

[54] **TERMINAL BLOCK CONNECTORS**

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[58] Field of Search 339/19, 198, 242, 22 R, 22 B, 339/217 S, 217 PS, 204, 205, 210, 207, 206, 253, 258 P

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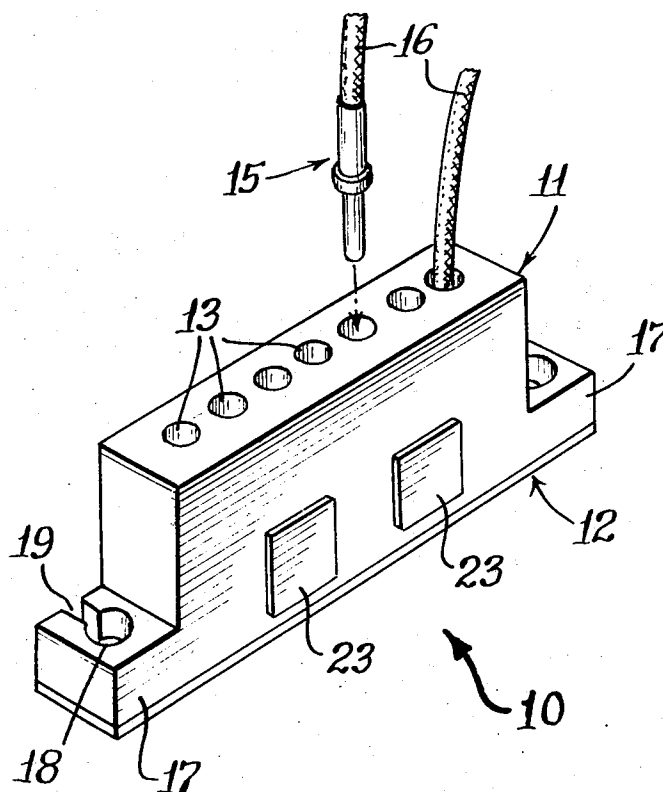
