

[54] PRINTED CIRCUIT BOARD EDGE CONNECTOR

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[22] Filed: Dec. 31, 1969

[21] Appl. No.: 889,427

[52] U.S. Cl. 339/184 M, 339/17 L, 339/220 R, 339/263 R

[51] Int. Cl. H05k 1/07, H01r 13/64

[58] Field of Search 339/17 F, 17 L, 17 LC, 17 LM, 339/17 M, 176 M, 176 MF, 176 MP, 184 M, 186 M, 191 M, 192 R, 198 R, 198 P, 198 S, 217, 219, 220

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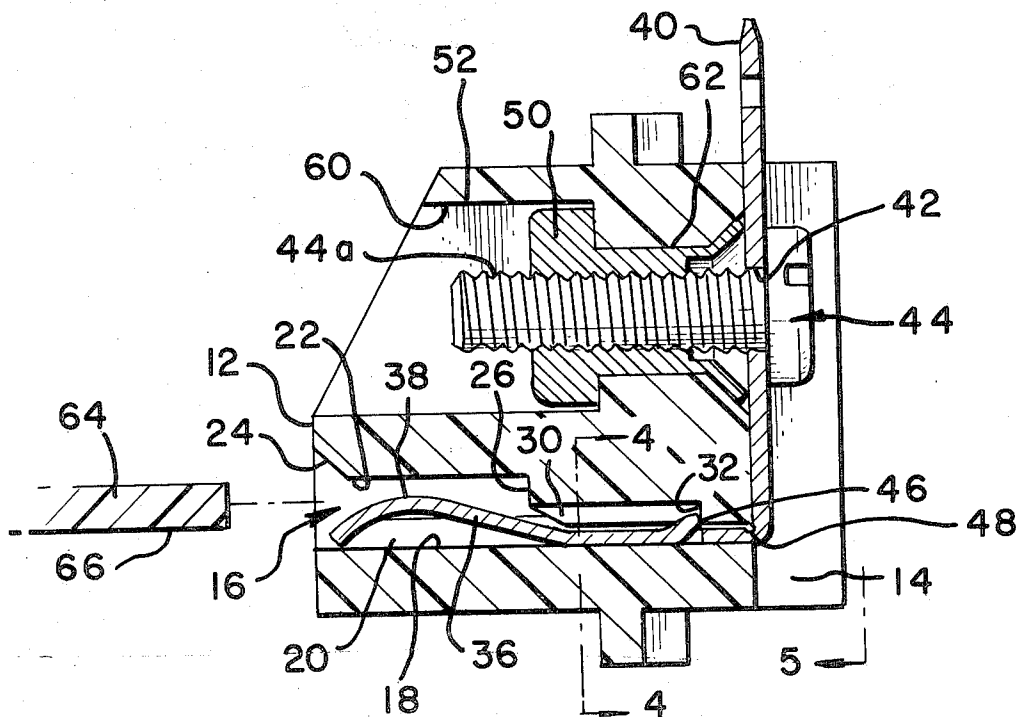
