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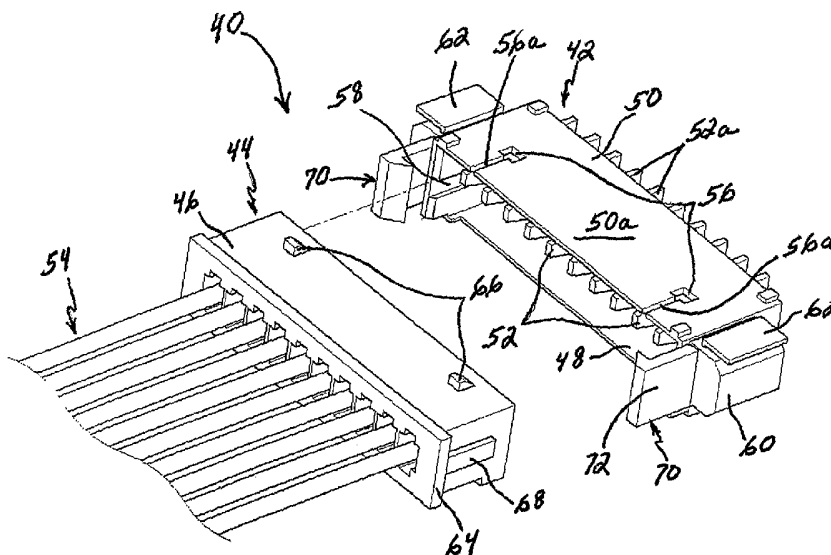
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(54) Title: ELECTRICAL CONNECTOR ASSEMBLY WITH IMPROVED LATCH MEANS



(57) Abstract: An electrical connector assembly includes a plug connector having a first dielectric housing mounting a plurality of conductors. A receptacle connector includes a second dielectric housing having a receptacle for matingly receiving the dielectric housing of the plug connector. The second housing mounts a plurality of terminals for connection to the conductors of the plug connector when the connectors are mated. A pair of latch arms project from opposite sides of the second housing of the receptacle connector into close proximity to opposite sides of the first housing of the plug connector when the connectors are mated. The latch arms have latch portions for engaging the first housing to prevent unmating of the connectors. The latch arms, thereby, perform a dual function of (a) preventing lateral movement of the plug connector relative to the receptacle connector, and (b) preventing unmating of the connectors.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

ELECTRICAL CONNECTOR ASSEMBLY WITH IMPROVED LATCH MEANS

Field of the Invention:

This invention generally relates to the art of electrical connectors and, particularly, to a connector assembly which includes a dual-function latch means between a pair of mating connectors.

Background of the Invention:

A typical electrical connector assembly includes a pair of mating connectors such as a plug connector which is insertable into a receptacle of a receptacle connector. Most often, some form of latch means are provided for holding the two connectors in mated condition.

For instance, FIGS. 1 and 2 show a typical electrical connector assembly, generally designated 8, which includes a receptacle connector, generally designated 10, mateable with a plug connector, generally designated 20. The connector assembly is designed for mounting on a printed circuit board (not shown).

Receptacle connector 10 of connector assembly 8 includes a dielectric housing 12 having a receptacle 14. The housing mounts a plurality of conductive terminals 16. A pair of latching apertures 17 are formed in a bottom wall of the housing, and a pair of slots 17a lead from an edge of the bottom wall to latching apertures 17. The housing is elongated, and a pair of support protrusions 18 project from opposite ends of the housing. A pair of L-shaped support members 19 are mounted in support protrusions 18. The support members are fabricated of metal material and are connected, as by soldering, to a pair of mounting pads on the printed circuit board to fix receptacle connector 10 to the board. Finally, a pair of guide grooves 15 are formed in the inside surfaces of the end walls of housing 12.