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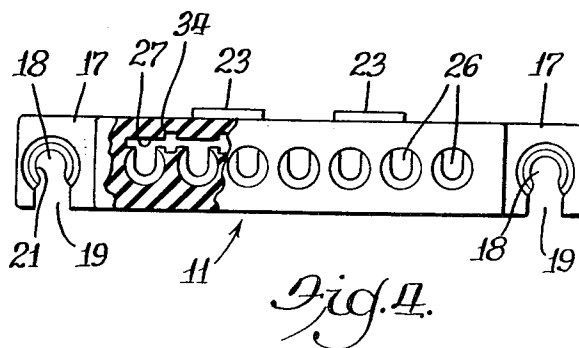
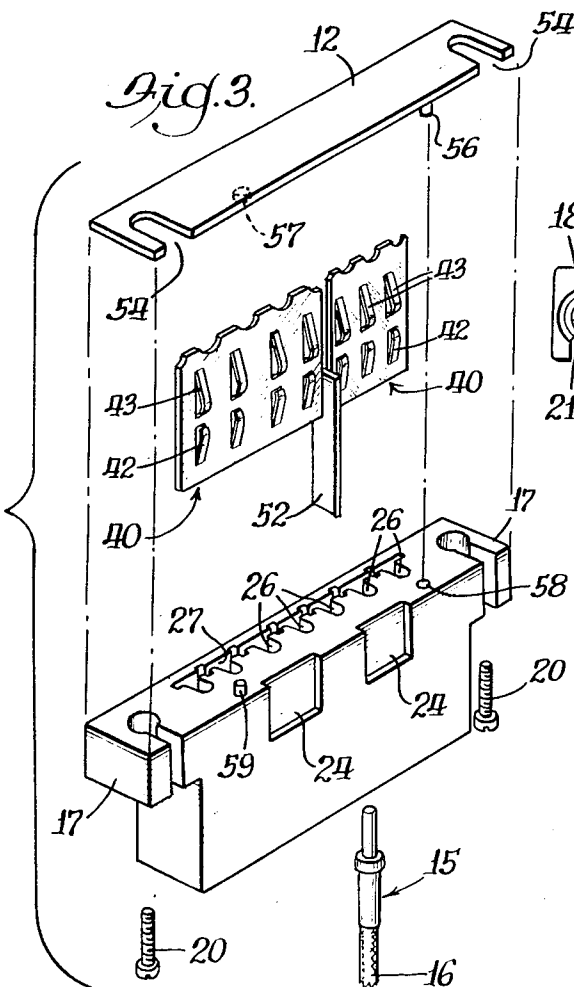
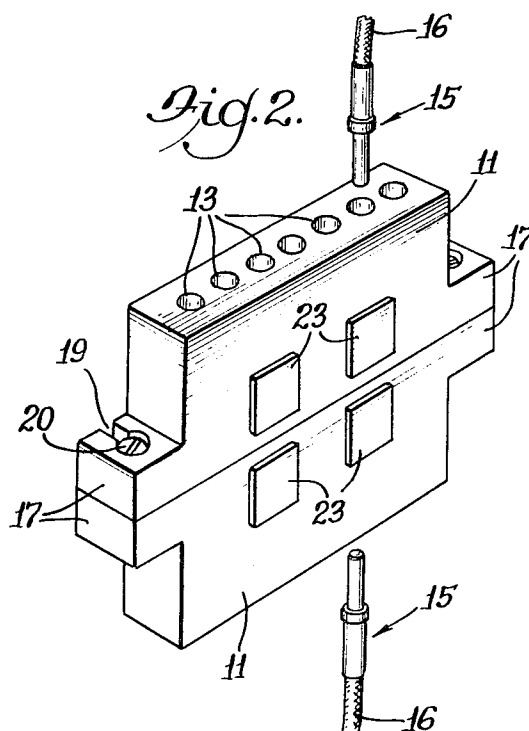
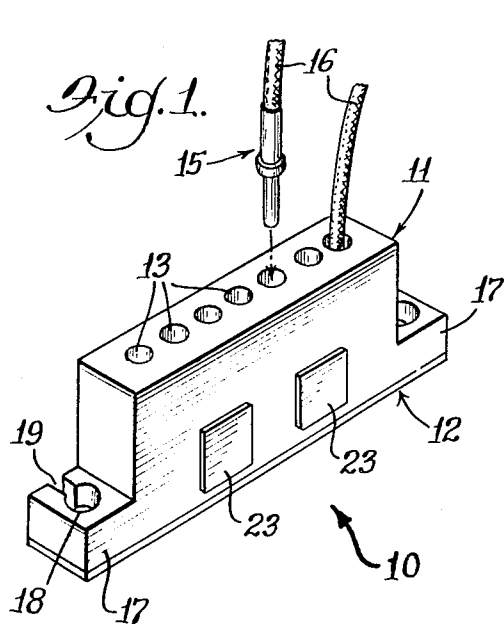
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[57] **ABSTRACT**

