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ELECTRICAL CONNECTOR

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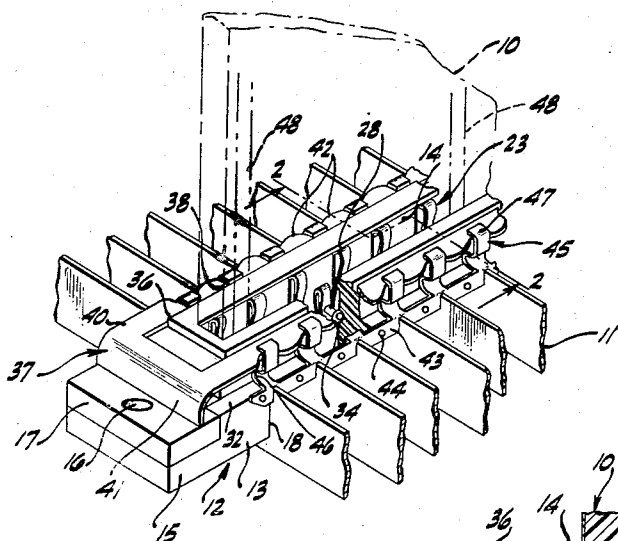


FIG. 1.

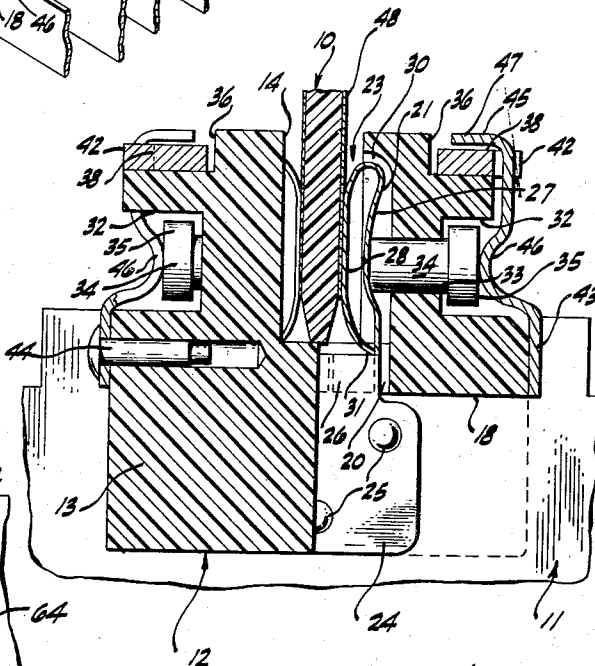


FIG. 2.

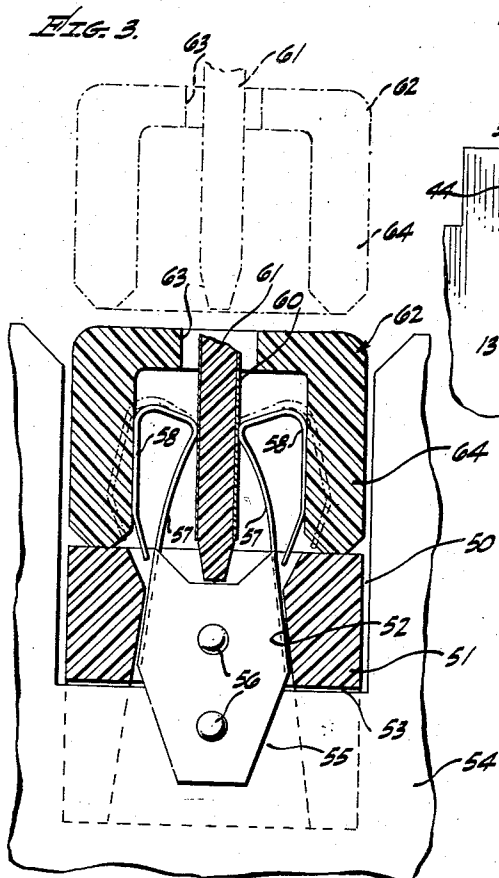


FIG. 3.

