Nov. 10, 1959 W. C. EDDY 2,912,668

ELECTRICAL SOCKET CONNECTOR

Filed July 15, 1957

FIG. 1

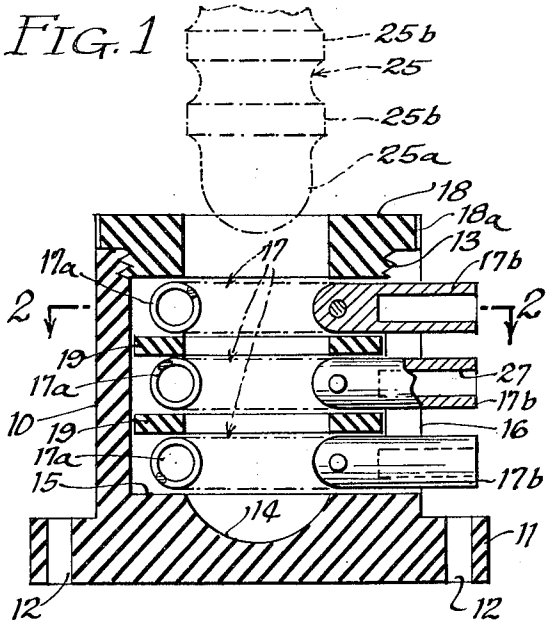


FIG. 2

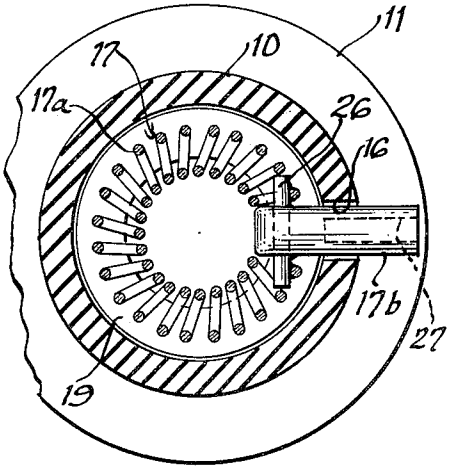


FIG. 3

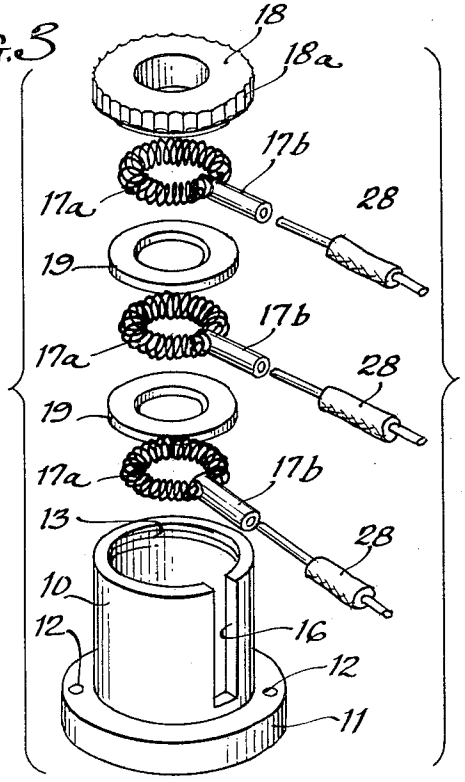


FIG. 4

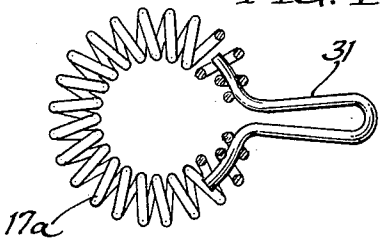
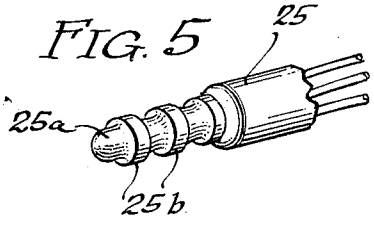


FIG. 5



INVENTOR.
William C. Eddy

BY
Dorns, McDougall, Williams & Kersh
Attorneys

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ELECTRICAL SOCKET CONNECTOR

William C. Eddy, Michigan City, Ind., assignor to Television Associates, Inc., Michigan City, Ind., a corporation of Illinois

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1 Claim. (Cl. 339—182)

This invention relates to the field of socket connectors for electrical circuits and is specifically addressed to an improved jack connector for use with multi-terminal plugs. The present invention is particularly useful in applications wherein the plug may in normal use rotate relative to the jack.