A terminal block connector of the feed-thru or feed-back variety for use preferably with a standard pin contact. The pin contact is retained within the terminal block by a metal tang struck outwardly from a flat piece of sheet metal, and the electrical contact within the terminal block is struck outwardly from the same piece of sheet metal. This piece of sheet metal resides within a slot within the terminal block body, and the retainer and contact tangs extend into the cavities which receive the male contacts.

6 Claims, 8 Drawing Figures

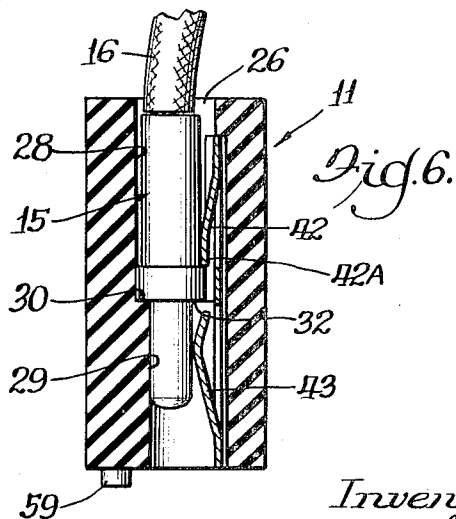
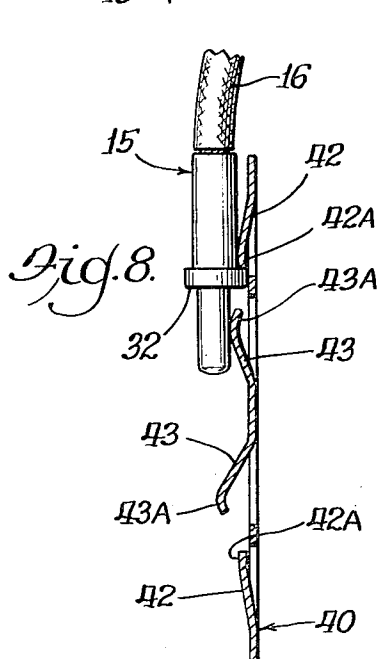
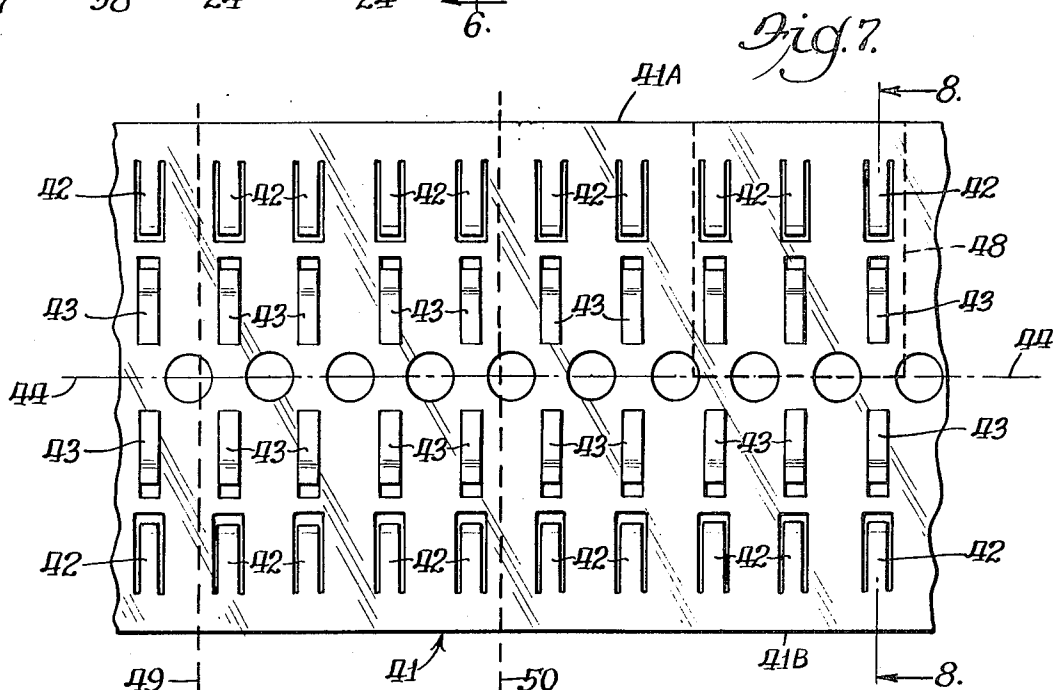
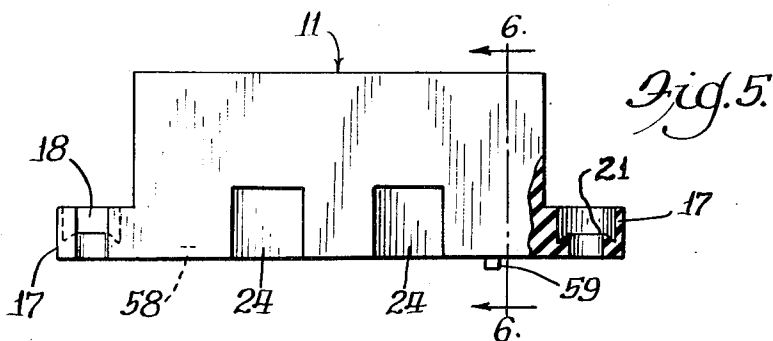




