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Siegler

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[54] **SLEEVE FOR GROUNDING BUSHING-MOUNTED CONTACT TO PLATE**

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[52] **U.S. Cl.** ..... **339/14 R,** 339/95 R

[51] **Int. Cl.** **H01r 3/06**

[58] **Field of Search** ..... 339/14 R, 14 L, 14 P, 339/14 R, 14 T, 176 R, 176 L, 176 M, 176 MF, 176 MP, 176 P, 221 R, 221 L, 221 M, 95 R; 151/41.73; 85/36; 248/43, 56; 285/158; 287/52.04, 52.06, 53 SS; 24/81 PE, 126 R, 122.3

[56] **References Cited**

UNITED STATES PATENTS

1,832,940	11/1931	Matthes	24/122.3
1,204,625	11/1916	Wheelock	248/56 UX
3,214,200	10/1965	Carlson et al.	285/323
3,231,843	1/1966	Antes et al.	339/14 R
3,337,833	8/1967	Creedon	339/14 R
3,553,628	1/1971	Crimmins	339/14 R

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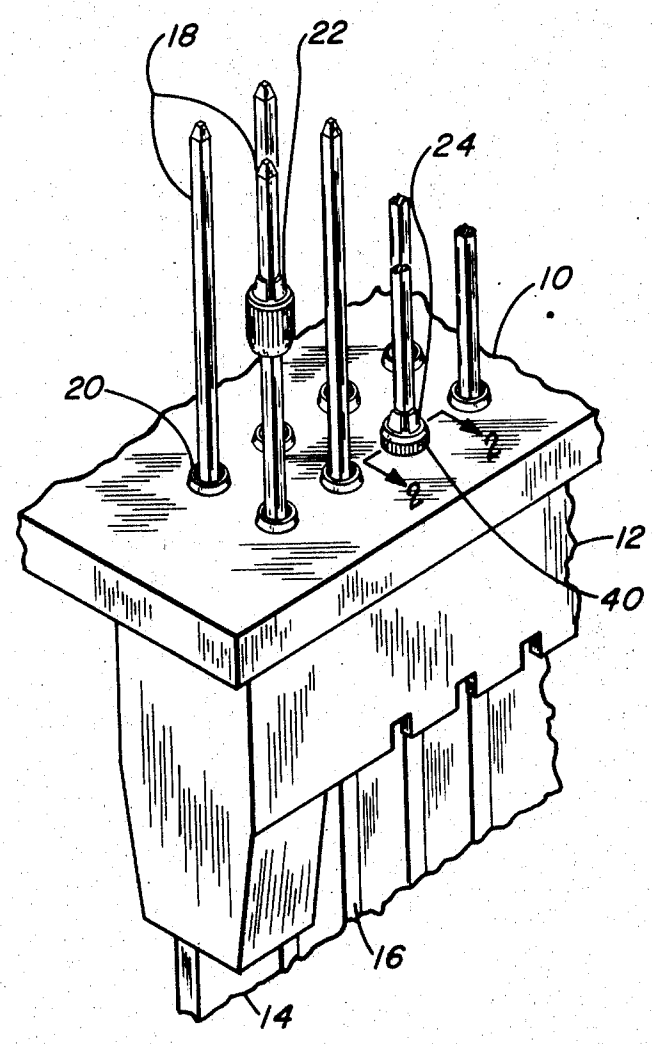
[57] **ABSTRACT**

In an electrical interconnection assembly of the type which comprises a conductive plate having elongated contacts mounted in respective apertures thereof by means of respective thermoplastic insulating bushings, a removable sleeve is provided for grounding any contact to said plate without damaging the plate, the bushing, or the contact. The sleeve comprises a cylindrical member having a sharpened lead-in edge at a first end, a fluted body portion, and at the other end, a plurality of arcuate fingers shaped to grip said contact when said sleeve is inserted thereover. To ground any contact, the sleeve is slipped over the contact, first end downward, and the lead-in portion is driven between the plate and bushing such that the fluted body portion makes a good connection with the plate and the gripping fingers make a good connection with the contact.

