United States Patent

Jayne et al.

[15] **3,675,186**

[45] **July 4, 1972**

[54] MEANS FOR POLARIZING A CONNECTOR ASSEMBLY

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[73] Assignee: **Sylvania Electric Products Inc.**

[22] Filed: **Jan. 7, 1971**

[21] Appl. No.: **104,744**

Related U.S. Application Data

[60] Continuation-in-part of Ser. No. 37,961, May 18, 1968, abandoned, which is a division of Ser. No. 737,163, June 14, 1968, Pat. No. 3,566,340.

[52] **U.S. Cl.** ..... **339/186 M**

[51] **Int. Cl.** **H01r 13/64**

[58] **Field of Search** ..... 339/176 MF, 176 MP, 184 M, 339/186 M

[56] **References Cited**

UNITED STATES PATENTS

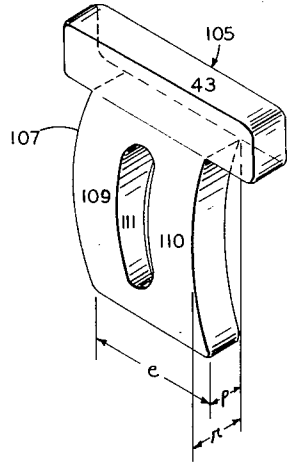
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Assistant Examiner—Lawrence J. Staab
Attorney—Norman J. O'Malley et al.

[57] **ABSTRACT**

Removable key means for polarizing a multiple contact connector assembly for accommodating printed circuit boards whereof at least one key of flexural material has the longitudinal portion thereof discretely formed to resiliently fit within respective spaced apart polarizing channels in a manner that the key can be easily inserted thereinto and resiliently retained within substantially the channel width to provide desired polarization of the assembly. The key is also formed with provisions to provide facile removal thereof when a change of polarization is desired.

