Aug. 26, 1969 W. T. MANSFIELD 3,464,054

ELECTRICAL CONNECTOR

Original Filed Oct. 22, 1965

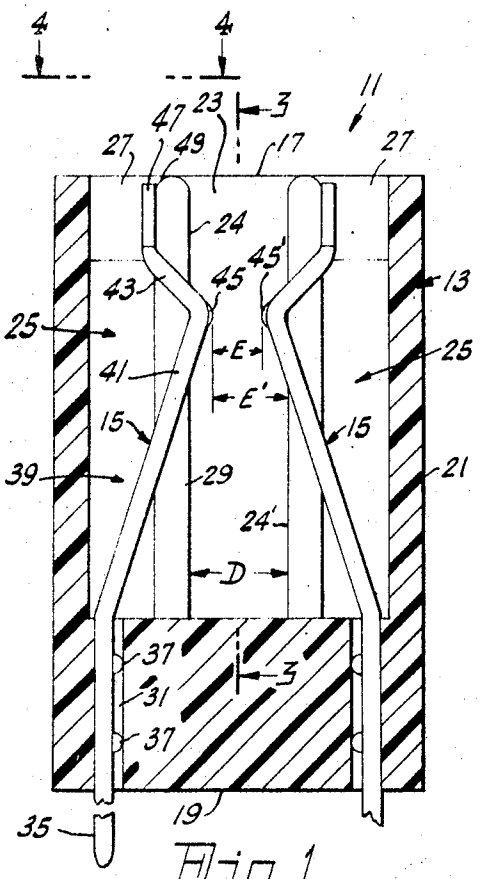


Fig. 1

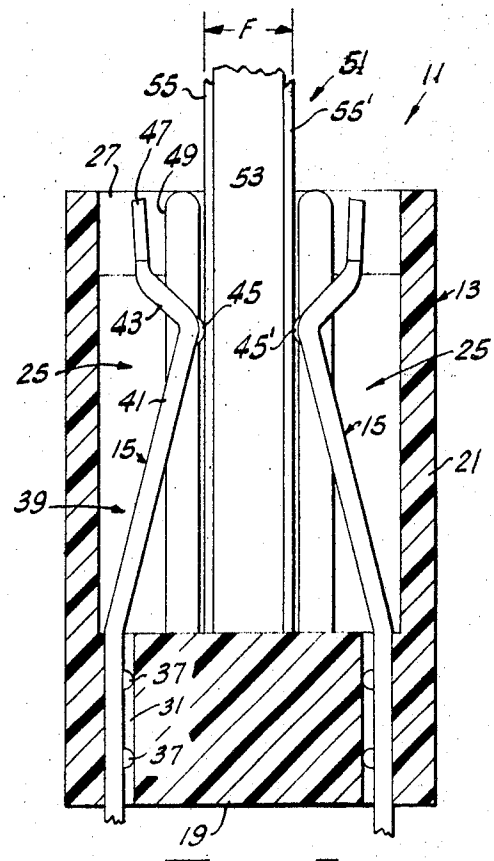


Fig. 2

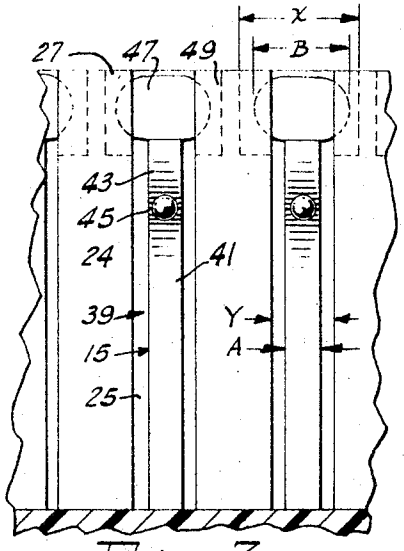


Fig. 3

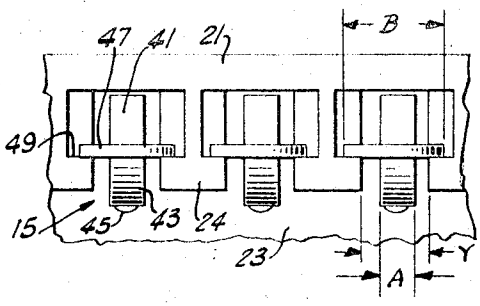


Fig. 4

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ELECTRICAL CONNECTOR

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Int. Cl. H05h 1/00; H01r 13/48
U.S. Cl. 339—176 2 Claims

ABSTRACT OF THE DISCLOSURE

An electrical connector wherein a plurality of longitudinal one-piece resilient contact members are individually formed of material of substantially uniform cross-sectional area and oriented in a pre-tensioned manner relative to a channel therein. Each member has a resilient element of a first width with a contact area formed thereon and an integral laterally formed flexure restraining termination of a greater width formed to cooperate with a portion of the channel wall to provide restricted flexured movement of the resilient element and limited protrusion of the contact area into the channel.

