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(54) Modular jack with lead frame insert

(57) Disclosed is a modular jack (110) with lead frame insert for making electrical connections. The lead frame insert comprises a vertical support member (112) and a top support member (114) extending therefrom. Terminals extend across the top support member (114) and are equidistant spaced from each other across the length of the top support member (114). The terminals extend across the vertical support member (112) as well but at some location along the length of the vertical support member (112) the terminals transition from a first spacing to a second spacing.

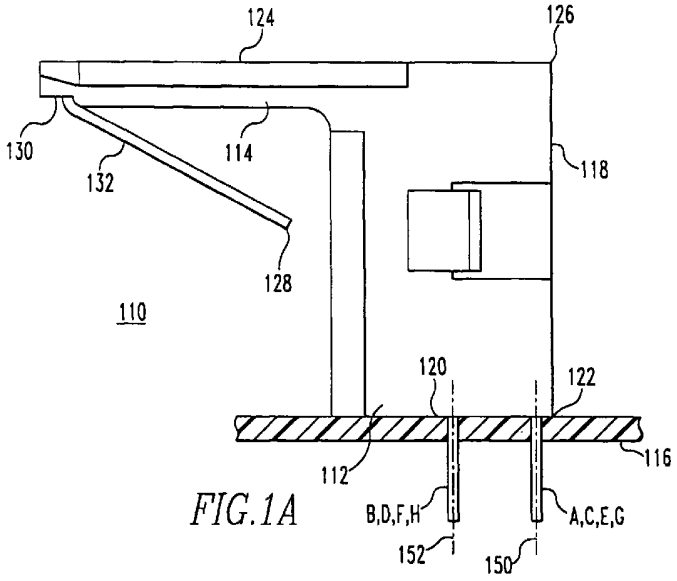

FIG.1A

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to electrical connectors and more particularly to an improved modular jack type connector.

BACKGROUND OF THE INVENTION

[0002] Modular jacks are well known in the telecommunications and computer networking fields and are typically employed to connect electrical terminals extending from one electrical device to another device. More specifically, modular jacks are customarily employed to provide an interface between a modular plug terminal and a printed circuit board.

[0003] A modular jack typically comprises a housing with a plug receiving socket located therein. The plug receiving socket is formed from an entrance surface with a plug receiving orifice therein, two opposing side walls, the internal surfaces of which define the internal side surfaces of the socket, and a top wall joining the two opposing side walls. An opening is formed in the rear end of the housing into which is placed a modular jack insert for carrying electrical contacts. A modular plug terminal, upon being inserted into the plug receiving socket, makes electrical contact with the electrical contacts on the modular jack insert.

[0004] An existing modular jack housing and insert is disclosed in U.S. Patent No. 5,759,070. Typically, existing modular jack inserts comprise a vertical support member with a top support member extending therefrom. Electrical terminals form a contact area and extend therefrom around a leading edge of the top support member, across the top support member, and down through the vertical support member where the terminals are placed in electrical communication with an electrical device such as a printed circuit board.

[0005] Generally, the terminals of an insert must be spaced apart from one another at a pre-set distance in the contact region so as to be compatible with plug terminators. For example, terminals may be required to be spaced at .040 inch intervals at the contact area. Similarly, the inter-spacing between terminals at the interface with the printed circuit board may be a pre-set value in order to insure compatibility with printed circuit boards. For example, insert terminals may be spaced at .050 inch intervals at the circuit board contact area. Because terminal spacing is typically greater at the circuit board interconnection in comparison to the contact area, it is necessary to transition the terminals from the first inter-spacing to the second inter-spacing. In existing systems this transition typically takes place along the top support member of the insert. Thus, the inter-spacing of terminals across the top support member is non-constant, i.e. the spacing between terminals changes across the length of the top support member. Some applications such as those employing LED's (light emitting diodes) require a constant spacing between terminals and therefore cannot be easily applied to existing modular jack insert designs which have a transition area across the top surface of the terminal. Thus, there is a need in the art for a modular jack insert which provides a constant inter-spacing between terminals across the top support member.

[0006] In existing insert embodiments for through-mounted application of a modular jack to a printed circuit board, alternating terminals of the insert are offset from each other at the location where the terminals contact the printed circuit board. The terminals are typically offset prior to being routed through the vertical support portion of the insert. In order to accommodate the routing of terminals through an insert, an insert must often be especially designed and manufactured for through mounted applications as opposed to surface mounted applications. Thus, there is a need in the art for an insert which is capable of being employed in both through-mounted and surface-mounted applications.

[0007] Existing insert designs typically employ round diameter gold plated wires for terminals. The specific area of the terminal which is used for electrical contact is not easily identified during production. Therefore, in these existing terminal designs the entire length of the terminal is gold plated. Plating the entire length of the terminal is expensive. Further, during the process of soldering the terminals to the circuit board, the gold plating often melts and contaminates the soldering bath. Lead frame, as opposed to plated wire can be manufactured to provide duplex plated terminals which do not contain gold in the soldering area of the terminal. Unfortunately, lead frame is not easily adaptable to applications which require the terminal to be routed through the body of the insert. Thus, there is a need in the art for a modular jack insert which employs lead frame terminals.

[0008] Accordingly, there is a need in the art for an improved modular jack insert. Specifically, there is a need for an insert providing for a constant inter-spacing of terminals across the top surface of the insert. Further, the insert should be capable of being applied in both through-mounted and surface-mounted embodiments. Finally, there is a need in the art for a modular jack insert which is adaptable for receiving lead frame terminals as opposed to round diameter wire terminals.

SUMMARY OF THE INVENTION

[0009] A modular jack with lead frame insert in accordance with the present invention addresses these and other shortcomings in the art. Briefly, a modular jack in accordance with the present invention comprises a modular housing and a modular jack insert. The modular housing has a plug receiving socket located therein into which is inserted the modular jack insert. The plug receiving socket is formed from an entrance surface

with a plug receiving orifice therein, two opposing side walls, the internal surfaces of the two opposing side walls defining internal side surfaces of the plug receiving socket, a top wall joining the two opposing side walls, and a rear end surface having an insert opening therein. The modular jack insert is inserted into the insert opening in the rear end surface of the housing.

[0010] The modular jack insert comprises a vertical support member, a top support member extending from the vertical support member, and a plurality of terminals extending from the top support member. The vertical support member has a transition surface with a bottom edge. The top support member extends from the vertical support member and has a leading edge as well as a transition edge at an intersection with the transition surface of the vertical support member. The plurality of terminals extend from the leading edge of the top support member, over the transition edge, and along the transition surface of the vertical support member to the bottom edge of the transition surface. The terminals are equidistant spaced from each other at a first equidistant spacing at both the leading edge of the top support member and the transition edge. The terminals are equidistant spaced from each other at a second equidistant spacing at the bottom edge of the transition surface.