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ELECTRICAL CONNECTOR

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3 Claims. (Cl. 339—17)

This invention relates generally to a positive pressure contact arrangement and relates more specifically to an apparatus for establishing connection between one printed wiring element and other either separate leads or adjacent printed wiring elements.

Contemporary electronic and electrical devices employ a considerable number of printed circuits including etched or plated wiring on dielectric base material, with the printed wiring sheets thus established being adapted to support various electrical and electronic components. In order that these sheet units may be effectively utilized, it is important that means be provided to enable attachment thereof to other components in a manner whereby to provide adequate contacts and removability when desired. However, inasmuch as most of the printed circuit units are relatively long with connector strips extending to the edge of such units and normal thereto, it is necessary that the pressure of contact clip elements or springs be relatively light in order to enable manual insertion of the units without undue application of force thereto. With this existing necessity, it has been found, however, while light contact pressures enable easy insertion and removal of circuit carrying plates, insufficient pressure exists to provide the necessary forces to establish adequate electrical connections. In other words, due to the presence of foreign materials and corrosive substances, light contact pressure either fails to penetrate such materials and provide firm electrical connection, or creates a restricted flow plath for electrical energy thus causing high electrical resistance across the various elements of the contact and connector.

Additionally, in order that the printed circuits may be used to the greatest advantage, that is, to provide space saving together with simplicity and reduced weight, it is important that any additional mechanism, plugs, attachments or fixtures employed with the circuits also utilize similar characteristics in order not to defeat the very purpose of using printed wiring circuitry.

Accordingly, it is one important object of the present invention to provide a novel positive pressure electrical contact arrangement.

It is another important object of the present invention to provide a novel positive pressure contact arrangement including dual pressure means, operatively associated with such contacts, which may be either manually or automatically energized.

A further important object of the present invention is to provide a novel means for connecting one printed wiring circuit element with another.

Still another object of the invention is to provide novel light weight, simple, effective, reliable and inexpensive means for effecting dual contact pressure between contact elements and a printed wiring circuit unit.

A still further object of the invention is to provide a novel positive pressure electrical contact arrangement for use between any of a great number of electrically connected structures wherein a female receptacle is adapted for reception of a male element, there normally

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being light contact pressure therebetween, and wherein means are provided for effecting relatively heavy contact pressure thereafter in order to establish adequate connection and firmly to hold the male element with respect to the receptacle.

Other and further important objects of the present invention will become apparent from the disclosures in the following detailed specification, appended claims and accompanying drawing, wherein:

Figure 1 is an isometric view showing the electrical contact arrangement of the present invention;

Fig. 2 is an enlarged fragmentary sectional view taken substantially as indicated by line 2—2, Fig. 1;

Fig. 3 is a sectional view similar to Fig. 2 showing a modified form of the present invention.

With reference to the drawing, the invention is shown associated with the connection of one printed circuit element 10 with a plurality of bus sheets or bars 11. However, it is to be understood that the circuit bus sheets or bars 11 may be any type of printed circuit elements, connections or conductors, may be of dielectric material or otherwise and may have various wires or leads connected thereto as may be desired.

With specific reference to Fig. 1, a receptacle, indicated generally at 12, includes an elongated body portion 13 having an elongated generally rectangular aperture 14 therein. The body portion 13 is preferably made from any suitable dielectric material. The ends of the body 13 are provided with reduced thickness extension portions 15 to provide means for mounting the body 13 to an adjacent structure as by a screw, bolt or the like inserted through an opening 16 in a spacer 17 and through a like opening in the extension 15. The body 13 has a plurality of spaced transverse slots 18 in the lower surface thereof, these slots being adapted for reception of the printed wiring circuit elements 11. It is noted that the slots 18 and the aperture 14 are provided with a communication by means of a plurality of openings 20, Fig. 2. The walls of the aperture 14 are further provided with a plurality of vertically disposed recesses 21 that are spaced and approximately aligned with the slots 18 in the body 13.