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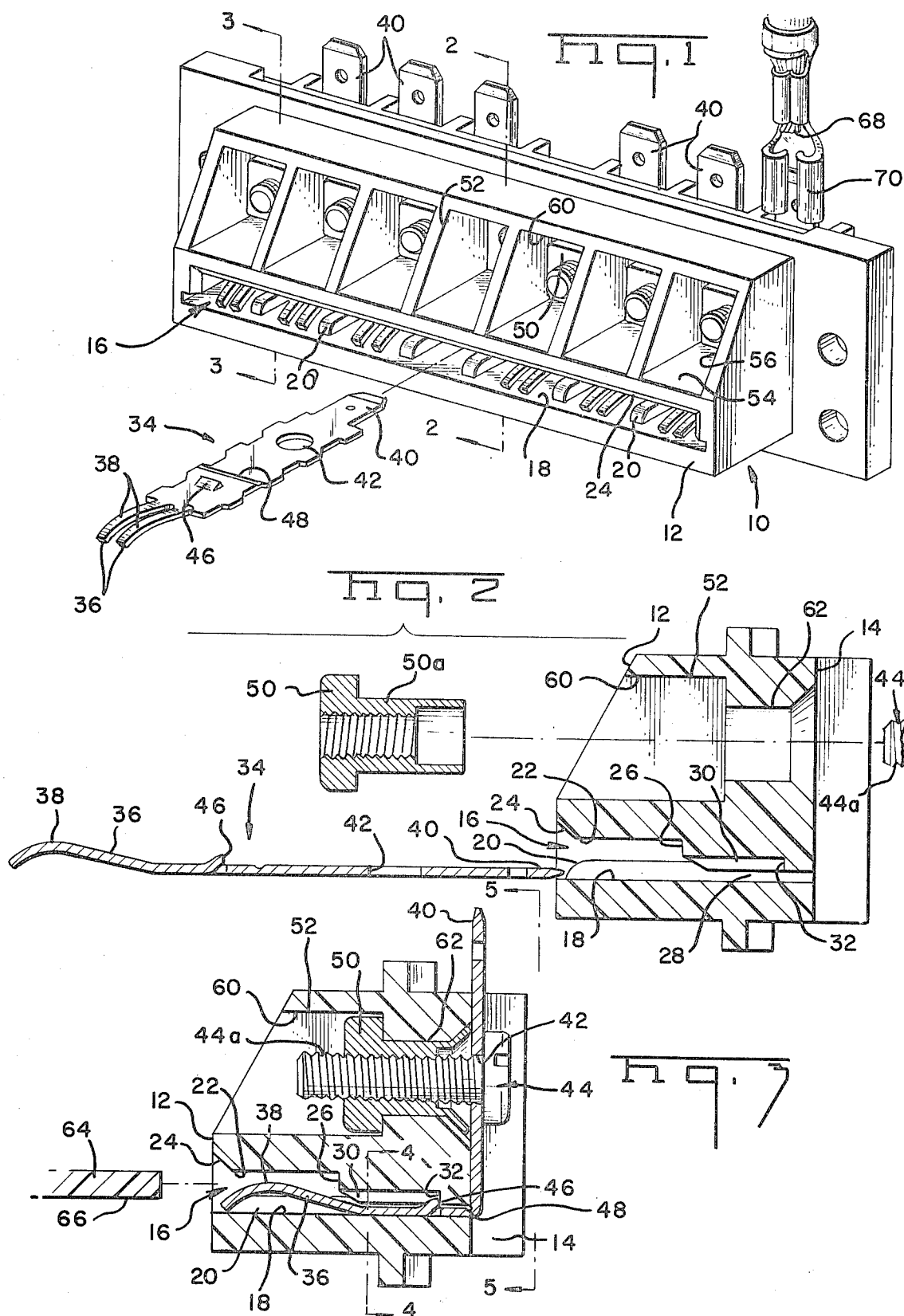
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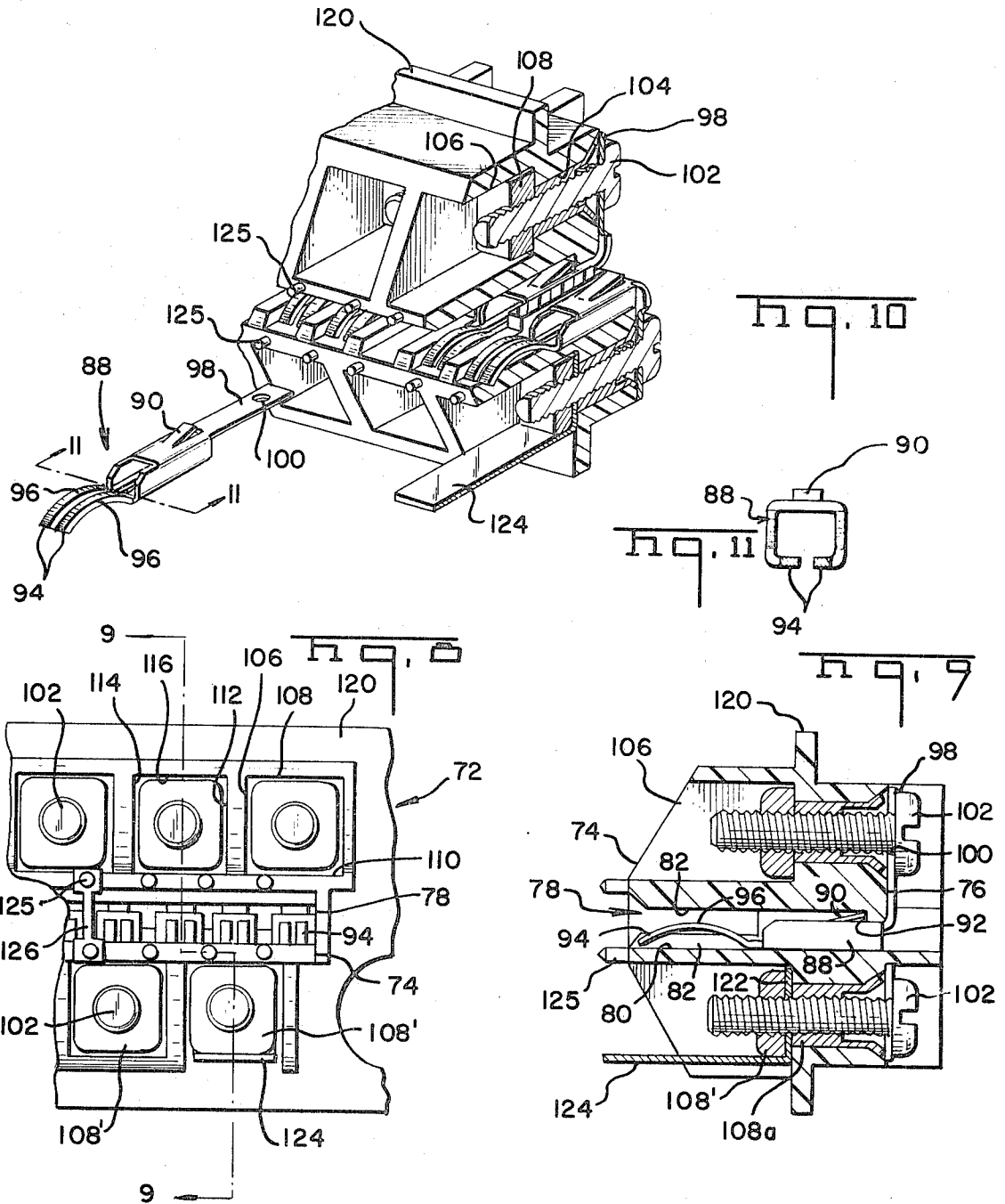
[57] ABSTRACT