7 Claims, 14 Drawing Figures



Patented July 4, 1972 3,675,186

4 Sheets-Sheet 1

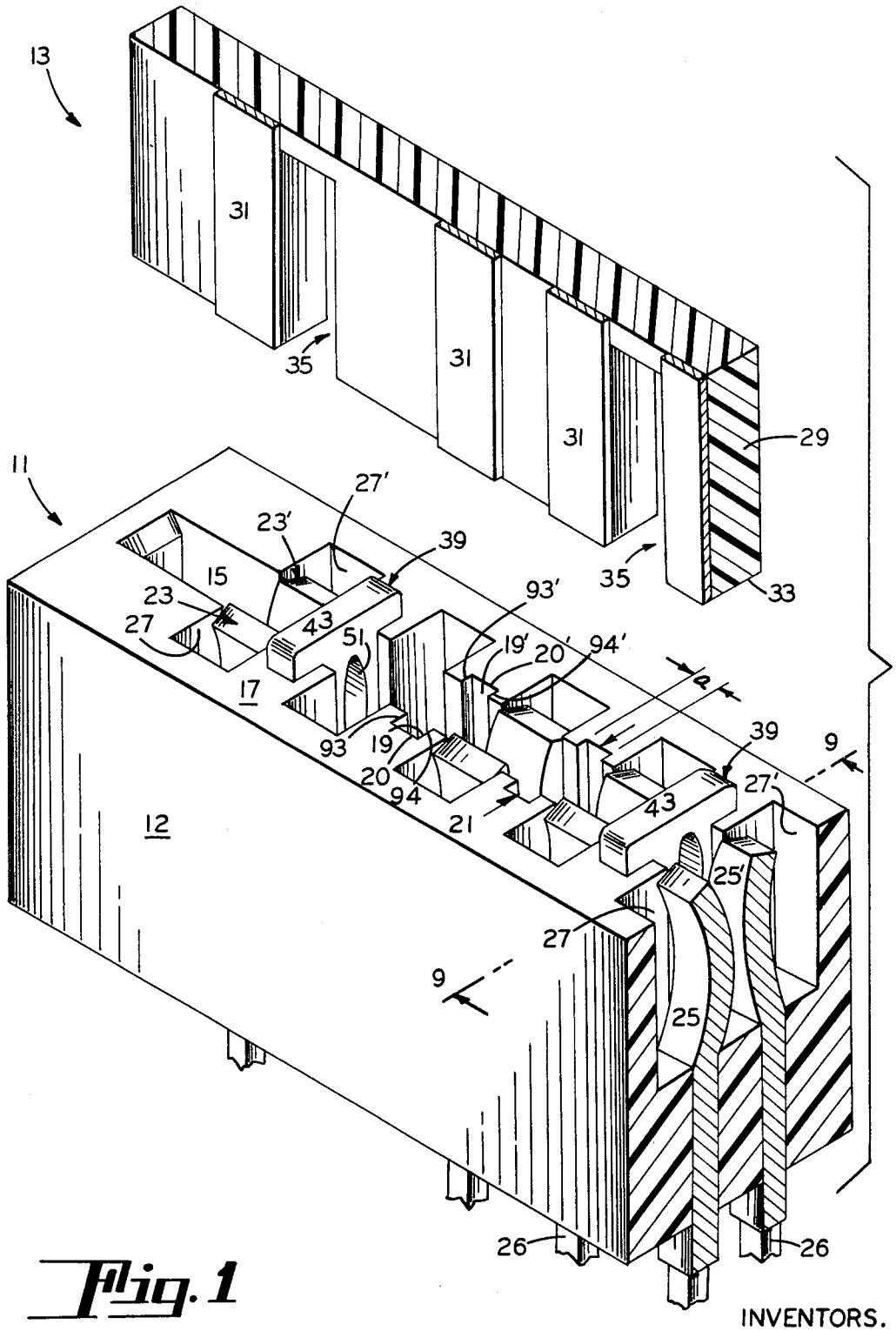


Fig. 1

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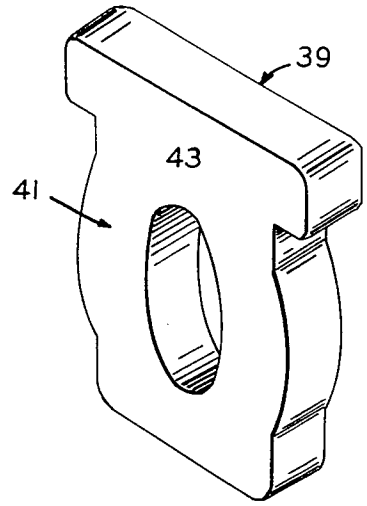