10 Claims, 3 Drawing Figures



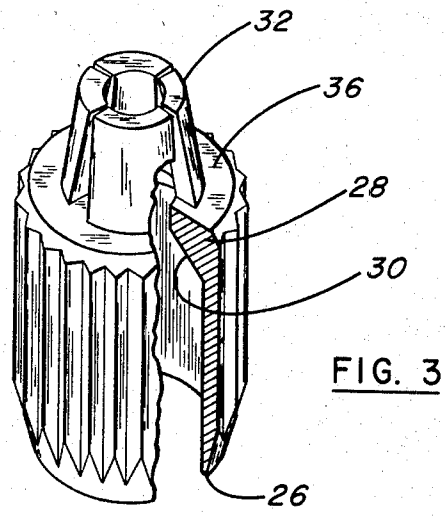


FIG. 3

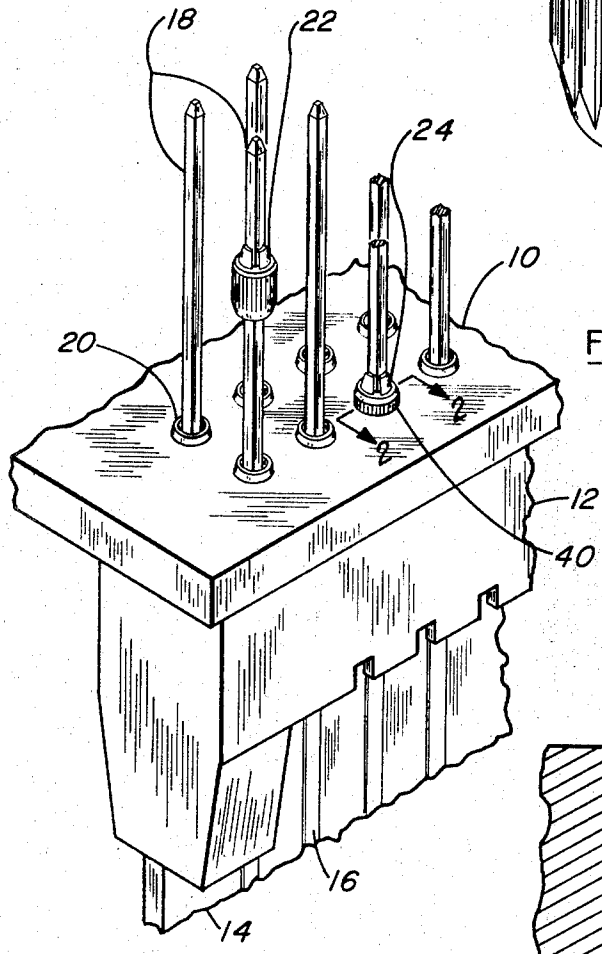


FIG. 1

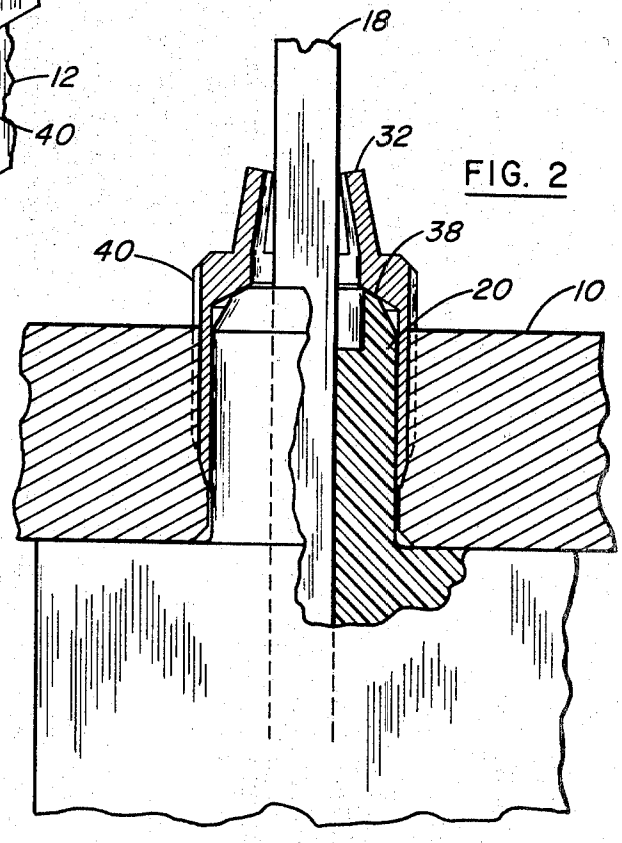


FIG. 2

SLEEVE FOR GROUNDING BUSHING-MOUNTED CONTACT TO PLATE

BACKGROUND: FIELD OF INVENTION

This invention relates to the electrical connector art, and particularly to an electrical interconnection assembly of the type comprising a conductive plate having cardedge connectors mounted thereon by means of insulating hubs which extend through holes in the plate, with the tails or secondary mating portions of the contacts extending out from the hubs on the underside of the plate so that such tails can be interconnected by wire wrapping means. The present invention comprises a ground sleeve which can be applied over any contact tail and between the insulating bushing and the sides of the hole in the plate in order to ground such contact to the plate without damaging the contact, the insulating bushing, or the plate, and which can be readily be removed, if desired.

BACKGROUND: DESCRIPTION OF PRIOR ART

In complex electrical systems, such as computers or other data processing equipment, it is common practice to employ a plurality of printed circuit boards, each of which contains electrical circuitry designed to accomplish a specific sub-function within the entire system. Connections to these boards or cards are provided by means of cardedge connectors into which the cards can be plugged. The cardedge connectors must, of course, in turn be interconnected and connected to other equipment.

One way in which cardedge connectors are commonly interconnected is by mounting the cardedge connectors on a metal plate such that the "tails" or secondary mating portionsof the contacts of the cardedge connectors protrude from the lower surface of the plate.

The cardedge connectors themselves consist of insulated housings having cylindrical hubs on their lower surface, which hubs are mounted in apertures of the metal plate by force fit, with the contact tails being in turn mounted in the hubs, also by force fit, such that the tails protrude from the hubs and extend below the lower surface of the plate. The contact tails are commonly interconnected by automatic wire wrapping machinery.

It is usually necessary to connect one or more contact tails to the plate since the plate provides a convenient ground circuit path or other common interconnection link between various contact tails. Heretofore various awkward means were employed to selectively connect predetermined contacts to the plate.

In one way, the insulating hub of the cardedge connector was removed and a metal bushing was substituted which served both to mount the contact in the plate and connect the contact electrically to the plate. This method did not allow much flexibility since once the insulating bushing was removed and a metal bushing was substituted, the ground connection became permanent and it would not be possible to insulate that contact from the plate again. In addition, it was expensive to perform all the steps necessary to effect this operation. Furthermore, once a cardedge connector was installed to the plate, and wiring beneath the plate was completed, it would be very difficult, if not practically impossible to ground the contact to the plate through the use of a metal bushing of the aforedescribed type.

