Feb. 22, 1966 W. H. WEST 3,237,149

ELECTRIC CONNECTOR

Original Filed Sept. 19, 1963

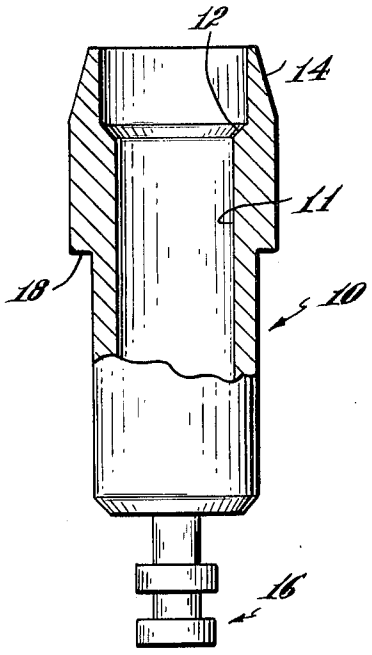

Fig. 1

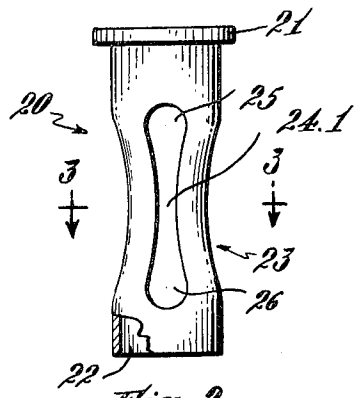

Fig. 2

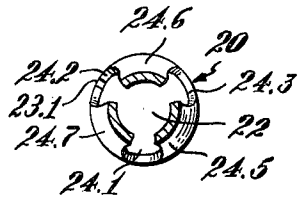

Fig. 3

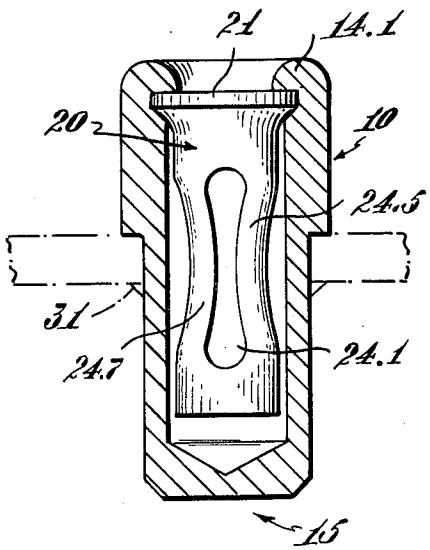

Fig. 4

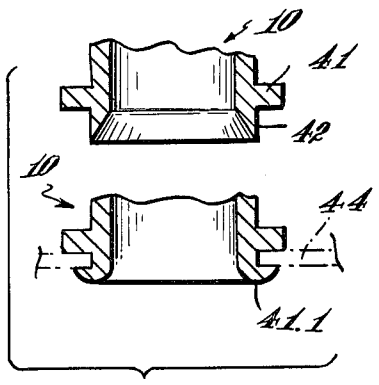

Fig. 5

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3,237,149

ELECTRIC CONNECTOR

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Continuation of application Ser. No. 310,005, Sept. 19, 1963. This application Jan. 18, 1965, Ser. No. 426,715
3 Claims. (Cl. 339—256)

This is a continuation of application Serial No. 310,005, filed September 19, 1963, now abandoned.

The field of the present invention is that of electrical connectors of the pin and jack type, and more particularly that of connector jacks having resilient contacting portions arranged around a common pin and jack axis.

Objects of the present invention are to provide a connector jack of optimally simple design which lends itself particularly well to extreme precision miniaturization, which was satisfactorily low and constant contact resistance under all operating conditions, which inherently avoids uncertainties as to stresses and movements of the contacts, which provides excellent frictional and pressurable contact under severe operating conditions, and which, while providing maximal operational advantages and precision, is comparatively inexpensive as to manufacture of the parts and assembly thereof.

The nature and substance of the invention may be shortly stated as residing in the arrangement, within a supporting body of an essentially tubular resilient metallic insert which is at one end firmly held, such as with a flange, at a rim of the body, and which insert has a constricted central portion with closed slots, thus forming spring strips between the slots with essentially non-yielding portions at either end, so that upon insertion of a contact pin the intermediate spring strips move symmetrically outward in radial directions while the insert body as a whole expands axially. In this manner an uncomplicated, symmetrical, and hence certain functioning of the contact portions is obtained, as distinct from previously proposed constructions where for example both ends of a contact insert are rigidly held in an outer confining body, or where kinematically indeterminate and unsymmetrical peripheral or radial expansion of spring members is relied upon as distinct from the above characterized symmetrical and determinate structure wherein the contact spring component is firmly and rigidly restrained at one end, floating freely cantilever fashion within the housing body so that its functioning does not depend upon uncontrollable stresses and frictional forces.

These and other objects, aspects of novelty, and advantageous results of the invention will appear from the following description of a practical embodiment thereof illustrating its novel characteristics.