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TERMINAL BLOCK CONNECTORS

SUMMARY OF THE INVENTION

The present invention relates to an improved terminal block assembly incorporating a novel contact strip which is flat and includes retainer means thereon to prevent withdrawal of the male contact. This contact strip can be produced from a length of flat strip stock, and it can be produced by tooling which has the additional capability of dividing this continuous strip into small segments to provide generally any manner of bussing between a series of adjacent or axially aligned pins. Where no electrical transmission or continuity is desired between a given pair of pins, the connector body has provision for receiving a dielectric strip therebetween to assure that an electrical short does not occur.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a terminal block assembly of the feed-back type with one male contact in place and a second male contact about to be inserted, this terminal block assembly embodying the principles of the present invention;

FIG. 2 is a perspective view of a terminal block assembly of the feed-thru type, also incorporating the principles of the present invention, and also showing a pair of male contacts about to be inserted therein;

FIG. 3 is an exploded perspective view of the terminal block assembly shown in FIG. 1, but inverted relative thereto, and with various parts shown in their respective positions;

FIG. 4 is a plan view, partly cut away, of the main body portion of the terminal block;

FIG. 5 is an elevational view, partially cut away, of the main body portion of the terminal block;

FIG. 6 is a cross-sectional view of the main body portion of the terminal block taking substantially along the lines 6-6 of FIG. 5, but with the pin and retainer and female contact in place to show their respective positions;

FIG. 7 is a portion of a continuous strip of combination contact and retainers; and

FIG. 8 is a cross-sectional view of the strip shown in FIG. 6 taken substantially along the lines 8-8 of FIG. 6, and showing the physical relationship between a pin contact and the contact and retainer tangs on a combination contact and retainer element.

DESCRIPTION OF SPECIFIC EMBODIMENT

The following disclosure is offered for public dissemination in return for the grant of a patent. Although it is detailed to ensure adequacy and to aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how others may later disguise it by variations in form or additions or further improvements. The claims at the end hereof are intended as a chief aid toward this purpose, as it is these that meet the requirement of pointing out of the parts, improvements, or combinations in which the inventive concepts are found.

Referring now to the drawings, the feed-back terminal block generally 10 of FIG. 1 includes a main body portion 11 and a closure cap 12. Closure cap 12 defines generally what is considered to be the front or forward end of the terminal block, whereas the rear end of the terminal block is normally at the entry holes,

here designated 13, for the male contact means, herein shown as standard pin contacts 15. Male contact 15 is attached to the end of a wire lead 16.

Main body 11 is generally of rectangular parallelepiped configuration with an ear or flange 17 jutting outwardly from two sides thereof. Each flange 17 has a countersunk hole 18 therethrough and a side entry slot 19 leading therein. The countersunk hole 18 is for receiving the head and part of the shank of an appropriately sized screw therein for fastening the terminal block to a panel or track, not shown. Slots 19 permit the screws 20 to be first partially screwed into the track or panel, and then the terminal block assembly 10 can be easily snapped in place over the screws which are subsequently tightened down. This snapping in place is achieved by the fact that portions of the flange that define the hole 18 extend inwardly of the slot width, and thus interfere with the screw threads. At the bottom of the countersink which forms a portion of hole 18 is a conical buildup 21 of the dielectric material forming the main body 11, and this additional material is crushed into the threads of screws 20 when screws 20 are tightened down to thereupon increase the friction between the screws and flange 17, thus inhibiting the tendency for the screw to unscrew out of its mounting when used in a vibrating environment.