[0011] Other features of the present invention are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A full understanding of the invention can be gained from the following description of preferred embodiments when read in conjunction with the accompanying drawings in which:

FIGURE 1A provides a side view of a modular jack insert in accordance with the present invention;

FIGURE 1B provides a top plan view of the modular jack insert shown in FIGURE 1A;

FIGURE 1C provides a plan view of the transition surface of the modular jack insert shown in FIGURE 1A;

FIGURE 1D provides a sectional view of the modular jack insert shown in FIGURE 1A;

FIGURE 1E provides a detailed view of the sectional area shown in FIGURE 1D;

FIGURE 1F provides a sectional view of the modular jack insert shown in FIGURE 1A;

FIGURE 2A provides a side view for a surface mounted modular jack in accordance with the present invention;

FIGURE 2B provides a top plan view of the modular jack insert shown in FIGURE 2A;

FIGURE 2C provides a plan view of the transition surface of the modular jack insert shown in FIGURE 2A;

FIGURE 2D provides a sectional view of the modular jack insert shown in FIGURE 2A;

FIGURE 3A is a top plan view of a modular jack representing a prepared embodiment; and

FIGURE 3B is a rear view of the modular jack shown in FIGURE 3A.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] A modular jack with the above-mentioned beneficial features in accordance with a presently preferred exemplary embodiment of the invention will be described below with reference to Figures 1A through 2D. The description given herein with respect to those Figures is for illustrative purposes only and is not intended in any way to limit the scope of the invention. Questions regarding the scope of the invention may be resolved by referring to the appended claims.

[0014] Figures 1A through 1F provide various views of a modular jack insert in accordance with the present invention. In particular, Figures 1A through 1F illustrate a through mounted embodiment of the present invention in which terminals of the modular jack are received into or through a receptacle in a printed circuit board. A surface mounted embodiment of a modular jack in accordance with the present invention is described below with reference to Figures 2A through 2D.

[0015] Referring to Figure 1A, a side view of jack insert 110 is provided. As shown, jack insert 110 comprises vertical support member 112 and top support member 114. Vertical support member 112 extends vertically from printed circuit board 116 and comprises transition surface 118, bottom surface 120 adjacent to printed circuit board 116, and bottom edge 122 at the intersection of the two surfaces 118 and 120. Top support member 114 extends in a cantilevered fashion from vertical support member 112 and comprises top surface 124 which intersects transition surface 118 at transition edge 126. Terminals 128 extend around leading edge 130 of top support member 114 to provide terminal contact area 132. Terminals 128 extend also over top surface 124 and along transition surface 118 and ultimately terminate in printed circuit board 116.

[0016] Figure 1B provides a top plan view of modular jack insert 110. As shown, top support member 114 extends from leading edge 130 to transition edge 126. Top support member 114 comprises a plurality of leading edge retention members 134 for positioning a plurality of terminals 128 proximate to leading edge 130. In one embodiment eight terminals A, B, C, D, E, F, G, H may be positioned by leading edge retention members 134. Leading edge retention members 134 may comprise raised walls between which are formed channels 136 for receiving terminals 128. The walls or leading edge retention members 134 extend from at or proximate leading edge 130 toward transition edge 126.

[0017] Proximate transition edge 126 are transition edge retention members 138 for positioning or securing in place terminals 128. In one embodiment, transition

edge retention members 138 extend from transition surface 118 as described in further detail below with reference to Figure 1C. It should be noted, however, that transition edge retention members could likewise extend from top surface 124 proximate transition edge 126. Leading edge retention members 134 and transition edge retention members 138 provide for positioning terminals on top surface 124 of top support member 114. As shown in Figure 1B, terminals 128 extend across top surface at equidistant spacing between adjacent terminals. In other words, terminals 128 have a constant pitch across the top surface 124. In one embodiment this equidistant spacing or pitch is .040 inches. Typically, the equidistant spacing between terminals 128 is accomplished by forming leading edge retention members 134 at an equidistant spacing. Transition edge retention members 138 are similarly formed at the same equidistant spacing. For each leading edge retention member 134, there exists a corresponding transition edge retention member 138 which is similarly aligned and spaced so as to maintain the equidistant spacing of terminals 128 across top support member 114. The equidistant spacing of terminals 128 across top support member 114 provides an area of modular jack insert 110 for application of LED's and similar devices which may be more easily attached to terminals with a consistent equidistant spacing.

[0018] Figure 1C provides a plan view of transition surface 118 of vertical support member 112. As shown, proximate transition edge 126 are formed a plurality of transition edge retention members 138. Transition edge retention members 138 comprise upstanding walls between which are formed channels 140. Terminals 128 are retained or positioned in channels 140. As previously noted, transition edge retention members 126 are positioned to form channels 140 which correspond to and are aligned with channels 136 formed by leading edge retention members 134. Thus, terminals 128 retained or positioned by leading edge retention members 134 and transition edge retention members 138 are equidistant spaced across top surface 124 of top support member 114.

[0019] Bottom edge retention members 142 are formed proximate bottom edge 122. In one embodiment, bottom edge retention members 142 comprise walls upstanding from transition surface 118. Bottom edge retention members 142 extend from at or proximate bottom edge 122 toward transition edge retention members 138. Between bottom edge retention members 142 are formed channels 144 for retaining or positioning terminals 128 proximate bottom edge 122. Bottom edge retention members 142 are positioned so as to form channels 144 which are equidistant spaced from each other. The spacing, however, is typically different from the first equidistant spacing between channels 140 provided by transition edge retention members 138. The second equidistant spacing, or pitch at bottom edge 122 is typically larger than the first equidistant spacing at transition edge 126. In one embodiment the equidistant spacing between channels 144 formed by bottom edge retention members 142 is .050 inches. As shown, channels 144 are offset from channels 140 formed by transition edge retention members 138.

[0020] On transition surface 118 between transition edge retention members 138 and bottom edge retention members 142 is formed transition area 146. In transition area 146 terminals 128 are transitioned from the first equidistant spacing that exists across top surface 124 of top support member 114, to the second equidistant spacing between terminals 128 that exists at bottom edge 122.

[0021] It should be noted that in one embodiment, terminals 128 have barbs 148 formed therein. Barbs 148 are formed to come into contact with bottom retention members 142 when the terminal is inserted into bottom edge retention member 142. Specifically, barbs 148 have an interference fit with the walls of bottom edge retention member 142 so as to secure terminals 128 in place.

[0022] As previously noted, modular jack insert 110 shown in Figures 1A through 1F is employed in through-mounted modular jack embodiments. Accordingly, referring to Figure 1A proximate bottom surface 120 alternating terminals B, D, F, and H in the plurality of terminals transition from a first plane adjacent to transition surface 118 to a second plan that is parallel to the first plane but which is offset into vertical support member 112 from transition surface 118. Thus, solder tails of terminals A, C, E, and G extend into printed circuit board 116 at a first plane 150 adjacent to transition surface 118 while solder tails of terminals B, D, F, and H extend into printed circuit board 116 at a second plane 152 offset from transition surface 118.