This application is a continuation of application S.N. 501,827, filed Oct. 22, 1965, and now abandoned.

This invention relates to electrical connectors and more particularly to a connector adapted to receive insertive connective means wherein the contacts are restrained to limited movement.

The electrical connector art has been extensively broadened through the increasing usage of printed circuit boards wherefor numerous connectors with slidable contacts have been developed. Since the multiple connection areas for printed circuitry are usually oriented in perimetric regions on the board, insertion of the edge portion thereof into a suitable connector consummates desired connection with compatible contacts contained therein.

A number of flat or leaf-type contacts have been developed, some of which have multiple layers and folds or bends to accentuate resiliency, while others have reverse bends to hook over projections in the connector assembly block to limit contact movement. In flat resilient materials, acute bends or folds tend to aggravate embrittlement and fracture of the material. Furthermore, such contacts, in addition to consuming extensive amounts of material, usually require complicated and expensive dies for fabrication.

Accordingly, it is an object of the invention to reduce the aforementioned disadvantages and to provide an improved connector wherein the contact members are adapted for restrained movement within the connector in conjunction with cooperative parts thereof.

A further object is to provide a connector having a formed contact member that lends itself to facile and inexpensive fabrication techniques.

Still another object is to provide a connector wherein the connector can be easily inserted and removed.

The foregoing objects are achieved in one aspect of the invention by the provision of an electrical connector having a body block with at least one open channel therein formed to receive the slidable insertion of printed circuit board connective means. Oriented within the block and adjacent to the channel are a plurality of contact members individually positioned and pretensioned to permit limited movement. Each contact member has a terminal element extending outward from the block and a flexible element retrained therein in a pre-tensioned manner with positioning means therebetween. The flexible element, which is formed with a portion thereof extending in a limtied fashion into the channel, is of a first width with a contact area formed thereon. A second width of the flexible element, being of a dimension greater than the first width thereof, forms a flexure restraining portion which cooperates with a portion of the channel wall to provide restricted contact movement. This permits the contact area to protrude a limited distance into the channel.

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following specification and appended claims in connection with the accompanying drawings in which:

FIGURE 1 is a sectioned view of the electrical connector showing the restrained positioning of the contacts therein;

FIGURE 2 is a sectional view of the connector illustrating a printed circuit board inserted therein;

FIGURE 3 is a section taken along line 3—3 of FIGURE 1; and

FIGURE 4 is another section of FIGURE 1 taken along line 4—4 thereof.

Referring to the drawings, the connector **11** comprises an insulative body block **13** wherein are positioned a number of one piece resilient contact members **15** longitudinally fabricated of material of substantially uniform cross-sectional area.

The insulative body block **13** has a substantially open face **17**, an oppositely disposed closed base portion **19** and an encompassing sidewall **21** therearound. Extending into the block **13** from the open face thereof is at least one elongated channel **23** having a width D between channel walls **24** and **24'** with a plurality of longitudinal recesses **25** opening from either side thereof. Each of these recesses, which extends substantially from the base portion **19** to the open face of the block, has at least an expanded portion **27** thereof having a lateral width X which is greater than that of the perpendicular recess opening width Y. At the bottom of each recess, an aperture **31** transverses the closed base portion of the block.

A one-piece resilient contact member **15**, oriented in each recess, has a terminal element **35** extending outward therefrom through the base portion aperture **31** to provide external connection means. Within the aperture are contact positioning means in the form of raised projections **37** on the contact member to provide a friction fit in the aperture **31**.

Extending above the positioning means and into the recess in a pre-tensioned manner is a flexible element **39** of the contact member having a first width A. This flexible element being preshaped comprises an ingressing portion **41** formed to emerge from the recess into the channel **23** and integrally join a counter regressing portion **43** to thereby consummate re-entrance into the recess; intermediate therebetween is an electrical contact area **45** which affords maximum contact protrusion into the channel.