As shown in Figs. 1 and 2, a plurality of spring contact elements, indicated generally at 23, are connected to the circuit elements 11, are positioned with portions thereof within the recesses 21 and extend into the elongated aperture 14. Each of the contact elements 23 is made from a metallic integral structure including a plate portion 24 that is secured to one of the circuit elements 11 as by rivets or eyelets 25, for example. This portion 24 of the contacts 23 may be connected either to printed circuitry on the elements 11 or to various fittings or leads as may be desired in particular installational situations. The plate portion 24 has a reduced width portion 26 which extends into the opening 20, there being outer spring portions 27 disposed from the reduced width portion 26 and inner spring portions 28 with the portions 27 and 28 being joined by curved portions 30. The portions 28 are adapted to overlie the portions 27 with the free ends thereof being normally disposed in contact with the portion 27 as at 31 and adjacent an edge of the reduced width portion 26.

The receptacle body 13 is provided with elongated grooves 32 on each side thereof, there being a plurality of laterally extending bores 33 communicating between the bases of the grooves 32 and the recesses 21. Each of the bores 33 has positioned therein a pin 34 having an enlarged head 35. The pins 34 are free to float and move within the bores 33, with the inner ends of the pins 34 being adapted for engagement with the outer spring portions 27 of the spring contact members 23.

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The receptacle body 13 is further provided with a pair of elongated steps 36 along the upper outer edges thereof. A cam slide bar or member, indicated generally at 37 and having side portions 38, is positioned on the steps 36 and adapted for longitudinal slidable movement thereon, the side portions 38 being joined by end cross portions 40 having downwardly turning lips 41 thereon. The outer edges of the side portions 38 are scalloped to provide a plurality of cams 42.

Connected to each of the sides of the receptacle body 13 are elongated metallic spring clip structures 43 that are connected to the body as by means of screws, rivets or the like indicated at 44. The structures 43 have depended upwardly therefrom a plurality of pressure controlling spring portions 45, each of which is provided with a curved portion 46 that is adapted to bear against the outer surfaces of one of the heads 35 of the pins 34. Upper ends of the spring portions 45 are bent inwardly as at 47, normally to overlie upper surfaces of the cam slide side members 38 thus to retain the cam slide in position on the steps 36.

The cams 42 are adapted for cooperation with the spring portions 45 upon longitudinal movement of the cam slide 37, to move the portions 45 outwardly to decrease the inward force on the pins 34 and associated compression of the spring portions 27 and 28 of the spring contact members 23. Thus, when the cams 42 are moved to a position laterally outwardly to move the spring portions 45, light pressure is applied by the pins 34 to the spring contact portions 27 and 28 and the printed circuit element 10 may easily be inserted in order that contact strips 48 thereon may mate with and provide a connection between these strips and the spring contact members 23. Upon movement of the slide member 37 in a direction whereby the spring portions 45 will be positioned between the cams 42, the curved portions 46 retract by spring action and act to move the pins 34 laterally inwardly, thus to deform the spring portions 27 and 28 of the contact members 23 and create a heavy contact pressure between the contact members and the circuit strips 48 on the plate 10. Thus it may be seen that the plate 10 may easily be inserted in the receptacle 12 and contact made with the contact members 23 without undue force being applied to the plate and that proper and necessary heavy contact pressure may thereafter be established by the beforementioned easily accomplished longitudinal movement of the slide cam bar 37. The downwardly turned lips 41 on the cam bar serve to provide an attachment means to enable manual movement of the cam slide bar.

With reference to Fig. 3, a modified form of the invention is shown wherein a receptacle, indicated generally at 50, is provided with a body portion 51 of dielectric material and having an elongated aperture 52 therein. The body 51 is further provided with a plurality of transverse slots 53 in which circuit elements 54 are positioned. Spring clip members 55 are secured to the circuit elements 54 by means of eyelets, rivets or the like indicated at 56 and extend upwardly through the aperture 52. The elements 55 have inner and outer spring portions 57 and 58 respectively that are adapted for contact with circuit strips 60 on a printed wiring circuit board 61. Varying contact pressures between the spring portions 57 and the contact strips 60 are established by means of an elongated pressure increasing member 62 of dielectric material, that is generally U-shaped in cross section and has an elongated slot in the upper wall portion 63. The elongated side wall portions 64 of the member 62 are adapted for engagement with the outer spring members 58 whereby to move such spring members, together with the spring members 57, laterally inwardly to establish the heavy contact pressure necessary as described hereinbefore. In this modified form of the invention, as shown by the dotted lines in Fig. 3, the member 62 may be removed vertically to relieve the heavy contact pres-

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sure between the spring members 57 and the contact strips 60 when it is desired to remove the plate 61. The further operating characteristics of the modified form of the invention shown in Fig. 3 are similar to those described hereinbefore in connection with the form of the invention shown in Figs. 1 and 2.