[0023] Figures 1D through 1F illustrate the offset area of modular jack insert 110. In Figure 1D is shown a cross section of modular jack insert taken at line A-A of Figure 1C. As shown, proximate bottom edge 122 offset channel 156 extends from transition surface 118 into vertical support member 112. Offset channel 156 forms a recess in bottom surface 120. The walls of offset channel 156 are formed by the body of vertical support member 112. Figure 1E provides a detailed view of offset channel 156. In one embodiment, offset channel is formed at about 90 degrees relative to transition surface 118. As shown, terminal 128 representative of terminals B, D, F, and H, extends along transition surface 118 and bends away from transition surface 118 into offset channel 156. Thereafter, terminal 128 bends about 90 degrees and extends out of bottom surface 120. Generally, terminals B, D, F, and H extends from bottom surface 120 parallel to terminals A, C, E, G but offset by about .100 inches.

[0024] Figure 1F shows a cross section of modular jack insert 110 taken at line B-B of Figure 1B. Line B-B designates an area of modular jack insert where the terminal is not free to be offset from transition surface 118.

As shown, vertical support member 112 is solid through bottom surface 120 as indicated by cross hatching. Thus, terminals A, C, E, and G extend from bottom edge 122 at transition surface 118.

[0025] It should be noted that in one embodiment of the present invention, terminals 128 are lead frame as opposed to round diameter wire. Because terminals 128 are generally applied to the exterior of insert 110 and are not routed through the body of insert 110, terminals 128 can comprise lead frame which is readily applied to the exterior of terminal 110.

[0026] Figures 2A through 2D illustrate a modular jack insert in accordance with the present invention wherein terminals 128 are surface mounted to the printed circuit board 116. As shown, terminals 128 extend across top surface 124 in a parallel fashion at a constant spacing or pitch across the entire surface 124. After traversing transition surface 118, wherein a transition pitch occurs as described above, in the proximity of bottom edge 122 terminals 128 bend parallel to printed circuit board 116. This is in contrast to the configuration of Figure 1A wherein terminals 128 are mounted into printed circuit board 116.

[0027] FIGURES 3A and 3B illustrate a modular jack which is essentially identical to the embodiment shown in FIGURES 1A through 1F except that there is a light emitting or conveying source such as light pipes 140 and 142 adjacent the top surface in an outward position relative the terminals. Such light pipes may be illuminated directly from their rear ends or may alternatively curve downwardly and be illuminated from a lower position. Light Emitting Diodes (LED's) may be also be positioned in a similar position at the front of the top section outwardly from the terminals.

[0028] The present invention may be employed in other specific forms without departing from the spirit or essential attributes thereof. For example, an insert in accordance with the present invention may be manufactured to accommodate any number of terminals. Also, various different types of retention members may employed such as channels, bumps, or ridges. Furthermore, the transition retention members may be attached to either top support member or vertical support member. Finally, the pitches at which the terminals are spaced may vary from those mention above. Accordingly, the scope of protection of the following claims is not limited to the presently preferred embodiment disclosed above.

Claims

1. Modular jack insert (110) for providing electrical connection to a printed circuit board (116), comprising:

a vertical support member (112) having a transition surface, said transition surface having a bottom edge (122);

a top support member (114) extending from said vertical support member (112), said top support member (114) having a leading edge and a transition edge at an intersection with said transition surface (118) of said vertical support member (112); and

a plurality of terminals (128) extending from said leading edge (130) of said top support member (114), over said transition edge (126), and along said transition surface (118) of said vertical support member (112) to said bottom edge of said transition surface (118), wherein said plurality of terminals (128) are equidistant spaced from each other at a first equidistant spacing at said leading edge (130) and said transition edge (126), and said plurality of terminals (128) are equidistant spaced from each other at a second equidistant spacing at said bottom edge of said transition surface (118).

2. The modular jack insert (110) of claim 1, wherein said vertical support member (112) further comprises a bottom surface (120) intersecting said transition surface at about said bottom edge (122), and at least one of said plurality of terminals transitions into said vertical support member (112) relative to said transition surface at about said bottom edge (122) and extends from said bottom surface parallel to said plurality of terminals (128).

3. The modular jack insert (110) of claim 1, wherein said at least one of said plurality of terminals (128) extends from said bottom surface (120) at about .100 inches offset from said plurality of terminals (128).

4. The modular jack insert (110) of claim 2, wherein said at least one of said plurality of terminals (128) transitions into said vertical support member (112) at about 90 degrees relative to said transition surface.

5. The modular jack insert (110) of claim 1, wherein said vertical support member (112) further comprises a bottom surface (120) intersecting said transition surface at about said bottom edge (122), and alternating terminals in said plurality of terminals transition into said vertical support member (112) relative to said transition surface at about said bottom edge (122) and extend from said bottom surface (120).

6. The modular jack insert (110) of claim 5, wherein said alternating terminals extend from said bottom surface (120) at about .100 inches offset from said plurality of terminals.

7. The modular jack insert (110) of claim 6, wherein

said plurality of electrical terminals (128) transition away from said transition surface (118) at about 90 degrees relative to said transition surface.

8. The modular jack insert (110) of claim 1, wherein said first equidistant spacing is about .040 inches.

9. The modular jack insert (110) of claim 1, wherein said second equidistant spacing is about .050 inches.

10. The modular jack insert (110) of claim 1, wherein said terminals (128) are lead frame.

11. A modular jack insert (110) for providing electrical connection to a printed circuit board (116), comprising:

a vertical support member (112) having a transition surface, said transition surface having a bottom edge (122);
a top support member (114) extending from said vertical support member (112), said top support member (112) having a leading edge and transition edge at an intersection wit said transition surface (118) of said vertical support member;
a plurality of leading edge retention members (134) coupled to said top support member (114) proximate said leading edge for positioning a plurality of terminals at said leading edge;
a plurality of transition edge retention members (138) coupled to said modular jack proximate said transition edge for positioning a plurality of terminals (128) at said transition edge;
and
a plurality of bottom edge retention members coupled to said vertical support member (112) proximate said bottom edge (122) for positioning a plurality of terminals proximate said bottom edge (122).

12. The modular jack insert of claim 11, wherein said vertical support member (112) further comprises a bottom surface intersecting said transition surface at about said bottom edge (122), said bottom surface having formed therein offset channels extending from said transition surface into said vertical support member (112) for offsetting terminals from said transition surface.

13. The modular jack insert of claim 12, wherein said plurality of leading edge retention members (134) are equidistant spaced from each other at a first equidistant spacing and said plurality of transition edge retention members (138) are equidistant spaced from each other at said first equidistant spacing.