The disclosure relates to a one-piece molded housing having terminals located therein in a cavity for making electrical contact with a printed circuit board and the like. At one end of the terminal are circuit engaging fingers for engaging a circuit on a printed circuit board, and at the other end is a hole for receiving a screw which secures the terminal end to the housing in conjunction with a nut; the screw receiving under its head the bared end of wire conductor. This end of the terminal may also have extending therefrom a tab portion for mating engagement with a receptacle terminated wire conductor.

6 Claims, 11 Drawing Figures







PRINTED CIRCUIT BOARD EDGE CONNECTOR

The present invention relates to a connector for connecting a plurality of electrical conductors, and more particularly to a connector for connecting a flat cable conductor or circuitry on a printed circuit board to a bare end or terminated wire conductor.

In many circuit applications, it is necessary to provide non-permanent interconnection between a packaged plurality of electrical conductors and a plurality of individual wire conductors. Such packaged electrical conductors may be in the form of printed circuits on a printed circuit board or may be in the form of a series of conductors comprising a flat flexible cable wherein a plurality of such conductors are encapsulated between two thin insulating layers with each conductor insulated from the other. The wire conductors may have bare lead ends or such ends may have terminals secured thereto.

The prior art provides for such connections by using intermediate connector means permanently mounted to the packaged plurality of conductors and adapted to releasably connect with bare or terminated wire conductors. In the alternative, individual wire conductors are soldered to the individual conductors in the packaged plurality of conductors or the wire conductors have terminals thereon adapted to be secured in a housing, which housing, in turn, receives the edge of printed circuit board or the end of a flat flexible cable. As can be seen, none of the above practices provide for easy disconnection of the individual wire conductor from its respective matching conductor in the flexible cable or printed circuit board.

It is therefore an object of the present invention to provide a new and novel connector assembly.

It is further object of the present invention to provide a new and improved connector assembly wherein individual bare end wire conductors may be releasably connected to a flat flexible cable or printed circuit board.

It is still a further object of the present invention to provide a new and improved connector assembly wherein individual terminated wire conductors may be releasably connected to a flat flexible cable or printed circuit board.

It is an additional object of the invention to provide a connector assembly for connecting individual wire conductors to a flat flexible cable or printed circuit board wherein the connector has keying provisions thereon to permit selective keying combinations.

These and other objects are achieved by providing a connector having a cavity in one face in which a plurality of contacts are disposed. This cavity is adapted to receive the end of a flat flexible cable or the edge of a printed circuit board with the contacts in electrical engagement with respective circuitry of the cable or circuit board. Portions of the contacts extend through the housing with the ends secured to the rear face of the housing by screw and nut means. Each screw is adapted to be backed off to receive under the head thereof the bared end of a wire conductor. In one embodiment, provision is made for the extreme end of the contact to extend beyond the screw so as to receive thereon a terminated wire conductor. In another embodiment, means are provided on the front face of the cavity portion to receive a keying element so that only the proper cable or circuit board may be inserted into the cavity.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration and principles thereof and the manner of applying them in practical use so that they may modify them in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIG. 1 is a plan view of the connector assembly of the present invention showing one of the contacts used therein prior to assembly therein and showing in phantom a terminated wire conductor connected to one of the contacts;

FIG. 2 is an exploded section view along lines 2—2 of FIG. 1;

FIG. 3 is a section view along lines 3—3 of FIG. 1 and showing the flat flexible cable or printed circuit board prior to insertion;

FIG. 4 is a partial section view along lines 4—4 of FIG. 3;

FIG. 5 is a partial elevation view of the back face as seen from lines 5—5 of FIG. 3;

FIG. 6 is an elevation view of another embodiment of the present invention providing for closer centers between contacts;

FIG. 7 is a section view taken along line 7—7 of FIG. 6;

FIG. 8 is an elevation view of yet another embodiment of the present invention having provisions for a solder tab in the front face thereof;

FIG. 9 is a section view along line 9—9 of FIG. 8;

FIG. 10 is a sectioned plan view along line 9—9 of FIG. 8 showing one of the contacts used therein prior to assembly therein; and

FIG. 11 is a section view along line 11—11 of FIG. 10 showing the cross-sectional configuration of the contact depicted in FIG. 10.

Referring now to FIGS. 1—5, there is shown one embodiment of the edge connector of the disclosed invention. The connector 10 is an elongated housing of a suitable insulating material, such as polycarbonate, having a front face 12 and a rear face 14. The front face 12 has a cavity therein, as indicated at 16. Cavity 16 has a first sidewall 18 having raised ribs 20 thereon spaced from each other, and a second sidewall 22 beveled as at 24 for reasons to be explained. Normal to sidewalls 18, 22 is a rear wall 26. Communicating between rear wall 26 and rear face 14 of the housing are a plurality of passageways 28 each having an enlarged portion 30 which ends with shoulder means 32. Adapted to be received within each passageway 28 is a contact 34 of a suitable electrically conductive material having resilient fingers 36 at an end thereof, each with a bowed intermediate portion 38. At the other end are wire conductor termination means which include a spade-type terminal 40. Also included as part of this end of contact 34 is hole 42 which, as seen in FIGS. 3 and 5, receives screw 44 therethrough. Located intermediate the two ends of contact 34 is a raised stop member 46 and a scored or weakened portion 48.