Having thus described the invention and the present embodiments thereof, it is desired to emphasize the fact that many further modifications may be resorted to in a manner limited only by a just interpretation of the following claims.

What is claimed is:

1. An electrical connector comprising, in combination: an elongated receptacle body having an elongated aperture therein; a plurality of laterally disposed slots in said aperture; a plurality of spring contact members having portions disposed in said aperture and within said slots, said contact members being adapted for reception of a contact strip carrying edge portion of a printed wiring circuit board; means for connecting said contact members to an electrical energy carrying structure; spring elements secured to exterior surfaces of said receptacle body; a plurality of pins positioned in laterally disposed openings communicating between said slots and said exterior surfaces of said body; an enlarged head on outer ends of each of said pins, inner ends of said pins being adapted for engagement with said contact members, said heads being adapted for engagement with said spring elements; a slotted cam slide bar carried by and mounted for slidable movement on said body; a plurality of cams formed along inner edges of said bar and engageable with portions of said spring elements to effect movement of said spring elements relative to said pins and said contact members to vary contact pressure of said contact members relative to said contact strips of said circuit board; and a tab formed on ends of each of said spring elements, said tabs being disposed to overlie said slide bar, slidably to retain said bar in position on said body.
2. An electrical connector comprising, in combination: an elongated receptacle body having an elongated generally rectangular aperture therein; a plurality of laterally disposed slots in facing walls of said aperture; a plurality of spring contact members having portions disposed in said aperture and within said slots, said contact members being adapted for reception of a contact strip carrying edge portion of a printed wiring circuit board; means for connecting said contact members to an electrical energy carrying structure; interconnected spring elements secured to exterior surfaces of said receptacle body; a plurality of pins positioned in laterally disposed openings communicating between said slots and said exterior surfaces of said body; an enlarged head on outer ends of each of said pins, inner ends of said pins being adapted for engagement with said contact members, said heads being adapted for engagement with said spring elements; a slotted cam slide bar carried by and mounted for slidable movement on said body; a plurality of integral scalloped cams formed along inner edges of said bar and engageable with portions of said spring elements to effect movement of said spring elements relative to said pins and said contact members to vary contact pressure of said contact members relative to said contact strips of said circuit board; and an integral tab formed on free ends of each of said spring elements, said tabs being disposed to overlie said slide bar, slidably to retain said bar in position on said body.
3. An electrical connector comprising, in combination: an elongated dielectric receptacle body having an elongated generally rectangular aperture therein; a plurality of laterally disposed slots in facing walls of said aperture; a plurality of spring contact members having integral looped portions disposed in said aperture and partially within said slots, said contact members being adapted for reception of a contact strip carrying edge portion of a

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printed wiring circuit board; plate and rivet means for connecting said contact members to an electrical energy carrying structure; interconnected spring elements secured to exterior surfaces of said receptacle body; a plurality of pins positioned in laterally disposed openings communicating between said slots and said exterior surfaces of said body; an enlarged head on outer ends of each of said pins, inner ends of said pins being adapted for engagement with said contact members, said heads being adapted for engagement with inwardly curved portions of said spring elements; a slotted cam slide bar carried by and mounted for slidable movement on said body; means for limiting movement of said slide bar; a plurality of integral scalloped cams formed along inner edges of said bar and engageable with portions of said spring elements to effect movement of said spring elements relative

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to said pins and said contact members to vary contact pressure of said contact members relative to said contact strips of said circuit board; and an integral tab formed on free ends of each of said spring elements, said tabs being disposed to overlie said slide bar, slidably to retain said bar in position on said body.

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