14. The modular jack insert of claim 12, wherein each of said plurality of bottom edge retention members are equidistant spaced from each other at a second equidistant spacing.

15. The modular jack insert of claim 11, wherein each of said plurality of leading edge retention members (134) comprises a wall extending from said top support member (114) so that adjacent leading edge retention members (134) in said plurality of terminals form a first wall and a second wall with a channel there between into which may be positioned a terminal.

16. The modular jack insert of claim 11, wherein each of said plurality of transition edge retention members (126) comprises a wall extending from said top support member (114) so that adjacent transition edge retention members (126) in said plurality of terminals form a first wall and a second wall with a channel there between into which may be positioned a terminal.

17. The modular jack insert of claim 11, wherein each of said plurality of bottom edge retention members (142) comprises a wall extending from said top support member (114) so that adjacent bottom edge retention members (142) in said plurality of terminals form a first wall and a second wall with a channel there between into which may be positioned a terminal.

18. The modular jack insert of claim 11, further comprising lead frame extending from said leading edge (130), over said top support member (114), and over said vertical support member (112).

19. A modular jack, comprising:

a housing with a plug receiving socket located therein, said plug receiving socket being formed from an entrance surface with a plug receiving orifice therein, two opposing side walls, the internal surfaces of said two opposing side walls defining internal side surfaces of said plug receiving socket, a top wall joining said two opposing side walls, and a rear end having an insert opening therein; and
a modular jack insert (110) for insertion into said insert opening, said modular jack insert comprising a vertical support member (112) having a transition surface, said transition surface having a bottom edge; a top support member (114) extending from said vertical support member (112), said top support member (114) having a leading edge and transition edge at an intersection with said transition surface of said vertical support member (112); a plurality of

leading edge (130) retention members coupled to said top support member proximate said leading edge (130) for positioning a plurality of terminals at said leading edge (130); a plurality of transition edge retention members coupled to said modular jack (110) proximate said transition edge for positioning a plurality of terminals at said transition edge; and a plurality of bottom edge retention members coupled to said vertical support member proximate said bottom edge for positioning a plurality of terminals proximate said bottom edge (122).

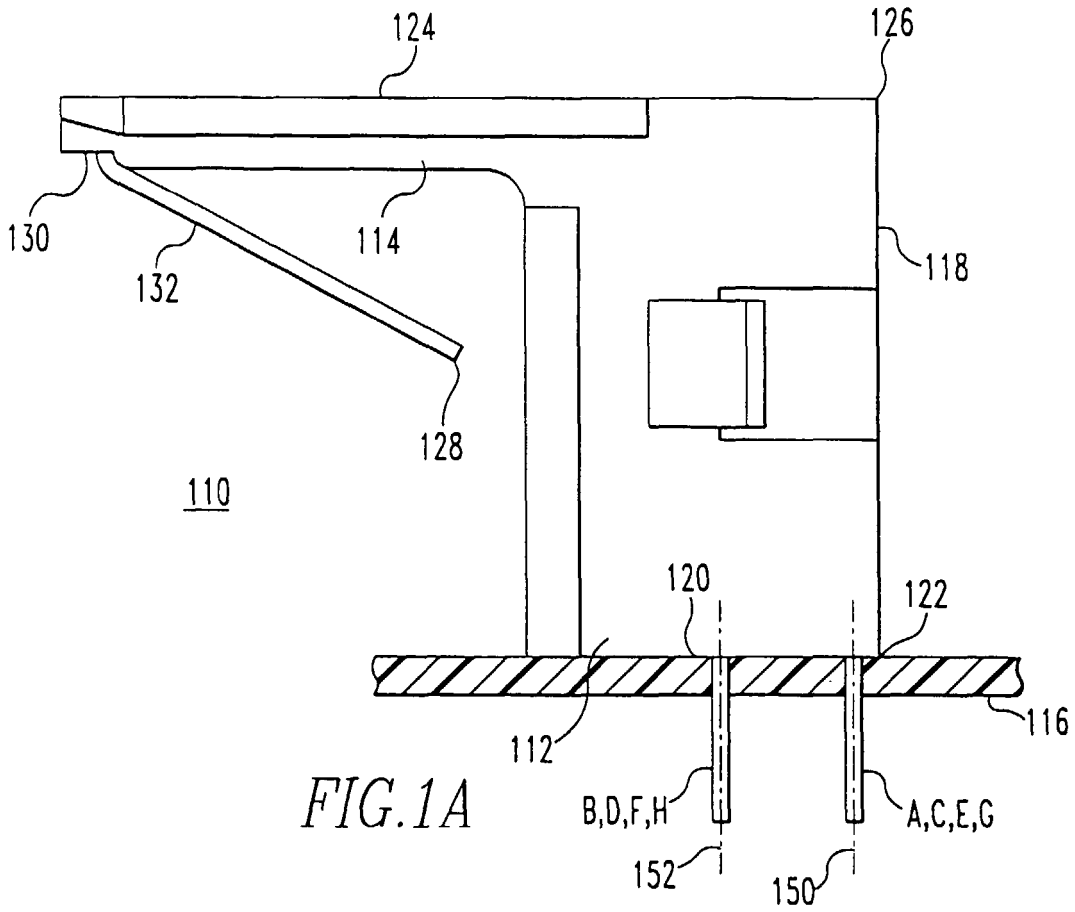
124
126
130
114
118
132
128
110
120
122
116
112
B,D,F,H
A,C,E,G
152
150