The description refers to a drawing wherein

FIG. 1 is an elevation partly in longitudinal cross section of the outer mounting body of a connector jack according to the invention prior to assembly, indicating two possibilities of applying terminal means thereto;

FIG. 2 is an elevation partly in section of the resilient insert;

FIG. 3 is a section on line 3—3 of FIG. 2;

FIG. 4 is a longitudinal section through the finished jack with the insert in elevation; and

FIG. 5 shows longitudinal sections of the lower portion of the jack body, illustrating a further possibility of mounting the jack.

In FIG. 1, the mounting body or shell **10** is shown prior to assembly. It is preferably but not necessarily cylindrical having a recess **11** and at one end a chamber **12** and a tapered lip **14**. The other end **15** is preferably but not necessarily closed and has in this embodiment a soldering terminal **16**. A shoulder **18** is preferably but not necessarily provided for mounting the jack on a printed circuit panel as indicated in FIG. 4.

The insert **20**, as shown in FIG. 2, has at one end a flange **21** and is open at the other end as indicated at **22**. The intermediate portion **23** is constricted towards the center, symmetrically to the axis, and has a number, for example three, longitudinal slots or perforations **24.1**, **24.2**, **24.3** which are preferably widened at their ends as indicated at **25** and **26** and symmetrical to a transverse plane. This insert can be fabricated by rolling from a stamped blank in which case it will be longitudinally split the slit being indicated at **23.1** in FIG. 3. While the slit is effectively prevented from opening at the flange portion **21**, as will appear hereinbelow, it can be closed at the open end **22** by conventional means, such as electronic welding, but this is not essential for most purposes since, due to the configuration of the insert with its constricted center, and if desired by heat treatment subsequently to shaping, the slit is kept closed at the end **22** also. In this connection it should be understood that the operation of this connector does not depend on the opening of an open slit through the entire length of the insert and that as a matter of fact it is preferred to keep the slit, if one is present, closed for proper operation. While the number of slots **24** can be varied, three of them were found to be sufficient for most purposes.

For assembly, the insert **20** is put with its flange **21** on the shoulder **12** (FIG. 1) of the body, and the lip **14** is then swaged over the flange as shown at **14.1** of FIG. 4. In this manner the insert is rigidly held at one end and free to expand towards the bottom of the body when a contact pin is inserted pushing the constricted strips **24.5**, **24.6**, **24.7** between the slots outwardly thus providing initially a good wiping contact and a permanently strong gripping action at symmetrically distributed points of the insert, with no possibiity of unevenly distributed contact forces and pull-out resistance which might lead to detrimental effects during certain uses such as involving vibration or shock. The spring insert **20** of a successful practical embodiment is made of 0.006 inch thick beryllium copper strip, annealed, and heat-treated after forming, whereupon it is often plated with a precious metal.

The body **10** of the jack is often made from brass, gold flash finished over silver plate. The joining of the two parts by swaging must be very reliable by spinning or swaging such that the assembly when completed does not show signs of looseness or relative rotation.

As shown in FIG. 4, the jack body **10** can be inserted into a printed circuit panel and joined thereto by dip soldering, as indicated at **31**.

The embodiment according to FIG. 5 has at **41** a flange and initially at **42** an inwardly chamfered lip. Upon mounting to a support **44**, the lip is swaged over the support such as a panel, to secure the body to a perforation thereof as indicated at **41.1**. As mentioned above, instead of providing the body with a plain bottom **15**, a terminal **16** can be applied thereto as shown in FIG. 1, which will then serve for making electrical connections instead of the soldering technique mentioned with reference to FIGS. 1 and 4.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. An electrical connector jack suitable for subminiaturizing comprising:

a thick walled generally cylindrical body having at one end a cylindrical inner recess with an inner annular portion which joins a narrower inner surface of the body at an angle to the axis of the body, and having on the outside an annular portion of reduced cross-

section to provide transversely extending annular mounting abutment means; and

an elongate, hollow, resilient insert stamped and rolled from thin sheet metal of uniform thickness to form a longitudinally slit, generally tubular element being within and clearing the cylindrical body, forming

at one end a flange fitting, and secured to said cylindrical recess with an annular mass of metal of form adapted to extend, prior to assembly, at said end of the body for reception of said insert and deformed over and peripherally contacting said flange in firm area contact therewith to prevent opening of the slit, and at the other end of the body an open cylindrical portion clearing the other end of said body, and forming

an intermediate region which is constricted, and has a plurality of elongate slots in axial direction with closed and rounded widened ends.

2. Connector jack according to claim **1**, wherein said abutment means of said body is a shoulder whereby the jack may be mounted on a support by inserting it into a perforation of the support with the shoulder determining the depth of insertion.

3. Connector jack according to claim **1** wherein said abutment means includes a flange and an inwardly chamfered lip, whereby the jack may be mounted on a support by inserting it into a perforation of the support with the lip leading and by thereupon swaging the lip over the support.

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JOSEPH D. SEERS, *Primary Examiner.*

Disclaimer

3,237,149.—*Warren H. West*, Seabrook Beach, N.H. ELECTRIC CONNECTOR. Patent dated Feb. 22, 1966. Disclaimer filed Jan. 17, 1977, by the assignee, *Cambridge Thermionic Corporation.*

Hereby enters this disclaimer to claims 1–3 of said patent.

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