Integrally extending from the regressing portion and terminating the pre-shaped flexible element is a substantially laterally formed flexure restraining portion **47** having a second width B which is greater than contact member first width A. This flexure restraining portion is oriented within the expanded recess portion **27** in a manner to be pre-tensioned against the forward wall **49** thereof to limit the forward movement of the contact area into the channel when at a state of rest before an insertive connective means or printed circuit board **51** is inserted thereinto. As shown in FIGURE 1 substantially opposed contact areas **45** and **45'** have a separation width E therebetween which prevents electrical shorting thereof. In those instances where contact members **15** are oriented on only one side of the connector channel, the position-

ing width E' designates the pre-tensioned rest positioning of the contact area relating to the opposing wall of the channel.

With paticular reference to FIGURE 2, the perimetric portion of a printed circuit board **51** is partially shown as being inserted within the elongated channel **23** of the connector **11**. The board having a width F, which is less than channel width D, is of conventional construction and comprises an insulative substrate **53** bearing discretely arranged circuitry connection areas **55** and **55'** on either surface thereof.

It will be noted that the aforedescribed pre-tensioned contact area separation or positioning widths E or E' respectively are less than board width F. Thus, with the insertion of the board into the channel, the contacts are spread farther apart in a manner to pressure the contact areas **45** and **45'** against the respective board connection areas **55** and **55'**; this action removes the flexure retaining portion **47** from the wall **49**.

The described embodiment of the invention utilizes a uniquely formed body block **13** wherein discretely shaped contact members **15** are compatibly oriented. The formed contact member, as aforedescribed, has at least two widths, the greater being that of the flexure restraining portion **47** terminating the contact member. This wide portion can be formed in several ways as by swaging, die stamping or bonding a portion thereto. The swaging technique has been found to be quite expeditious as the increased width can be discretely achieved from the width of material common to the remainder of the contact member. In addition, the forming of the one-piece contact member lends itself to simplified one-step fabrication. There are no tricky or fracture-aggravating bends or folds. Restrained contact movement is realized without resorting to complicated reverse bends. Furthermore, the frictionally-retained contact members can be easily removed and replaced through the open face of the connector block, there being no obstructions in the block to hinder such procedure. The individual contact member is easily grasped on the flexure restraining portion by suitably dimensioned needle-nose pliers.

Thus, there is provided an improved connector with improved contact members contained therein, that is adapted to consummate electrical connections with printed circuit boards inserted therein. The different widths of the contact member achieve pretensioned restraint in a simplified manner.

While the wider width of the contact members in the form of the flexure restraining portion **47** has been shown and described as being in substantially the terminal portion of the contact member, it is possible to locate this second or wider width elsewhere in the flexible contact element in conjunction with suitable movement restrictive means formed elsewhere in the recess-channel sidewall.

While there have been shown and described what are at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention.

I claim:

1. An electrical connector formed in a manner to receive insertive connective means comprising:

an insulative body block having an open longitudinal channel formed therein to receive the insertion of said connective means;

a plurality of one-piece resilient contact members oriented in said block in a controlled pretensioned manner relative to said channel to provide restrained and limited movement therein, each contact member being longitudinally fabricated to have at least first and second widths and integrally comprising: a substantially longitudinal terminal element extending outwardly from said body block, and an integral flexible element of a first width internally oriented within said body block relative to and extending into said channel, said flexible element having an electrical contact area formed thereon and extended in a limiting manner into said channel, said flexible element having a laterally formed flexure restraining termination portion of a second width greater than said contact member first width, said restraining portion being in the form of a substantially flattened, planar terminal structure longitudinally removed from said electrical contact area; and

movement restrictive means formed as channel wall portions in said block to cooperate with said laterally formed termination restraining portion of said second width and limit the forward movement of said first width flexible element into said channel.

2. An electrical connector according to claim **1** wherein said insulative body block has a substantially open face and an oppositely disposed closed base portion with an encompassing sidewall therearound, said block having at least one open elongated channel formed inwardly from said open face and adapted to receive said connective means, said channel having a plurality of longitudinal recesses opening at least on one side thereof and extending perpendicularly from said closed base portion toward an opening at said open face, at least the open end portion of each recess having an expanded lateral width greater than that of said perpendicular recess opening, whereof the walls abutting said perpendicular recess opening form limiting movement restrictive means to cooperate with said laterally formed flexure restraining termination portion of said contact member, and wherein said perpendicular recess opening is of a width greater than the first width of said contact member and less than the second width thereof, each of said recesses having an aperture traversing said closed base portion of said block to accommodate the placement of said contact terminal element.

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