Another method of connecting a contact to the plate electrically was through the use of a wire-wrapped connection. However, such a connection required the use of an intervening wire between the contact and the plate, and, as will be recognized by those skilled in the art, this is electrically undesirable since such a wire may have high resistance and may pick up spurious noise signals.

Accordingly, several objects of the present invention are (1) to provide an economical, reliable, and simple means for grounding a contact to a supporting plate, (2) to provide means for grounding a contact to a plate which can be removed and replaced at will and which can be applied to any selected contact within a large array of contacts, and (3) to provide a method of grounding a contact to a plate which is mechanically and electrically secure and reliable. Other objects and advantages will become apparent from a consideration of the ensuing description.

DRAWINGS

FIG. 1 is a partial bottom axonometeric view of a plate having a cardedge connector mounted thereon, including a showing of several ground sleeves according to the invention. FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1. FIG. 3 is an axonometeric cutaway view of the ground sleeve according to the invention.

DESCRIPTION

The metal plate 10 of FIG. 1 (bottom view) has a cardedge connector 12 (partial view) mounted on the top surface thereof; a printed circuit card 14 (partial view) is plugged into connector 12. Connector 12 includes cardedge contacts of any type well known in the art having primary mating or "nose" portions (not shown) for engaging the ends (not shown) of respective printed wiring paths, such as 16, on board 14. The contacts have secondary mating or "tail" portions, such as 18, of square or rectangular cross-section which protrude from the lower surface of plate 10. Connections between different cardedge connectors are effected by means of wire wrapped interconnections between tail portions 18. Lastly, the contacts have mounting or "body" portions (not shown) which join secondary mating portions 18 with primary mating portions; such body portions aid in mounting the contacts in connector 12. A connector 12 is mounted on plate 10 by means of insulating hubs, such as 20, which extend from the lower surface of connector 12 and are retained in respective apertures of plate 10 by force fit, with contact tails 18 being in turn held in the respective hubs, also by force fit. The insulator of connector 12, of which hubs 20 may be an integral part, is made of thermoplastic material, such as nylon or polycarbonate which, as is well known, is slightly compressible.