FIG.1A

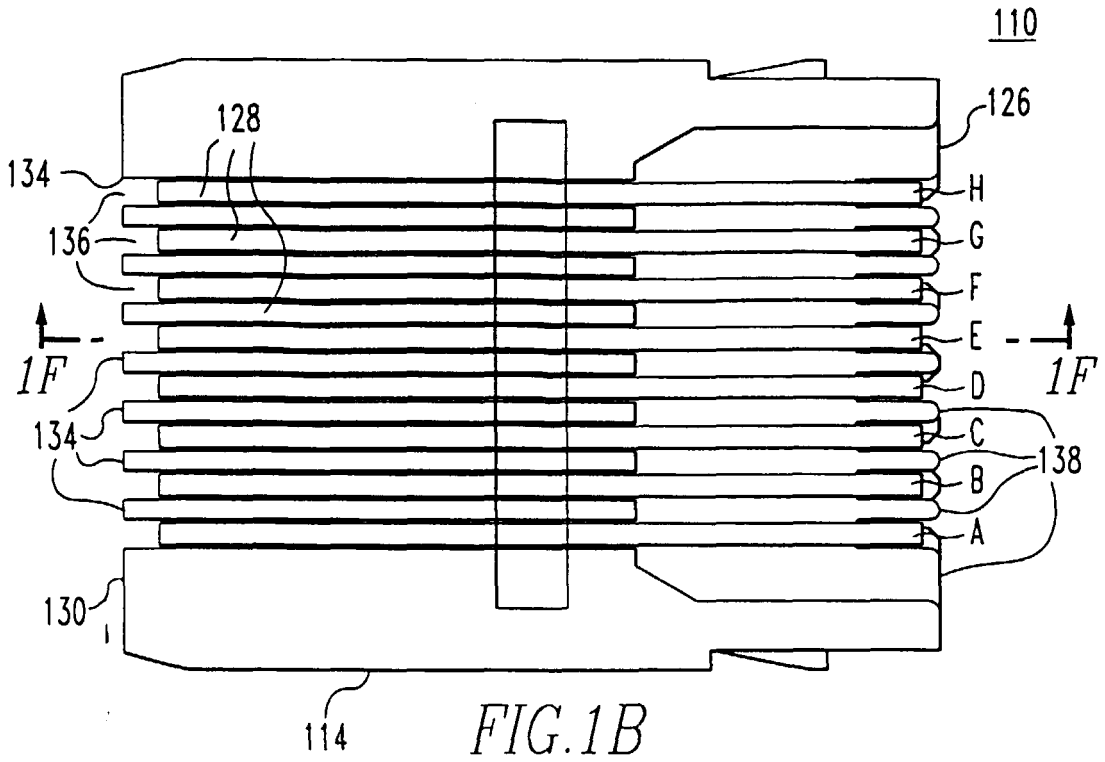
110
126
128
134
H
136
G
F
1F
E
1F
D
134
C
138
B
A
130
114

FIG.1B

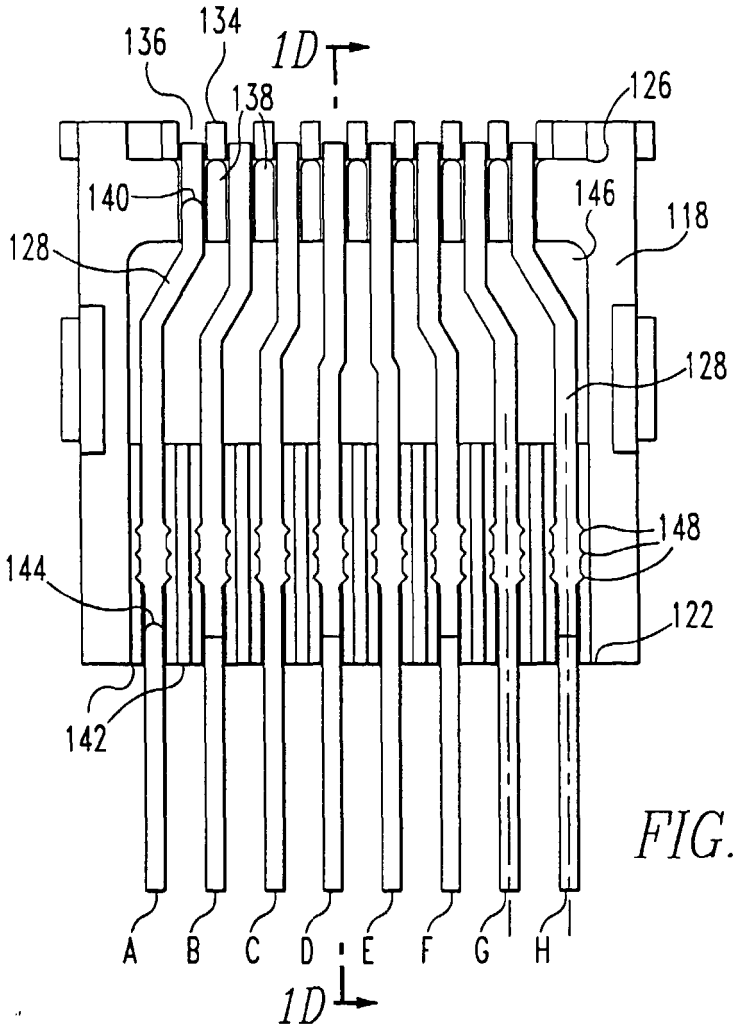
136
134
1D
138
126
140
146
118
128
128
148
144
122
142
A
B
C
D
E
F
G
H
1D