As is well known practice, a number of terminal blocks may be grouped together side by side, and their alignment is assured by the well known expedient of providing shallow projections such as at 23 on one side of the terminal block assembly, and shallow mating depressions 24 on the opposite side thereof. Thus, with the projection 23 of each of a plurality of connectors residing in the shallow depression 24 of a contiguous terminal block, the entire series can be effectively locked together as a unit merely by screwing down the first and last terminal block.

Internally, the main body 11 is hollowed out or cored to receive the male contact means 15 as well as the female contacts and other paraphernalia to be described later. Specifically, this cored out portion comprises a plurality of bores or cavities 26 which are aligned in a straight and elongate slot 27.

Cavities 26 are preferably aligned in a straight row and extend entirely through main body 11 from its rear end to and through its front end. Each cavity consists of a rear portion 28 and a forward or front portion 29 in axial alignment with the rear portion. These two portions of each cavity are separated generally by a rearwardly facing fixed stop or shoulder 30. As will be most easily understood upon a viewing of FIGS. 4 and 6, the rear portion 28 and front portion 29 of the cavity 26 are axially aligned and arranged to receive a male contact therein, this male contact having an appropriately sized shoulder 32 which abutts against the fixed stop 30.

Elongate slot 27 extends interferringly along one side of the row of cavities 26, breaking into each one along a common side, and thereby creates an intercommunication therebetween. Slot 27 extends in a lengthwise dimension relative to cavities 26 from the front of main body 11 to very nearly its rear end.

Between each adjacent pair of cavities 26 and extending transversely across the bridging slot 27 to each

side thereof is a cross-slot 34. Cross-slot 34 also extends from the front end of main body 11 to very nearly its rear end. Cross-slots 34 are designed to receive a dielectric barrier element, to be described in more detail later.

Carried within the internally cored out portion of the main body 11 is one or more combination contact and retainer elements, generally 40. Elements 40 are produced from an elongate strip 41 of conductive and resilient metal (a portion of which is shown in FIG. 7) which can later be divided into individual pieces to satisfy substantially any bussing required from the terminal block unit. Strip 41 includes longitudinal edges 41A and 41B. Referring now specifically to FIG. 7, a length of combination elements as originally blanked and formed includes a plurality of retainer tangs 42 in two different rows, one row being adjacent one edge 41A, and the other row being adjacent edge 41B.

Retainer tangs 42 are struck outwardly to the same side of strip 41, and their outer tips 42A are bent slightly back to avoid scratching the contact unduely. Each retainer tang 42 at one edge of the strip 41 is transversely opposite another tang 42 adjacent the other longitudinal edge. Also struck outwardly from the strip 41 is a resilient contact tang 43 adjacent to and spaced transversely inwardly from each of the retainer tangs 42. More specifically, these contact tangs 43 are positioned between the longitudinal center line or axis 44 of the strip 41 and the retainer tangs 42. Contact tangs 43 are formed to jut outwardly to the same side of the strip 41 as do the retainer tangs 42, and their outermost tip 43A is also bent back to avoid scoring the pin contact. Extending along the center line 44 at regular intervals are a plurality of circular holes 45 which merely serve to position the strip of metal 41 in the blanking and forming die.

In FIG. 3 there are shown two combination elements 40. The one shown at the left includes four pair of contacts and retainers, one contact and its adjacent retainer comprising a pair, while the combination element at the right shows three such pair. Each of these two combination elements represents and is made from a portion of the strip 41 of metal shown in FIG. 7. Specifically, if the strip of FIG. 7 is sheared along the U-shaped dashed line 48, the element 40 shown at the right in FIG. 3 is obtained. Likewise, if the strip 41 of FIG. 7 is sheared at dashed lines 49 and 50, and then again along the center line 44, two of the combination elements 40 will be formed which are equivalent to the one combination element 40 shown at the left in FIG. 3.