Fig. 2

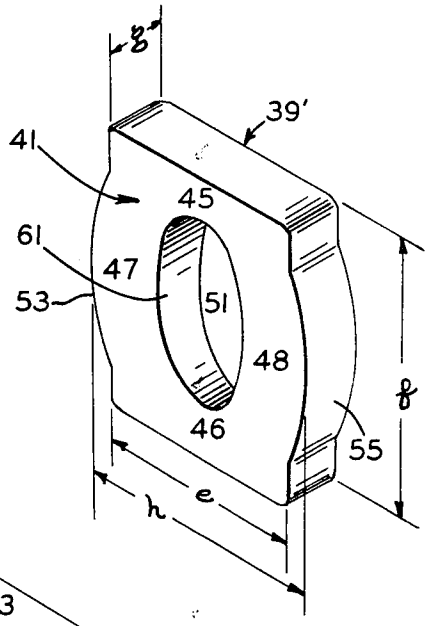


Fig. 2a

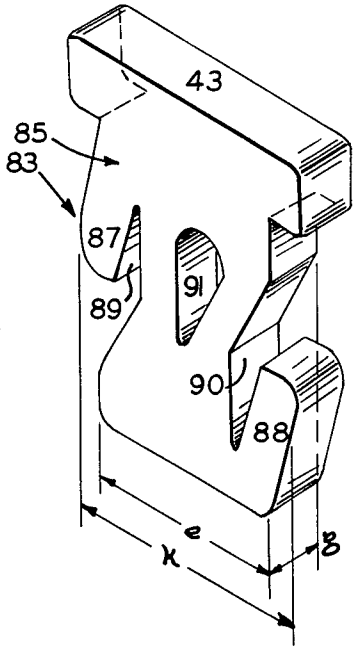


Fig. 5

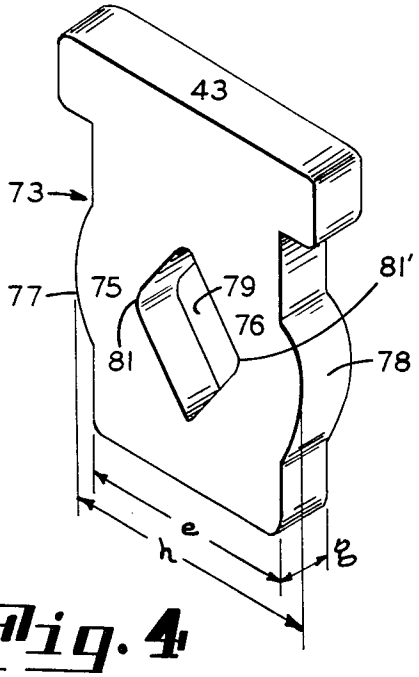


Fig. 4

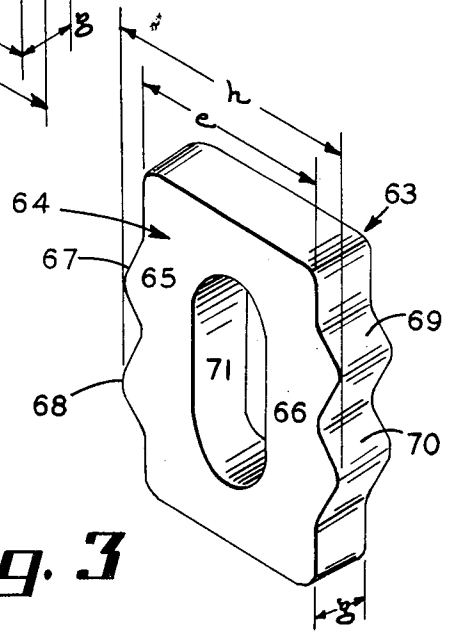


Fig. 3

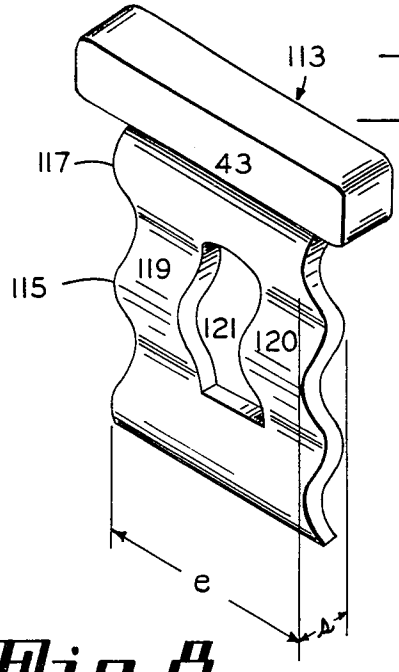


Fig. 7