FIG.1C

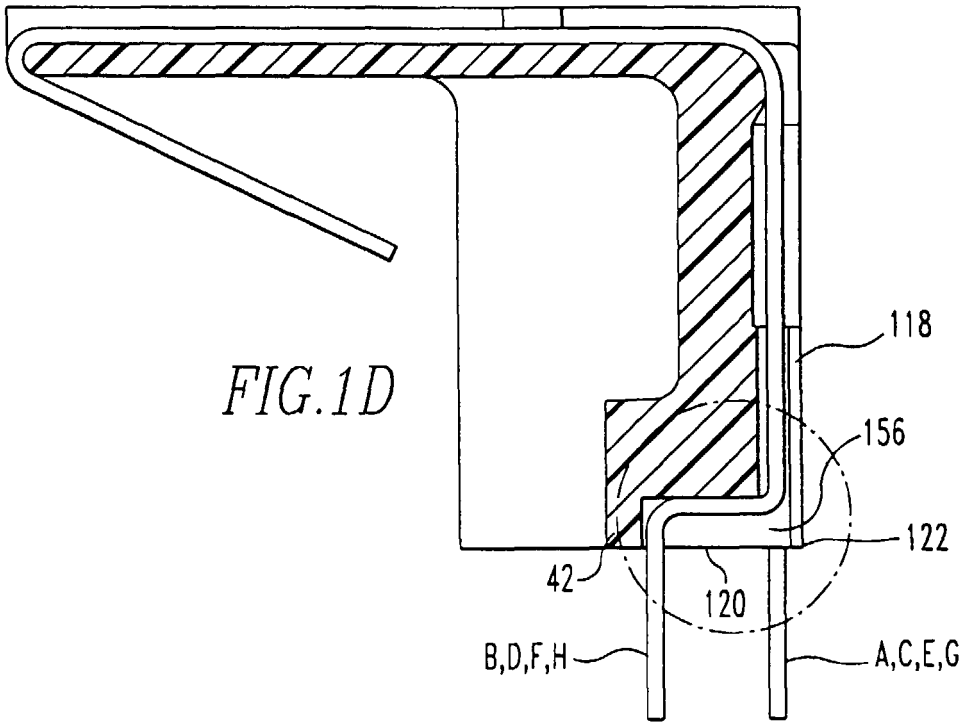
118
156
122
42
120
B,D,F,H
A,C,E,G

FIG.1D

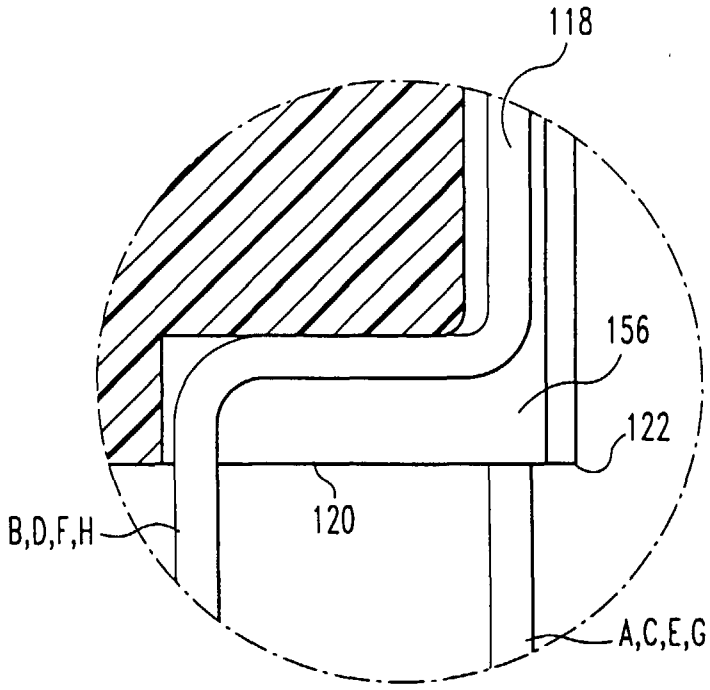

FIG.1E

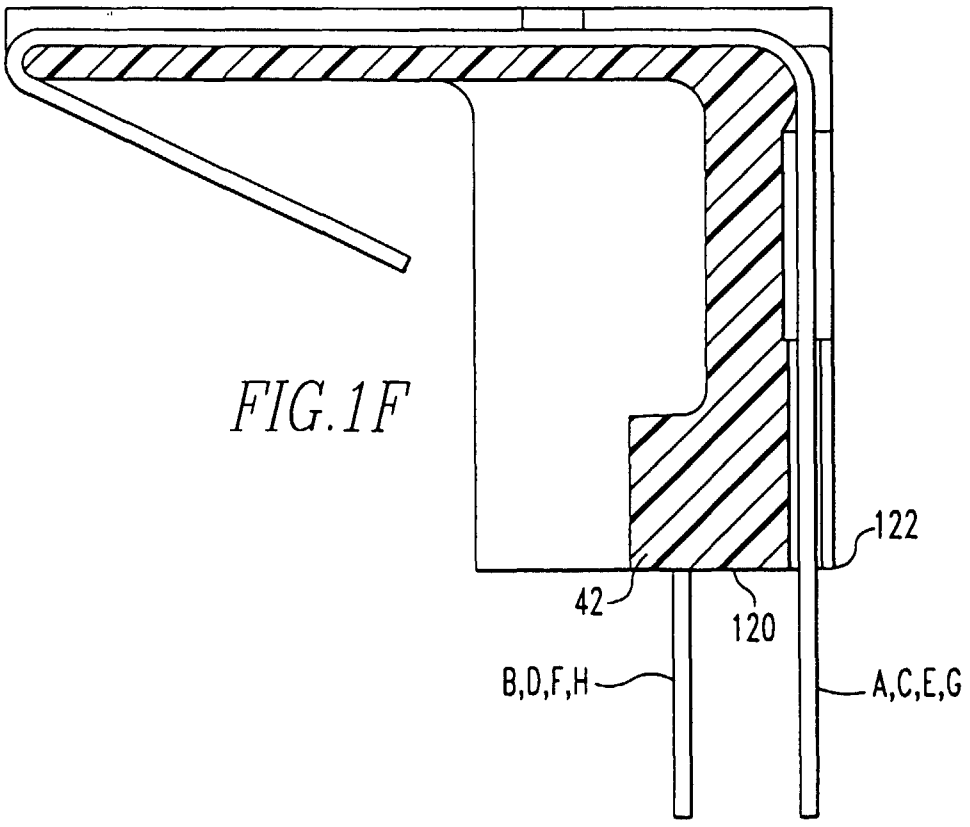

FIG.1F

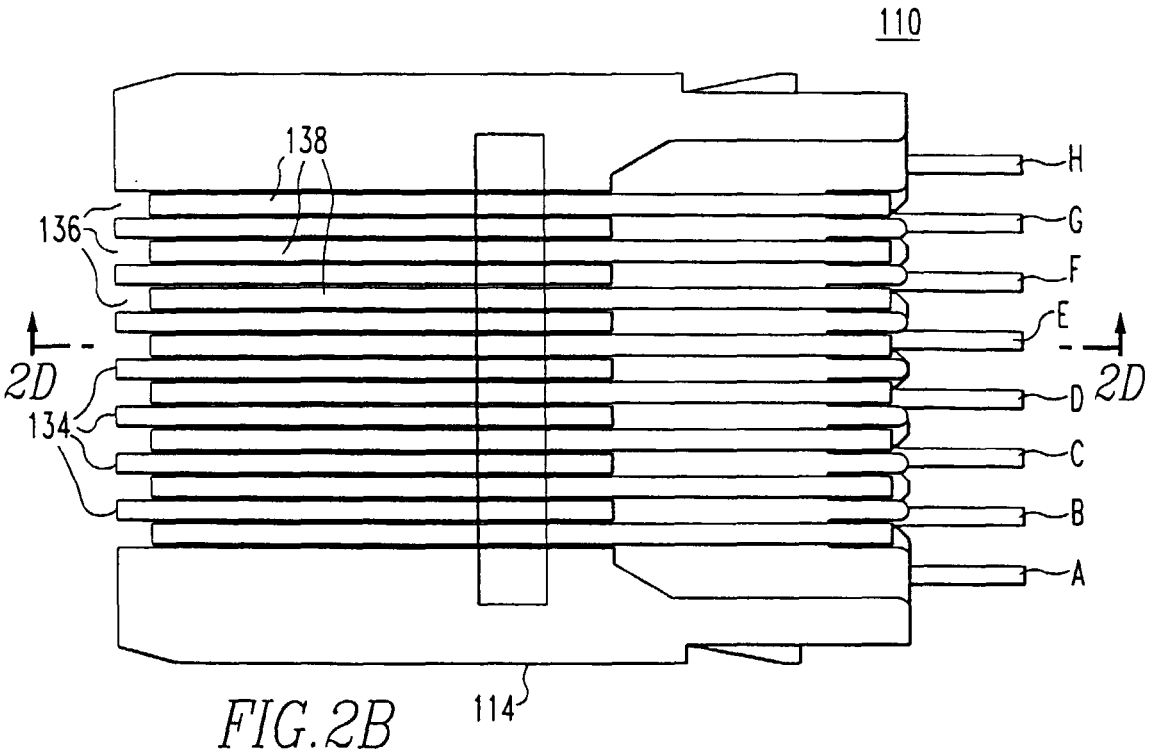
110
138
136
134
2D
2D
H
G
F
E
D
C
B
A
114