With reference to FIGS. 1—3, it is seen that each contact 34 is assembled into the housing 10 by inserting the terminal end 40 into cavity 16 between two ribs 20 and through passageway 28 until stop member 46 abuts against shoulder 32. As can be seen, the bevel portion 24 facilitates insertion of contact 34 by eliminating a corner upon which stop 46 could catch. After full insertion the contact is bent at the scored portion 48 (see FIG. 3); screw 44 is inserted through the hole 42, and nut 50 secured thereon.

For each contact 34 and passageway 28 there is a recess 52 each adapted to receive a nut 50 therein. Each recess has a first wall 54 common with cavity 16, second and third walls 56, 58, respectively, parallel and spaced from each other and normal to first wall 54. A fourth wall 60 joins walls 56, 58 and is spaced from and parallel to wall 54. Communicating between each recess 52 and the rear face 14 of housing 10 is an aperture 62. This aperture receives the sleeved portion 50a of nut 50, which in turn receives the threaded portion 44a of screw 44. It is obvious from this arrangement that the contact 34 is rigidly secured to housing 10.

With reference to FIG. 3, the printed circuit board or flat flexible cable 64 is inserted into cavity 16 with the bared circuitry 66 facing down so as to electrically engage the intermediate portion 38 of contact fingers 36. The ribs 20 serve to support the board or cable thereby preventing overstressing of the contact fingers 36. To complete a connection to the board or cable, a wire conductor is secured to the terminal end 40 of the contact either by providing the wire conductor 68 with a mating terminal 70 (see FIG. 1) or, more preferably, backing off screw 44 and securing the bared end of the wire conductor between the screw head and the contact and tightening down

the screw (see FIG. 5). It is to be noted that, because of the curvature of contact fingers 36, these fingers extend above ribs 20 providing a built-in resiliency in the fingers thus ensuring a good electrical contact with circuitry 66 on board 64.

Turning now to FIGS. 6-11, there is shown two modified embodiments of the invention, one differing only slightly from the other. These modes provide for closer center-to-center spacing of contacts. In these figures there is shown housing 72 having a front face 74 and a rear face 76. In front face 74 there is a cavity 78 having a first sidewall 80 and a second sidewall 82. Located on first sidewall 80 are a plurality of raised ribs 82 which function to support a printed circuit board or flat cable. Such board or cable will abut rear wall 84 which serves to limit the depth of insertion of such board or cable. Connecting the rear wall 84 with the rear face 76 are a plurality of passageways 86, each passageway being located between two ribs 82. Located in each passageway is a contact 88, of a suitable electrically conductive material as better illustrated in FIG. 10. This contact 88 is inserted into passageway 88 until a stop member 90 thereon abuts with a shoulder 92 located in the passageway. Thereafter the termination end portion 98 is either bent up or down 90°, depending on which passageway it is in, to allow for securing same to the housing 72. At one end of the contact 88 are fingers 94 cantilevered to the contact body. These fingers are bowed and have intermediate portions 96 which extend above the raised ribs 82 (see FIGS. 7 and 9) and make electrical contact with circuitry on the bottom of the inserted circuit board or cable (not shown). The ribs 82 will prevent any overstress of the contact fingers 94. Extending from the other end of contact 88 is termination end 98 which has a hole 100 therethrough. The contact 88 is generally rectangular in cross section (see FIG. 11) and formed from a one-piece blank. The hole is designed to receive a screw 102 therethrough, which screw extends through aperture 104 into recess 106 and receives thereon nut 108. Each recess has a first wall 110 common with said cavity, second and third walls 112, 114, respectively, normal to wall 110 and parallel to each other, and a forth wall 116 spaced from and parallel to wall 112.