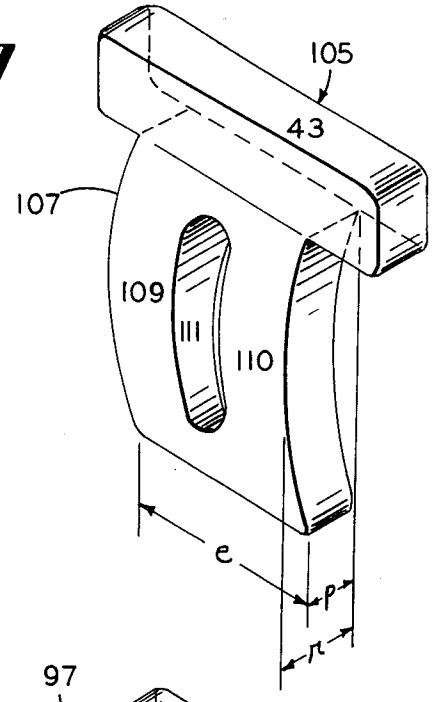


Fig. 8

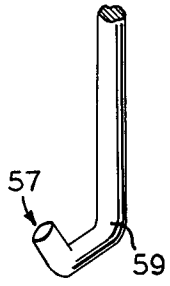


Fig. 10

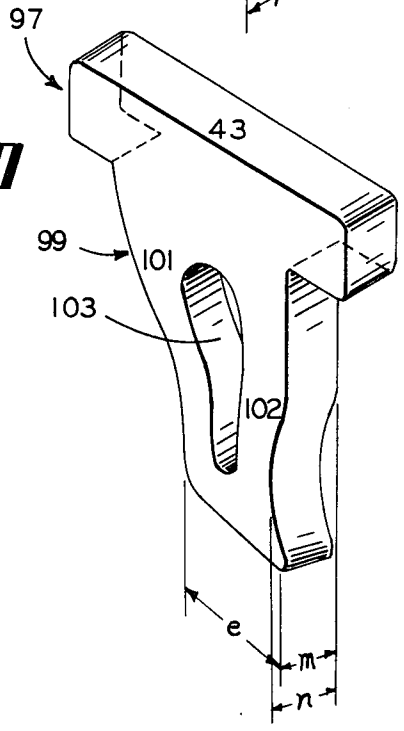


Fig. 6

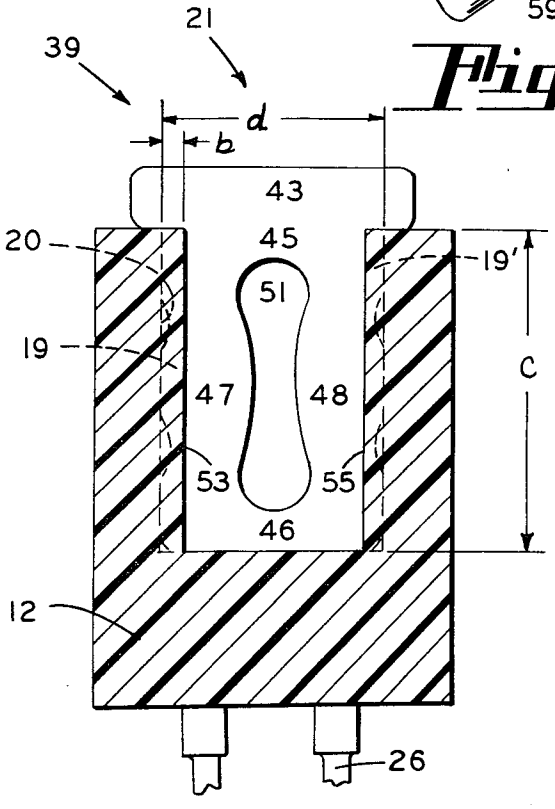


Fig. 9

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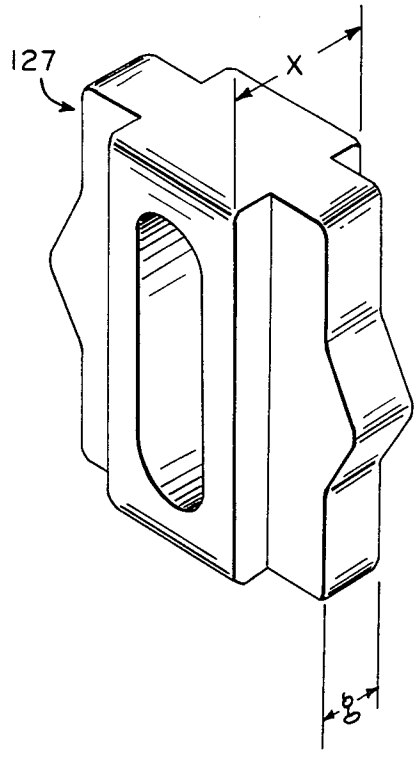