Multi-terminal plugs of the type with which the present invention is particularly useful are widely employed as cable connectors. They are characterized by an elongated cylindrical shank having a plurality of insulated lands which, in combination with internal insulating sleeves, provide electrical separation between various electrical contact surfaces disposed longitudinally along the shank. The tip of the shank acts as one electrical contact surface, and the other electrical contact surfaces are annular rings disposed along the shank, separated from one another by the insulated lands and having coaxial cylindrical extensions extending rearwardly into the handle portion of the plug, terminating in lugs or other suitable devices to facilitate connection thereto of the various wires of a cable. The insulating sleeves aforementioned separate and insulate these coaxial extensions from one another. Such plugs are conventional in the switchboard art and are found in many other applications. They do not, of themselves, form any part of the present invention. This brief description of such plugs is included in this specification merely to assist in an understanding of the mode of operation of my novel jack or socket connector.

An object of the present invention is to provide an improved jack for plugs of the class described wherein positive wiping contact is provided for each of the contact surfaces of the plug around substantially its entire periphery.

Another object of the present invention is to provide a jack for use with multi-terminal plugs wherein the contact members of the jack are self-centering with respect to the contact rings of the plug, insuring positive electrical connection between the respective contact members of the jack and plug.

Still another object of the present invention is to provide a jack or socket for multi-terminal plugs wherein a positive gripping contact is provided for the connector rings of the plug during rotation of the plug relative to the jack or socket.

A still further object of the invention is to provide a jack for multi-terminal plugs wherein the plug is inherently designed to adjust to minor dimensional variations in the plug, preventing the open circuits and poor contacts which are often characteristic of prior-art jacks.

Other objects and advantages of the invention will appear from the following detailed description of a typical embodiment thereof.

In the appended drawing, Figure 1 is a sectional view of a typical embodiment of the invention, being a jack or socket designed for panel mounting. Fig. 2 is a sectional view of the Fig. 1 embodiment taken in a plane at right angles to that of Fig. 1, the section being along

the lines 2—2 of Fig. 1. Fig. 3 is an exploded view of the Fig. 1 connector, showing the various parts and the manner of their assembly. Fig. 4 is a plan view of an alternative type of garter-spring contact member which may be used in the invention. Fig. 5 is a perspective view of a typical multi-terminal plug with which the invention may be used.

In Fig. 1, I show a body member **10** which serves as a housing for my jack or socket, member **10** being formed from any suitable insulating material, such as a low-loss plastic. At the base of body member **10** I provide an annular flange **11**, which may be formed integrally with body member **10** and which provides a convenient means for panel mounting via the apertures **12** which may receive screws or rivets.

Body member **10** is hollowed out to define a generally cylindrical interior, internal threads **13** being provided at the upper end thereof. The bottom of the interior portion of body **10** is provided with a central recess **14**, formed to accommodate the tip of a connector plug and defining therearound a flat shelf or shoulder **15**.

Along one side of body member **10**, extending from the top thereof to a point near the base of flange **11** is an axial slot **16**, the function of which will be clearly brought out in a subsequent paragraph.

Carried within the interior of body member **10** are three contact members **17**, each of which comprises a garter spring **17*a*** and a projecting arm **17*b***. The details of assembly of these contact members will be more fully described hereinafter.

The three contact members **17** are stacked within the interior of body member **10** with the projecting arms **17*b*** extending in each case externally of the body member **10** through the slot **16**. The contact members **17** are separated from one another by means of flat rings or washers **19** of insulating material which are interposed between each pair of contact members. The entire assembly is held in position by means of a gland or follower member **18**, formed of the same material as body member **10** and provided with threads adapted for cooperation with threads **13**. If desired, member **18** may have a knurled upper flange **18*a*** to facilitate member **18**'s being manually screwed into tightened and assembled position in the top of body member **10**.

As may be observed from Figs. 1 and 2, the dimensions of the contact members **17**, the spacing washers **19**, and the body member **10** are so proportioned as to leave the assembled parts a limited amount of "play" or freedom of movement in both the axial and radial directions. That is, the outer diameters of both the garter springs **17*a*** are slightly less than the inner diameter of the interior of body member **10**. Similarly, the axial dimension of the interior of body member **10** with gland **18** screwed tightly into assembled position is slightly greater than the height of the stacked assembly of contact members and spacers.

As the result of this construction, the contact members **17** are accorded a limited freedom of movement within the body member **10** when the connector is fully assembled.