When a combination element 40 is entirely inserted into the slot 33 of the main body 11, the retainer tang 42 juts out into the rear portion 28, and the contact tang 43 juts out into the front portion 29, of the cavity 26. Their position and relationship relative to an inserted pin is shown best in FIG. 6.

When two or more combination elements 40 are used in a given main body 11, the possibility of an electrical short therebetween is minimized by insertion therebetween of a dielectric barrier 52 (see FIG. 3). Barrier 52 is merely a thin strip of nonconductive material which can be readily slipped into cross slot 34 before or after combination elements 40 are inserted into the main body 11.

Carried on the forward face of main body 11 is closure cap 12 which serves to dielectrically captivate elements 40 and barriers 52 within the main body 11. Closure cap 12 is simply a flat piece of material with a pair of notches 54 therein which align with the holes 18 and side entry slots 19 in the main body.

Closure cap 12 also has a projecting pin 56 and blind hole 57 (not visible in the drawings) which register with a mating hole 58 and pin 59, respectively, on the forward end of the main body. These pins and holes maintain alignment between these parts.

Assembly of the device is exceptionally simple. If a feed-back terminal block is desired with continuity between four pins, this continuity to be separated from continuity between another three pins, the combination elements 40 shown in FIG. 3 are used with a dielectric barrier 52 therebetween. If continuity between seven pins is desired, a single strip having seven adjacent pair of retainers and contacts can be cut from the long continuous strip 41 shown in FIG. 7, and this piece can be inserted in its entirety in the main body 11. As will be appreciated, various combinations can be achieved, and a main body having any number of cavities 26 can likewise be constructed.

After inserting the desired combination elements 40 and whatever dielectric barriers 52 are required, the bottom cap 12 is put in place and bonded, if desired, to the main body. This captivates the elements 40 and barriers 52 and completes the assembly. The assembly can then be mounted to a panel or on a track, if desired, and male pin contacts 15 can thereafter be inserted through the holes 13 at the rear end of the main body. As will be understood, during insertion the shoulder 32 on the pin 15 will cam back the outwardly extending retainer tang 42 until the leading surface of the shoulder 32 abutts the fixed stop 30 of the cavity 26. At this time, or slightly before, the retainer tang 42 snaps behind shoulder 32 to retain the pin 15 in the cavity. As the pin 15 is inserted, the leading end or contact portion of the pin will cam the contact tang 43 over and maintain electrical continuity therewith. Since the entry hole 13 must be of sufficient diameter to admit the shoulder 32 of the pin 15, and since the crimping barrel of the pin is of lesser diameter than shoulder 32, there remains a gap between the crimping barrel and the inner wall forming rear portion 28 of the cavity. This gap is sufficient to admit a thin tool therein to cam the retainer tang back and permit withdrawal of the pin 15 in a manner well known in the art.

In FIG. 2 there is shown a feed-thru variety of terminal block which is constructed of the same pieces discussed hereinbefore. Specifically, this feed-thru variety consists of two main body portions 11 of which one is inverted relative to the other so that the alignment hole 58 and alignment pin 59 of one main body portion register in the alignment pin 59 and alignment hole 58 of the other main body respectively. The combination element 40 used in this feed-thru variety is taken from the strip 41 in FIG. 7 by shearing any desirable number of transverse double-pairs, a double-pair merely being two pair transversely aligned between edges 41A and 41B of strip 41. For example, if it is desired that four pins inserted on one side of the feed-thru terminal block register with four pins on the opposite side thereof, then a combination element

achieved by shearing the strip 41 at locations 49 and 50 and leaving the entire width intact is used. The two main body portions 11 of FIG. 2 are separated, the combination element is inserted into one half, and the other main body 11 is brought over the exposed half of the combination element to form an assembly. In this configuration, no closure cap 12 is required. The two main body portions register alignment with one another by the interaction of their holes 58 and pins 59, and the two main bodies may be screwed together at their flanges 17 or glued. In this particular configuration, it is plausible to use one double-pair combination element 40. Thus, a pin inserted in one of the holes 13 could have electrical continuity only with a pin inserted in the aligned hole 13 of the other main body portion 11. Of course, numerous different combinations are available depending on how the strip 41 is sheared.