Fig. 12

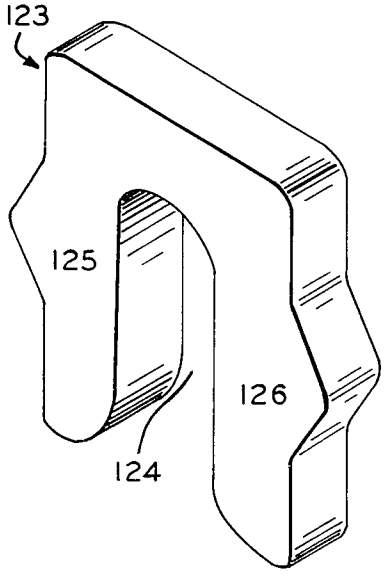


Fig. 11

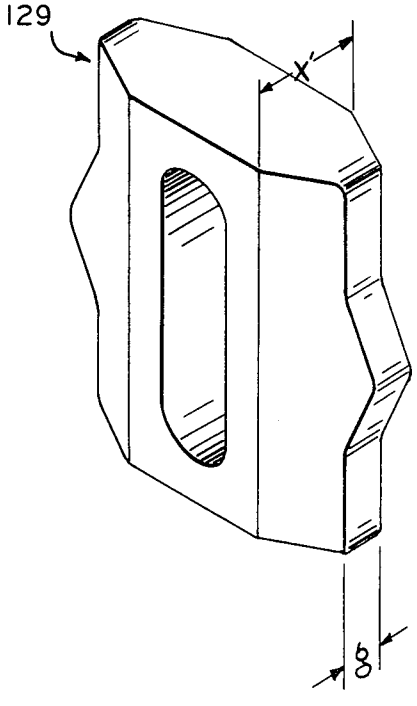


Fig. 13

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MEANS FOR POLARIZING A CONNECTOR ASSEMBLY

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of Ser. No. 37,961, filed May 18, 1968 now abandoned, which was a divisional application of Ser. No. 736,163, filed June 14, 1968, and now U.S. Pat. No. 3,566,340, which is assigned to the assignee of the present invention. This continuation-in-part in-part divisional application contains matter disclosed but not claimed in two other applications Ser. No. 37,960, now U.S. Pat. No. 3,603,915 and Ser. No. 37,962, now Pat. No. 3,576,519, which applications are also divisional applications of Ser. No. 737,163.

BACKGROUND OF THE INVENTION

The invention relates to means for polarizing a multiple contact electrical connector assembly and more particularly to a flexural key type polarizing means adapted for insertion and resilient retention in a connector assembly formed to receive printed circuit boards.

Since diversified printed circuitry can be adequately accommodated on circuit boards of similar dimensions, it is important that the desired boards to inserted into the proper connector assemblies. To achieve proper matching it is conventional to polarize the socket assembly with one or more wedge inserts or keys in a manner that only boards having properly oriented mating slots can be received therein. One conventional type of polarizing insert is formed to provide a friction or interference fit when forcibly pressed into a closely dimensioned slotted opening. Such polarizing means require close dimensional tolerances which results in high fabrication costs. In addition, the press fit type of polarizer causes both insertion and removal difficulties. A broken key resultant of the required insertion pressure provokes further aggravation in that special tooling and added time are required to ready the socket for usage.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to reduce the aforementioned difficulties and to provide improved means for polarizing a connector assembly to accommodate the proper circuit boards therein.

Another object is to provide polarizing means that can be readily inserted, easily removed and inexpensively fabricated.

The foregoing objects are achieved in one aspect of the invention by the provision of a polarizing key of flexural material that has a longitudinal portion formed to resiliently fit within the width of spaced apart locating channels in the connector assembly. The flexural characteristics and constructional form of the key facilitate easy insertion and removal as may be required and provide for positive resilient retention thereof within the keying slot to effect the desired polarization.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partially sectioned perspective view showing a portion of a connector assembly having polarizing means therein oriented to receive a portion of a compatibly formed circuit board;

FIGS. **2** through **8** and **11** through **13** are perspective views of various embodiments of the resilient polarizing key;

FIG. **9** is a sectional view taken along the line **9—9** of FIG. **1** showing the resilient retention of a polarizing key within the connector assembly; and

FIG. **10** illustrates a type of removal means formed to withdraw the polarizing key from the connector assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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 aforedescribed drawings.

With reference to the drawings, FIG. **1** and FIG. **9**, which is a section taken along the line **9—9** of FIG. **1**, partially show a multiple contact connector assembly **11** whereof the assembly block portion **12** is formed to accommodate a printed circuit board **13**. The assembly block is usually fabricated of an insulative plastic material having internal shaping to comprise a discrete board-receiving recess **15** which opens on the face **17** of the assembly block. On either side of the recess are a plurality of open substantially vertically disposed channels **19** and **19'** each having dimensions substantially defined as a width *a*, a depth *b*, and a length *c*. It is to be noted that the channel length *c* is not necessarily required to equal the depth of the receiving channel **15**. While substantially rectilinear channels are shown and described, other cross-sectional channel configurations, such as arcuate or ovoid, may be equally utilized in keeping with the concept of the invention. The channels are aligned as spaced apart pairs of facing channels **19** and **19'** to provide a plurality of polarizing channel means **21** each having a defined span *d*. A plurality of aligned metallic electrical contact members **23** and **23'** suitably positioned and affixed in the block portion, have resilient contact portions **25** and **25'** located in suitable contact recesses **27—27'** that are oriented in the assembly in spaced relationship to the adjacent polarizing channel means **21**. Proper external circuitry, not shown, is connected to the exterior contact portions **26** protruding from the assembly block.