When a plug **25** is inserted into the assembled socket structure, the nose or tip **25*a*** of the plug successively forces open the garter spring **17*a*** as the plug enters the socket, the springs being still further distended by the lands **25*b*** as they successively pass the contact members **17**. When the plug is fully received within the socket assembly, the tip **25** is in gripping relation with the lowermost garter spring **17*a***, the lowest land **25*b*** occupies a position opposite the lowest spacer **19**, the intermediate garter spring **17*a*** is in annular gripping contact with the first contact ring of the plug **25**, the second land **25*b*** is disposed opposite the upper spacer

19, and the uppermost contact ring on plug 25 is gripped by the top garter spring 17*a*.

The natural resilience of the garter springs and their slight freedom of axial movement causes them to center accurately around the tip and the contact rings of plug 25, notwithstanding small dimensional inaccuracies in the structure of plug 25.

I shall now describe in some detail two alternative modes of construction of the contact members 17.

One type of construction is shown in Fig. 2. In this structure, the inner end of arm 17*b* is provided with a short transverse metallic pin 26, tightly secured in any desired way within an appropriate aperture in arm 17*b*, and the ends of the garter spring 17*a* are permanently secured to the opposite ends of the pin 26 by any suitable method, as by silver soldering. Arm 17*b* is of course formed of electrically conducting material and may be provided with an axial aperture 27 at its outer end to serve as a lug for soldering or otherwise securing a connecting wire 28 thereto, wires 28 running, as will be understood, to an external circuit of any desired type.

In Fig. 4, I show an alternative type of construction for the contact members 17. In this construction, the projecting arm 17*b* and pin 26 of the Fig. 2 embodiment are replaced by a bent wire 31 which is sharply folded over at its midpoint to define a projecting portion corresponding to arm 17*b* and having its ends flared outward to provide seats for the ends of garter spring 17*a*. The ends of spring 17*a* may be crimped, silver soldered, or otherwise securely affixed to the flaring ends of the wire member 31. It will of course be understood that the U-shaped central portion of member 31 will extend through slot 16 externally of the body member 10 and serve as a connecting lug for external circuit wires.

The operation of the Fig. 4 type of contact member is similar to that of the type shown in Fig. 2.

In many instances, in the construction of completed apparatus, it is desirable to "pot" the assembled socket connector in a block of solid plastic. Since the projecting arms 17*b* or 31 of the contact members must be afforded some freedom of movement, both radial and axial, suitable provision for such movement must be made before the connector is potted. One effective method of doing this is to seal the slot 16 and the external portions of the contact elements 17 in a body of a resilient material such as silastic rubber, after which the entire connector assembly can be potted. Such a construction provides the mechanical strength and protection against moisture which potting affords while at the same time it leaves the contact members the necessary freedom of movement.

It will of course be understood that the constructional details of a connector in accordance with this invention will vary considerably according to the particular type

of plug with which the connector is to be used. Some plugs have more than three distinct contact surfaces, whereas other plugs have only two. The number of garter-spring contact elements employed in a given connector may of course vary accordingly.

Similarly, the width of the insulating lands separating the contact rings on a plug is not always uniform. Some plugs have one narrow land and one wide land, whereas others may have other combinations of lands of varying width. Hence, in designing a connector in accordance with this invention for use with a particular plug, the thickness of the spacing members 19 will be chosen so as to correspond generally to the dimensions of the insulating lands on the plug. Other modifications of this sort, to adapt a given connector to a particular type of plug, will be obvious to persons skilled in the art.

While I have in this specification described in considerable detail a typical embodiment of my invention, it should be understood that the description is merely illustrative. It is my desire that the scope of my invention be determined primarily from the appended claim.

I claim.

A jack for use with a multi-terminal plug comprising a housing having a generally cylindrical recess therein defining an axis, one wall of said recess being relieved to define a slot generally parallel to said axis, a plurality of contact members stacked in said recess, an insulated spacer disposed between each adjacent pair of said contact members, and means for confining said contact members in stacked relation within said recess while allowing them a limited freedom of movement in the axial direction, each of said contact members comprising a coiled spring and an arm having oppositely extending spring anchors at the inner end thereof, said spring being bent into generally circular shape and having its ends affixed to said spring anchors to form a garter spring, the outer diameter of said garter spring being slightly less than the inner diameter of said recess, said arms extending externally of said housing through said slot to provide means for external circuit connections to said contact members.

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