According to the invention, any contact tail 18 may be connected to plate 10 electrically in a reliable, economical, and simple manner by the use of the ground sleeve of FIG. 3. One ground sleeve is shown partially installed in FIG. 1 at 22 and another is shown fully installed at 24. The ground sleeve comprises a generally cylindrical member, one end of which has a sharpened or tapered lead-in end 26 (FIG. 3) and the other end of which has a reducing portion 28 which provides an internal shoulder 30 facing lead-in end 26 and an external shoulder 36. Connected to reducing portion 28 and

extending from shoulder **36** are four integral fingers, such as **32**, each of which has an arcuate cross section. The fingers extend from an end of reducing portion **28** of the sleeve toward an imaginary extension of a central axis (not shown) of the sleeve.

The outer surface of the portion of the sleeve between the reducing and lead-in portions is fluted as indicated at **34** to provide a plurality of edges to aid in making a low resistance connection with the walls of the aperture of plate **10.**

The entire sleeve is preferably made of springy material, such as heat-treated beryllium copper. In one example where tail sections **18** of the contacts in connector **12** had a square cross section and measured 25 mils on each side, the sleeve was about ⅛inch high, with its other dimensions scaled proportionately as indicated in FIG. **3.** The entire sleeve can be formed by machining and other well known metal-working techniques from an integral cylindrical blank.

OPERATION

In order to ground any contact tail **18** to plate **10,** an insulating sleeve according to the invention is fitted over a contact tail as indicated at **22** (FIG. **1**). When the sleeve is thusly installed over a tail, the tail will spread gripping fingers **32** (FIG. **3**), whereby these fingers will exert a strong gripping force against the four sides of tail **18.** However, since there are as many gripping fingers **32** as sides of tail **18** (four), these fingers will not engage or damage the corners of tails **18,** thus advantageously leaving such corners sharp, as required for effective wire wrapping operations.

With the aid of a simple, cylindrical installation tool (not shown) designed to engage the upwardly-facing shoulder **36** (FIG. **3**) of the sleeve, the sleeve is forced downward until its sharp lead-in edge **26** fits between the edge of bushing **20** of card-edge connector **12** and the side of the aperature in the plate. With plate **10** and connector **12** well supported and using an arbor press or a hammer, the sleeve is pushed between the bushing **20** and the side of the hole until shoulder **30** of the sleeve meets the end of the bushing as indicated at **38** (FIG. **2**). The sleeve is now fully installed.

An excellent connection is now provided between the contact tail and the plate since the spring fingers of the sleeve grip the contact tail firmly and since the fluted outer surface **34** of the sleeve engages the sides of the hole of plate **10.**

If necessary, the sleeve can easily be removed with the aid of a pliers having a knife-edge cylindrical grasping jaw. The pliers are used to grasp the extending fluted portion **40** (FIGS. **1** and **2**) of the sleeve, whereby the sleeve can be pulled upwardly to be removed. After such removal, thermoplastic hub **20** of connector **12** will spring back to its normal shape and still retain its contact firmly.

It is thus seen that an extremely simple, yet highly reliable and versatile means for grounding any contact tail to a plate is provided according to the invention.

It will be recognized that gripping fingers **32** can be spaced in a non-symmetrical fashion, rather than as indicated, in order to engage the sides of a non-square rectangular contact tail, if desired.

While the above description contains many specificities, these should not be construed as limitations upon the scope of the invention but merely as an exemplification of one preferred embodiment thereof. The true scope of the invention is indicated by the subject matter of the appended claims and their legal equivalents.