The circuit board **13**, which is only partially illustrated in FIG. **1**, is formed of an insulative substrate **29** with exposed circuit connective areas **31** disposed relative to the leading edge **33** of the board. These connective areas are aligned to mate with the respective resilient contact portions **25** and **25'** when the board is inserted into the connector assembly. Included in the leading edge portion of the board are one or more polarizing slots **35** which serve as means for differentiating the particular circuitry application for which the board is intended. The proper connector assembly for accommodating the aforementioned circuit board has polarizing means **39** oriented therein to mate with the polarizing slots **35** formed in the board.

The polarizing means **39** is a body member formed as an insert key having flexural characteristics to facilitate facile insertion into and removal from the proper polarizing channels **19** and **19'** as shown in FIG. **1**. The key is formed of a resilient material having the necessary flexural characteristics, dimensional stability, and heat and abrasion resistances required for the usage. Suitable substances are found, for example, in the thermoplastic class of resins, such as, for instance, nylon and polycarbonate materials, either with or without fillers, but other substances exhibiting the above-identified characteristics are equally applicable.

In certain of the embodiments disclosed herein, as for example those illustrated in FIGS. **7** and **8**, it has been found that, in addition to plastic material, substantially flattened lightweight resilient metal is also applicable especially in miniaturized applications where size and material thickness are prime considerations.

Usually the keys are of a color differing from that of the connector block to facilitate rapid visual identification of the polarization. In greater detail, the polarizing insert key **39** is further delineated in FIGS. **2** and **2***a*. The key **39** in FIG. **2** has a longitudinal section **41** with a horizontal T-bar **43** formed at the top which exceeds the lateral breadth of the key and is fashioned to stop against the face **17** of the connector assembly when the key is fully inserted therein. The T-bar is advantageous in that it affords a larger identification area on the face of the connector assembly and provides means for gripping the top of the key. In the various embodiments to be subsequently described, the T-bar **43** may or may not be incorporated depending upon whether or not the above noted features relating to stopping, identifying or gripping, are desired. The outstanding contribution of this invention is mainly concerned with that portion of the key which is positioned within the polarizing channels **19** and **19'** of the assembly.

To clarify description of the polarizing key, one embodiment **39'** thereof as shown in FIG. **2***a* will be utilized. This embodiment is substantially the same as that illustrated in FIG. **2** with the exception that the T-bar is eliminated. The longitudinal section is formed of ends **45** and **46** and longitudinal flexural side portions or members **47** and **48** intermediate of which there is a defined elongated opening **51**. The key has a basic lateral breadth *e*, a length *f* and an edge defined thickness *g* which are compatible with the respective corresponding dimensions *d*, *c*, and *a* of the polarizing channel means **21** to permit sliding acceptance of the key therein.

At this point it is appropriate to mention that in referring to the several embodiments of the insert key to be subsequently described, the designated lateral breadth *e* and the edge defined thickness *g* dimensions are in keeping with the span *d* and width *a* of the related polarizing channel means **21** to facilitate a slidable acceptance of the different key embodiments therein. The expanded dimensions of flexural elements in the several keys, to effect resilient retention, are identified by other letter notations.

In the embodiment shown, in FIG. **2***a*, each of the side members **47** and **48** of the key has at least one part thereof shaped as protrusions **53** and **55** which form an expanded lateral breadth *h* that exceeds the basic lateral breadth *e*. The protrusions and associated flexural side members are related to the aperture **51** in a manner to permit lateral flexure of the side members into the aperture to effect lateral retractive movement of the protrusions **53** and **55** when the key is inserted in a sliding manner into the polarizing channel means. The resilience of the retracted side members exerts sufficient resilient retention force against the channel means in the region of the protrusions, to retain the key as positioned.

When it is desired that the connector assembly **11** be polarized in a different manner, the resiliently retained keys can be expeditiously removed by utilizing a hook-type key removal means **57**, as shown in FIG. **10**. The removal means comprises a hook-shaped metallic member **59** fashioned to fit through the top portion **61** of the opening **51** and cooperate against the top member **45** whereby the key can be easily withdrawn and reused in another polarizing requirement.

In another embodiment shown in FIG. **3**, the key **63** has basic dimensions of breadth, length, and thickness that substantially equal those of the embodiment illustrated in FIG. **2***a*. In this instance the longitudinal section **64** has side flexural members **65** and **66** with a plurality of protrusions **67**, **68**, **69**, and **70** thereon extending beyond the basic lateral breadth *e*. The flexural side members cooperating with the opening **71** provide resilient retention of the key in the polarizing channel means.