FIG.2B

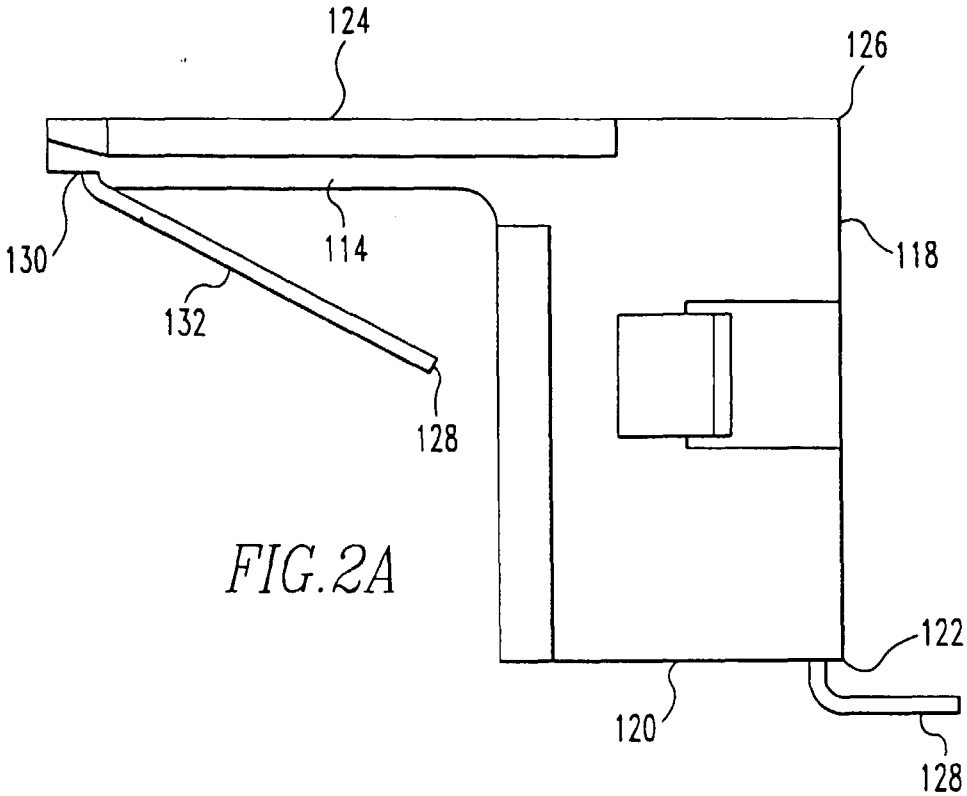
124
126
130
114
118
132
128
122
120
128

FIG.2A

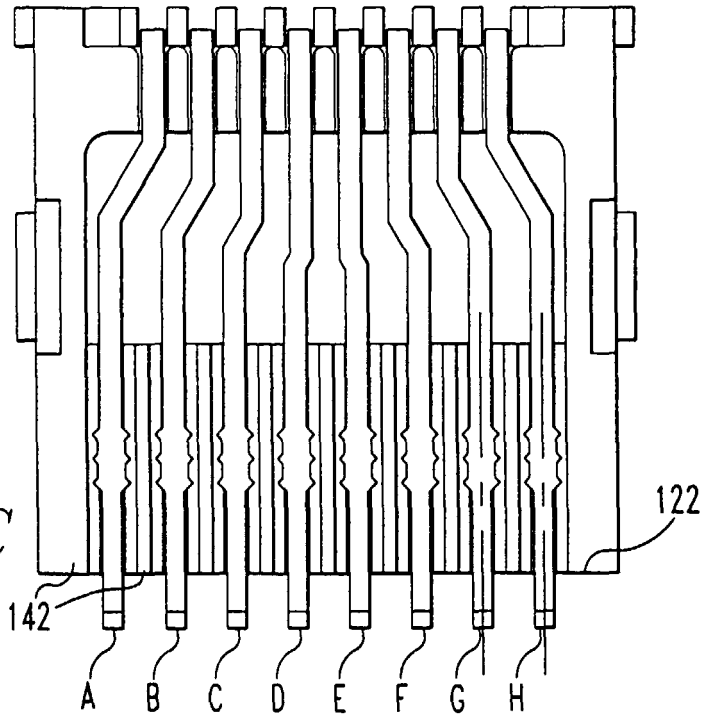

FIG.2C

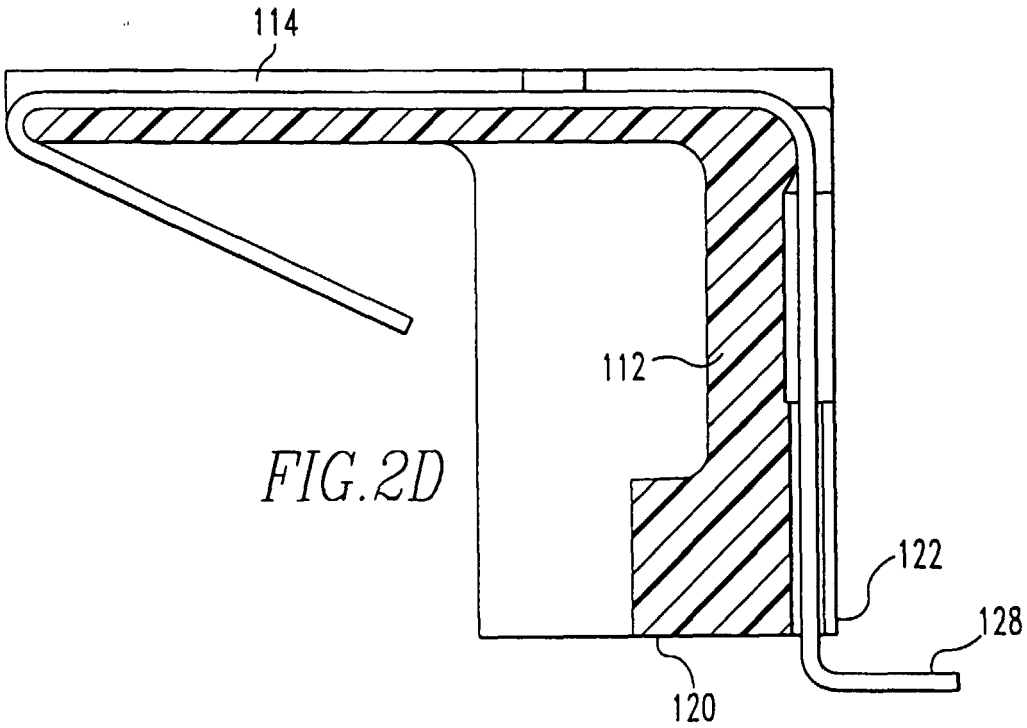

FIG.2D

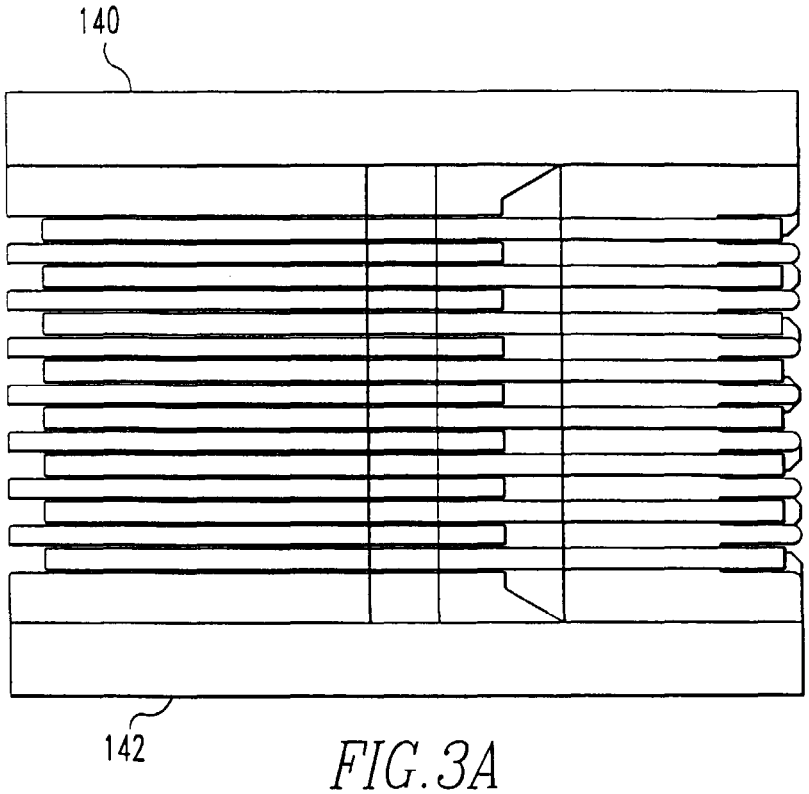

FIG.3A

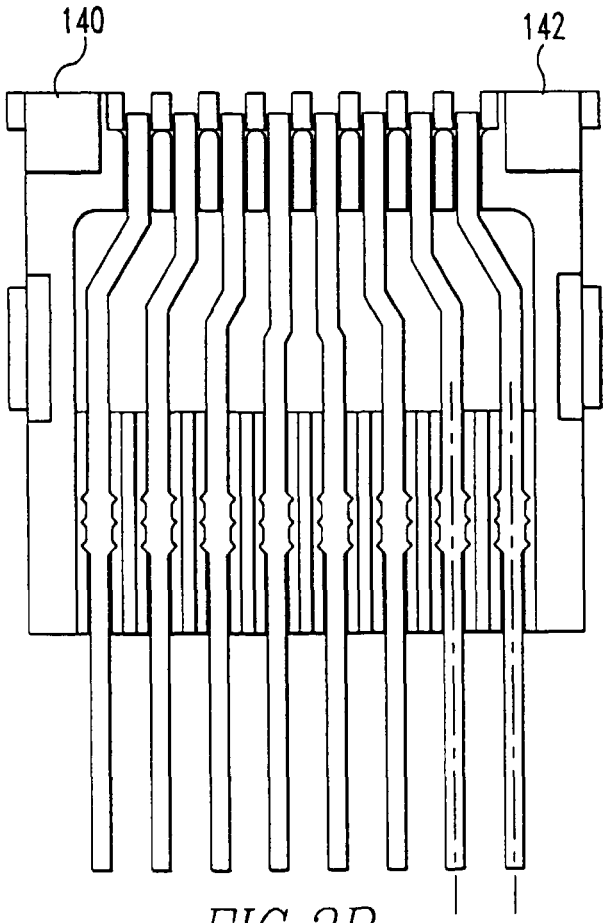

FIG.3B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 2284

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X A	EP 0 165 490 A (STEWART STAMPING CORP) 27 December 1985 (1985-12-27) * page 14, line 2 - page 17, last line; figures 10-14 *	1,2,4,5,7 11-17,19	H01R24/04 H01R13/717
D,Y	US 5 759 070 A (BELOPOLSKY YAKOV) 2 June 1998 (1998-06-02) * column 3, line 19 - column 7, line 10; figures 1-14 *	1,3,8-19	
Y	US 5 478 261 A (BOGESE II STEPHEN B) 26 December 1995 (1995-12-26) * column 8, line 14 - column 11, line 3; figures 1-8 *	1,3,8-19	
Y	US 4 210 376 A (HUGHES DONALD W K ET AL) 1 July 1980 (1980-07-01) * column 3, line 5 - column 6, line 3; figures 1-12 *	1,3,8-19	
A	EP 0 692 884 A (MOLEX INC) 17 January 1996 (1996-01-17) * column 3, line 34 - column 7, line 18; figures 1-12 *	1,10,11,14,16,18,19	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 April 2000	Schaap, E