I claim:

1. For use with an electrical interconnection assembly of the type which comprises a perforated plate having conductive portions at least at the holes thereof, with electrically conductive elongated members mounted in said holes by means of compressible insulating bushings which are force-fit between said elongated members and the sides of said holes, the improvement comprising metal sleeve means for selectively connecting any of said members to said plate, said sleeve means, comprising a cylindrical conductive member having a central longitudinal axis, having one end tapered to sharp lead-in edge means for fitting between said bushing and the side of said hole, and finger means at the other end of said conductive member for gripping said member when said sleeve means is inserted thereover, said finger which coverage towards said central axis means including a plurality of resilient fingers.

2. For use with an electrical interconnection assembly of the type which comprises a perforated plate having conductive portions at least at the holes thereof, with electrically conductive elongated members mounted in said holes by means of compressible insulating bushings which are force-fit between said elongated members and the sides of said holes, the improvement comprising a sleeve for selectively connnecting any member to said plate, said sleeve comprising a cylindrical conductive member, one end of which is tapered to a sharp lead-in edge which is dimensioned to fit between said bushing and the side of said hole, the other end of which comprises a plurality of fingers dimensioned to grip said member when said sleeve is inserted thereover, said sleeve having a body which is straight along any longitudinal path thereon, and a cylindrical cross section, said outer surface being fluted to aid in making a good electrical connection with the sides of said hole.

3. For use with an electrical interconnection assembly of the type which comprises a perforated plate having conductive portions at least at the holes thereof, with electrically conductive elongated members mounted in said holes by means of compressible insulating bushings which are force-fit between said elongated members and the sides of said holes, the improvement comprising a sleeve for selectively connecting any member to said plate, said sleeve comprising a cylindrical conductive member, one end of which is tapered to a sharp lead-in edge which is dimensioned to fit between said bushing and the side of said hole, the other end of which comprises a plurality of fingers dimensioned to grip said member when said sleeve is inserted thereover, said sleeve including a shoulder surface on the inside of said sleeve adjacent said other end thereof and facing said one end thereof for limiting travel of said sleeve when it meets said bushing after said sleeve is inserted between said bushing and said side of said hole.

4. For use with an electrical interconnection assembly of the type which comprises a perforated plate having conductive portions at least at the holes thereof, with electrically conductive elongated members mounted in said holes by means of compressible insulating bushings which are force-fit between said elon-

gated members and the sides of said holes, the improvement comprising a sleeve for selectively connecting any member to said plate, said sleeve comprising a cylindrical conductive member, one end of which is tapered to a sharp lead-in edge which is dimensioned to fit between said bushing and the side of said hole, the other end of which comprises a plurality of fingers dimensioned to grip said member when said sleeve is inserted thereover, said fingers extend outward from the end of said sleeve toward an imaginary center axial extension of said sleeve.

5. For use with an electrical interconnection assembly of the type which comprises a perforated plate having conductive portions at least at the holes thereof, with electrically conductive elongated members mounted in said holes by means of compressible insulating bushings which are force-fit between said elongated members and the sides of said holes, the improvement comprising a sleeve for selectively connecting any member to said plate, said sleeve comprising a cylindrical conductive member, one end of which is tapered to a sharp lead-in edge which is dimensioned to fit between said bushing and the side of said hole, the other end of which comprises a plurality of fingers dimensioned to grip said member when said sleeve is inserted thereover, said sleeve having a body portion between said two ends thereof which has a cylindrical cross section of uniform diameter, a reducing portion adjoining the end of said body portion remote from said one end of said sleeve which narrows the diameter of said sleeve, said fingers adjoining a surface of said reducing portion adjacent the axis of said sleeve.

6. The invention of claim **5** wherein said reducing portion has an inner surface which forms a shoulder facing said one end of said sleeve, thereby to limit travel of said sleeve when said shoulder meets said bushing after said sleeve is inserted between said bushing and the side of said hole.

7. The invention of claim **6** wherein said fingers extend outwardly from said sleeve toward an imaginary central extension of said sleeve, said fingers are four in number, and each has an arcuate cross section.

8. The sleeve is claim **5** wherein said fingers extend outwardly from the end of said sleeve toward an imaginary central axial extension of said sleeve.

9. The sleeve of claim **8** wherein said fingers are four in number, so as to grip effectively an elongated member with a rectangular cross section, and wherein each finger has an arcuate cross section.

10. The sleeve of claim **6** wherein said fingers are four in number, each having a curved cross section.

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