Another related embodiment comprising the key **73** is illustrated in FIG. **4** wherein the side members **75** and **76** have discrete protrusions **77** and **78** thereon. The defined opening **79** is substantially diamond shaped with the lateral apices **81** and **81'** thereof being oriented relative to the laterally extending protrusions **77** and **78**.

The embodiment of the key **83** shown in FIG. **5** has a longitudinal section **85** with discretely formed flexural side members **87** and **88** which protrude in an angular manner to effect an expanded lateral breadth *k* which exceeds the basic lateral breadth *e*. The protruding portions **87** and **88** are formed to cooperate with related compatible openings **89** and **90**. Upon insertion into the polarizing channel means **21**, the angularly oriented side members **87** and **88** are retracted into the related openings **89** and **90** to simultaneously exert resilient retention force against the channel means. Another opening **91** in the longitudinal section is discretely formed to enhance the lateral resilient characteristics of the key and also provide means for key withdrawal.

The aforedescribed embodiments shown in FIGS. **2**, **2***a*, **3**, **4**, and **5** all exert defined areas of resilience in the direction of lateral breadth whereby resilient force or pressure is exerted against discrete areas of substantially the bottom portions **20** and **20'** of the channels **19** and **19'**. In the embodiments to be described, such as those shown in FIGS. **6**, **7**, and **8**, resilient retention force or pressure is also effected, but in these instances it is exerted against the sides **93** and **94** of channels **19** and **19'**.

The embodiment of the key **97** shown in FIG. **6** has a flexural longitudinal section **99**, a lateral breadth *e* and side members **101** and **102** which define an opening **103** therebetween. The thickness of the material *m* is less than the width *a* of the channels **19** and **19'**. A slight resilient twist is provided to the longitudinal section to produce a torsional effect upon insertion of the key into the polarizing channel means **21**. The side members have a prior-to-insertion twist that effects a resilient dimension *n* that exceeds the channel width *a*. As the key is inserted, the side members substantially conform to the dimensions of the channel in a manner to substantially remove the twist. This effects a torsional resilient retention of the key by exerting a resilient force substantially against the sides of the channels.

In FIG. **7**, a key **105** is shown whereof the flexural longitudinal section **107** has a lateral breadth *e* and side members **109** and **110** which define an opening **111** therebetween. The thickness of the material *p* is less than the width *a* of the channels **19** and **19'**. At least one of the flexural side members is discretely formed to have a longitudinal camber therein to effect a resilient dimension *r* that exceeds the channel width *a*. Upon inserting the key into the polarizing channel means **21**, the resilient pressure resultant from substantially straightening the camber formation of the longitudinal section **107** effects sufficient force across the individual widths of the respective channels **19** and **19'** to promote the resilient retention of the insert key therein and provide desired polarization of the connector assembly.

A further embodiment is illustrated in FIG. **8** wherein the insert key **113** is formed to have a plurality of lateral corrugation formations **115** fashioned to provide the flexural longitudinal section **117** with an effective resilient dimension or thickness *s* which exceeds the channel width *a*. Between the side members **119** and **120** is an opening **121**. When the flexural key is inserted into the polarizing means **21**, the resilient corrugations slidably fit within the channels **19** and **19'** and effect resilient force across the width *a* of the respective channels and against the sides **93**, **94**, **93'** and **94'** thereof in a manner to promote resilient retention of the insert key therein.

As mentioned previously, the insert key embodiments shown in FIGS. **7** and **8** lend themselves to fabrication from more than one type of material. Molded thermoplastics are adequately effective, but in ruggedized usage applications and in miniaturized connector assemblies in particular, resilient metal such as ¼ to ½ hard temper low carbon steel has been found to be advantageous.

In the several embodiments of the invention that are shown and described, both of the respective side members are similarly formed, but such is not intended to be limiting. It is in keeping with the concept of the invention that at least one of the flexural side members be formed to exert a sufficient resilient force within the polarizing channel means to effect retention of the key therein. The openings in the longitudinal members promote the resilient movement of the flexural side members and provides means for facile removal of the respective polarizing keys from the connector assembly.