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27-04-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0165490 A	27-12-1985	US 4641901 A	10-02-1987
		AT 56316 T	15-09-1990
		CA 1243090 A	11-10-1988
		JP 8001818 B	10-01-1996
		JP 60254573 A	16-12-1985
		US 4889503 A	26-12-1989
		US 4653837 A	31-03-1987
US 5759070 A	02-06-1998	US 5599209 A	04-02-1997
		CN 1171860 A	28-01-1998
		EP 0795215 A	17-09-1997
		JP 10510666 T	13-10-1998
		WO 9617411 A	06-06-1996
		US 5687478 A	18-11-1997
US 5478261 A	26-12-1995	US 4457570 A	03-07-1984
		US 4501464 A	26-02-1985
		US 4577921 A	25-03-1986
		US 4717217 A	05-01-1988
US 4210376 A	01-07-1980	US 4193654 A	18-03-1980
		AR 218161 A	15-05-1980
		AT 1875 T	15-12-1982
		AU 523952 B	26-08-1982
		AU 4997579 A	13-03-1980
		BR 7905491 A	13-05-1980
		CA 1101957 A	26-05-1981
		DE 2964098 D	30-12-1982
		DK 374179 A,B,	09-03-1980
		EP 0009867 A	16-04-1980
		ES 483993 A	01-09-1980
		FI 792753 A,B,	09-03-1980
		HK 4485 A	25-01-1985
		MX 146588 A	09-07-1982
		NO 792814 A,B,	11-03-1980
		SG 45084 G	08-03-1985
EP 0692884 A	17-01-1996	CN 1120271 A	10-04-1996
		JP 2932161 B	09-08-1999
		JP 8064288 A	08-03-1996
		KR 156063 B	16-11-1998
		SG 38853 A	17-04-1997
		US 5626497 A	06-05-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82