It will be appreciated that the same strip 41, requiring essentially one set of tooling, can be employed to produce an entire line of terminal block connectors, each having a different connection pattern or bussing arrangement than the other. It will also be appreciated that the shearing of the strip 41 into whatever combinations are desirable can be achieved in the next step immediately following the original blanking and forming of the strip so that the exact pieces required are received from the tooling without distinct secondary operations.

No doubt other designs following the concepts herein taught will be brought to mind upon a reading of this disclosure, and no doubt many of these will fall within the basic inventive concepts disclosed hereinabove.

I claim:

1. An electrical connector for receiving a male contact,

a dielectric body having an internal cavity and a rear end with a hole therein communicating with said cavity, said cavity having an internal sidewall including a forward portion and a rearward portion, said cavity also defined in part by slot means at one side thereof,

a substantially flat combination element carried in said slot means, said element constructed of resilient and conductive sheet stock and including contact means and retainer means, said retainer means comprising a finger struck outwardly from said element and sloping forwardly and interfering inwardly into said rearward portion of the cavity, said contact means comprising a finger struck outwardly from said element and sloping interfering inwardly into the forward portion of the cavity,

and other means covering and enclosing said combination element in said dielectric body,

whereupon insertion of said male contact into said cavity cams said retainer means and contact means

laterally and causes them to bear back against the male contact which is supported on its opposite side by the dielectric internal sidewall of the cavity.

2. The connector as set forth in claim 1, wherein said dielectric body includes a plurality of individual cavities which are interconnected by said slot means, and wherein said combination element forms an electrical bridge therebetween.

3. The connector as defined in claim 2, wherein said dielectric body includes mounting means for receiving a screw to thereby affix the body to a mounting panel, said mounting means comprising a hole and a side-access slot permitting side entry into said hole, said side-access slot being narrower at its junction with the hole than said screw to permit the connector to be snapped over the screw and be captivated thereby.

4. The connector as defined in claim 2, wherein said dielectric body includes mounting means for receiving a screw to thereby affix the body to a mounting panel, said mounting means comprising a hole for receiving a screw having a screw head, the hole at one end being defined by a buildup of upstanding dielectric material which is crushed under the head of said screw upon a tightening thereof to maintain intimate contact with the screw and resist the loosening thereof.

5. An electrical connector, comprising:

a connector body having a rear end and a front end, said body defined in part by an internal opening having a plurality of relatively large contact cavities interconnected by a thin and flat slot, each contact cavity having a fixed stop as well as a rear portion and a forward portion,

a contact element retained in said slot and forming an electrical bridge therebetween, said contact element being substantially thin and flat and having two sets of prongs extending outwardly therefrom, one set of said prongs comprising a plurality of contacts, each contact of which extends inwardly into a different one of the forward portions of one of said contact cavities, the other set of said prongs comprising retainers, each one of which extends inwardly into a different one of the rearward portions of the contact cavities,

a pin contact in each of said cavities, each pin contact including a shoulder for abutting said fixed stop, said pin contact also including means which interact with said retainers for preventing removal of said pin contact after insertion thereof into one of said cavities,

and means enclosing said contact element in said slot to retain it therein.

6. The connector as set forth in claim 5, wherein said connector body also includes cross-slot means between adjacent cavities and intersecting said slot for receiving a barrier element and dividing said slot into a plurality of discontinuous slots.

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