Another embodiment of the polarizing means is shown in FIG. **11** wherein the insert key **123** is configurated as an open-end structure having an elongated opening **124** defined between flexural side members. As in the other aforementioned embodiments, the side members **125** and **126** are formed to exert resilient retention force against the channel means when the key is inserted thereinto.

There are occasions when it is desired to have polarizing insert keys that effect bowing or flexing pressures additional to that normally provided by the edge defined thickness of the material. In these instances an additional intermediate material thickness is provided between the channel defined edges.

As shown in FIG. **12** the insert key **127** resembles that shown in FIG. **2***a* except that the intermediate material thickness *x* is greater than the edge-defined thickness *g*. A related embodiment is illustrated in FIG. **13** wherein the insert key **129** has an intermediate material thickness *x* which exceeds the edge-defined thickness *g*. It will be noted that the defined edge of the insert key **129** is formed to slidably mate with polarizing channel means having a compatible cross-sectional shape.

It is within the concept of the invention that the several aforedescribed embodiments of the insert key can also incorporate the increased intermediate material thickness if the characteristics effected thereby are desired. In any instance the increased material thickness *x* or *x'* should not be such as to extend into the adjacently located contact recesses **27** and **27'**.

The several foregoing embodiments provide a flexural polarizing insert key that exhibits improved features not evidenced in the art. The resilient key described in each specific embodiment is readily inserted, easily removed, and inexpensively fabricated.

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 modifications and changes may be made therein without departing from the invention as defined by the appended claims.

We claim:

1. Means for polarizing a multiple contact connector assembly for accommodating printed circuit boards whereof the assembly block portion has a discrete board-receiving recess formed therein to open on the face thereof, said recess having a plurality of open channels of fixed width, depth and length dimensions aligned as spaced apart pairs of facing channels disposed on either side of the recess to provide a plurality of polarizing channel means each having a defined span and oriented in spaced relationship to contact members positioned in separate channels adjacent thereto, said polarizing means comprising:

at least one body member formed as an insert key having flexural characteristics to facilitate insertion into and removal thereof from said polarizing channel means, said key being of resilient material of a uniform thickness having a flexural longitudinal section dimensioned to have a basic uniform lateral breadth and length and an effective resilient thickness dimension defined by at least one curve-like formation extending laterally across said longitudinal section, said polarizing means being slidably acceptable in said polarizing channel means, said longitudinal section of said key being flexurally formed to effect a resilient dimension exceeding said material thickness and the widths of the respective polarizing channels to effect sufficient resilient force across said fixed widths of, said polarizing channel means to promote the resilient retention of said insert key therein and provide polarization of said connector assembly.

2. Means for polarizing a multiple contact connector assembly according to claim **1** wherein said insert key has said flexural longitudinal portion discretely formed to have sufficient flexural longitudinal camber therein to effect resilient force across the width of a respective polarizing channel to promote the resilient retention of said insert key therein and provide polarization of said connector assembly.

3. Means for polarizing a multiple contact connector assembly according to claim **1** wherein said insert key has said flexural longitudinal portion discretely shaped to have a plurality of lateral corrugation formations therein fashioned to effect a resilient force across the width of a respective polarizing channel and against the sides thereof in a manner to promote resilient retention of said insert key therein and provide polarization of said connector assembly.

4. Means for polarizing a multiple contact connector assembly according to claim **1** wherein said insert key has an end member formed to exceed said lateral breadth of said key to provide a top T-bar thereon fashioned to stop against the face of said connector assembly when said key is inserted therein.

5. Polarizing means according to claim **1** wherein said longitudinal section is fabricated to have at least one aperture opening oriented substantially centrally therein to provide means for expeditiously removing said insert key from said polarizing channel means.

6. Means for polarizing a multiple contact connector assembly according to claim **1** wherein said insert key is formed of molded thermoplastic material.

7. Means for polarizing a multiple contact connector assembly according to claim **1** wherein said insert key is formed of substantially flattened resilient metal material.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,675,186 Dated July 4, 1972

Inventor(s) Max L. Jayne and Robert W. Pihlblad

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, Line 5, "May 18, 1968" should read --- May 18, 1970 ---

Column 1, Line 6, "736,163" should read --- 737,163 ---

Column 1, Lines 8 and 9, "in-part" second instance should be deleted

On the cover sheet [60] "May 18, 1968" should read -- May 18, 1970 --.

Signed and sealed this 6th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents