its top. Shoulder **33** separates the upper and lower sections and limits the extent that the electrical connector can be inserted into bore **14** of housing **13**. Bare conductor **12** would be inserted in female socket **32** and solder melted therein to form the connection.

Another embodiment is shown in FIG. 4 having a male pin type receptacle **40**. It also has a standard lower section **22***b* with a pin **42** formed at its top. Flange **43** separates the upper and lower sections. To pin **42** a female connector **44** attached to the bare conductor is slid thereover. This type receptacle is also connected with a male connector such as seen in FIG. 1.

The last embodiment is the dual in-line type receptacle **50** seen in FIG. 5. It likewise has the standard lower section here designated **22***c* and has an upper section **52** configured the same as the lower section, and it also forms a female socket. Flange **53** separates the upper and lower sections. To mate with the upper section **52** a male connector **54** similar to that illustrated in FIG. 1 has to be attached to bare conductor **12**. Its locking and unlocking characteristics would be the same as those existing between the male connector and female receptacle discussed in the first embodiment.

It will be appreciated that the combination provides a superior mechanical connection to the female connector by virtue of the fact that the external diameter of the male connector fixture is supported over a considerable portion of its length by the bore **14** of the insulating fixture **13**. This enhances the electrical connection that is made by the male and female devices.

What is claimed is:

1. The Combination comprising a housing of insulating material of a predetermined thickness having an opening of predetermined cross-section extending all the way therethrough from top to bottom, an electrical connector having an upper section above said housing and a lower section press fitted into said opening, conductor securing means formed on said upper section, said electrical connector having means formed between said upper section and said lower section to limit insertion of the electrical connector into said

opening only as far as the top of said lower section, the lower section of the electrical connector being fixedly held in the upper portion of said opening in the housing, the bottom edge of said connector being positioned inwardly from the bottom of said opening, said lower section forming a tubular wall female connector providing a bore, said wall extending inwardly forming a groove in its outer surface intermediate its ends which wall is supported on either side of said groove by the wall of said opening and said inward extending wall portion providing a restricted neck adjacent the mouth of said bore, an elongated male connector whose outside lateral dimensions are slightly smaller than the dimensions of said opening such that the male connector may be slid into said opening in mating relationship and be supported by the wall of said opening, said male connector having a tip with a knob-like configuration, said tip being slit longitudinally along at least two crossing planes to provide resilience to snap said tip past said restricted neck.

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