As in the previous embodiment, a circuit board or flat cable with bared circuitry facing down is inserted into cavity 78. The connection is completed by backing off screw 102 and placing a bared end of a wire conductor between the screwhead and the contact and then tightening down on the screw. Although terminal tabs are not shown as a part of contact 88, it is foreseen that they could be.

In FIGS. 8, 9, and 10, one recess and cooperating nut are modified to provide for a solder tab extending from the front face of the housing. In all embodiments the housing is mounted in a panel with the front face on one side and the rear face on the other side thereof. To facilitate mounting in a panel, holes 118 are provided in the flange portion 120 of each housing. As seen in FIGS. 8-10, the forth wall of one end recess is deleted and the nut 108 modified as shown in FIG. 9 to allow one end 122 of a solder tab 124 to be secured between the nut 108 and screw 102. A sleeve 108a is provided to provide a tight fit in aperture 104 for screw 102. This tab allows for an extraneous wire to be secured at the front of the panel allowing for mounting of an indicator light or the like on the front of the panel.

Also shown in the embodiment of FIGS. 8-10, and easily adapted to the other embodiments, are projections 125 which facilitate the use of a key 126. This key bar has holes at either end and readily mounts on any two opposing projections 125. In this manner connector 72 will only receive a specific board

or cable with a mating key slot.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein are intended as merely illustrative and not as restrictive of the invention.

We claim:

1. An edge connector for making electrical connection to a printed circuit board and the like comprising an elongated housing of electrically insulating material having a front face and a backface, an elongated cavity in said front face adapted to receive therein one edge of a printed circuit board, said front face including a plurality of recesses, a plurality of apertures in said housing, each aperture communicating with said backface and one each of said recesses, said cavity having a rear wall, a first sidewall and a second sidewall spaced from each other and normal to said rear wall, said first sidewall having raised ribs on its inside surface offset from said passageways, said raised ribs limiting the width of said cavity thereby limiting lateral movement of said printed circuit board upon insertion into said cavity, a plurality of passageways in said housing in communication between said rear wall and said backface, a contact positioned within at least one of said passageways, one end of said contact including circuit engaging means extending from one end of said passageway into said cavity for engaging circuitry on said printed circuit board, said circuit engaging means comprising at least one curved finger cantilevered to said contact, the free end of said finger engaging said inside surface of said first sidewall with an intermediate portion of said finger extending above the height of said raised ribs so as to make electrical contact with said circuitry on said printed circuit board, and the other end of said contact including wire conductor termination means for making electrical contact with a wire conductor, said termination means including a hole, and screw means cooperating therewith for securing said wire conductor to said other end of said contact, and wherein said screw means comprises a screw passing through said hole in said contact and through one of said apertures and extending into a respective one of said recesses, and a nut received in said recess and being threaded onto said screw.

2. An edge connector as set forth in claim 1 wherein each said recess has a first wall common with said cavity, second and third spaced parallel walls adjoining said first wall and normal thereto, and a fourth wall joining said second and third walls, spaced from and parallel to said first wall, and wherein said second and third walls act as supports for said second sidewall of said cavity.

3. An edge connector as set forth in claim 2 wherein said contact is positioned in said passageway by insertion into said passageway, said passageway having shoulder means therein, and said contact having stop means protruding therefrom for engagement with said shoulder means thereby allowing for proper positioning of said contact within said passageway.

4. An edge connector as set forth in claim 3 wherein said other end of said contact additionally includes a terminal portion integral therewith, said terminal portion adapted to mate with a terminated wire conductor.

5. An edge connector as set forth in claim 3 including a key element, and wherein said first and second sidewalls of said cavity have located on their front face edges means to selectively receive said key element.

6. An edge connector as set forth in claim 3 wherein each said passageway contains a contact and each cooperating recess and aperture contains a nut and screw.

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