Plug connector 20 of connector assembly 8 includes a plug-shaped dielectric housing 22 for insertion into receptacle 14 of receptacle connector 10. The housing has an outwardly projecting peripheral flange 24. A pair of guide ribs 25 project outwardly from opposite ends of the housing. A pair of chamfered latch bosses 27 project upwardly from the housing. Finally, a plurality of conductors, generally designated 30, are terminated in the housing. Receptacle

connector 10 and plug connector 20 are mated in the direction of arrows "A" (Fig. 2). The plug-shaped housing 22 of the plug connector is inserted into receptacle 14 of receptacle connector 10. During insertion, guide ribs 25 at opposite ends of the housing of the plug connector ride into guide grooves 15 within opposite ends of the receptacle. When the two connectors are fully mated, peripheral flange 24 of the plug connector abuts against the front edge of housing 12 of the receptacle connector about receptacle 14. During mating, latch bosses 27 of the plug connector move into receptacle 14 of the receptacle connector, inside slots 17a which allow for the receptacle wall to expand, until the latch bosses "snap" into latching apertures 17 of the receptacle connector to hold the two connectors in mated condition.

A conventional connector assembly such as connector assembly 8 has various problems. First, the latching means defined by latching apertures 17 and latch bosses 27 are too easy to unlatch during handling or due to impacts on the connector assembly. In addition, the plug-shaped housing 22 of plug connector 20 is too easy to shift or shake back and forth in the longitudinal direction of the elongated assembly, resulting in the connections between terminals 16 and conductors 30 being impaired. The housings, themselves, can become abraded or damaged due to this shifting or relative movement between the two connector housings longitudinally of the assembly.

The present invention is directed to solving these various problems of the prior art by providing a dual-function latching system which not only securely latches two connectors in mated condition, but the latch means, itself, prevents relative movement between the connectors.

Summary of the Invention:

An object, therefore, of the invention is to provide a new and improved electrical connector assembly of the character described and having an improved latching system.

In the exemplary embodiment of the invention, an electrical connector assembly includes a plug connector having a first dielectric housing mounting a plurality of conductors. A receptacle connector includes a second dielectric housing having a receptacle for matingly receiving the dielectric housing of the plug connector. The second housing mounts a plurality of terminals for connection to the conductors of the plug connector when the connectors are mated. A pair of latch arms project from opposite sides of the second housing of the receptacle connector into close proximity to opposite sides of the first housing of the plug connector when

the connectors are mated. The latch arms have latch portions for engaging the first housing to prevent unmating of the connectors. The latch arms, thereby, perform a dual function of (a) preventing lateral movement of the plug connector relative to the receptacle connector, and (b) preventing unmating of the connectors.

According to one aspect of the invention, the first housing of the plug connector has a flange which prevents over-insertion of the first housing into the receptacle of the second housing of the receptacle connector. The flange performs a dual function of providing a latch shoulder for engagement by the latch portions of the latch arms. The latch arms are flexible and the latch portions thereof comprise latch hooks for automatically snapping into latching engagement with the latch shoulder of the flange when the connectors are mated.

According to another aspect of the invention, the receptacle connector includes a pair of support blocks projecting outwardly from the opposite sides of the second housing. A pair of support members are mounted in the support blocks and are connectable to a printed circuit board to thereby fix the receptacle connector to the circuit board. The latch arms project from the support blocks. As disclosed herein, the second housing is molded of plastic material, the support blocks are molded integrally with opposite sides of the second housing, the latch arms are molded integrally with the support blocks, and the support members are fabricated of metal material for solder connection to the circuit board.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings:

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIG. 1 is a perspective view of a connector assembly according to the prior art;

FIG. 2 is a perspective view of the assembly of FIG. 1, turned upside-down, and with the connectors unmated;

FIG. 3 is a perspective view of a connector assembly according to the invention;

FIG. 4 is a perspective view of the assembly of FIG. 3, turned upside-down and with the connectors unmated;

FIG. 5 is a perspective view of the receptacle connector in the orientation of FIG. 3; and

FIG. 6 is a fragmented, enlarged perspective view showing the area of one of the latch arms of the receptacle connector in latching condition against the plug connector.

Detailed Description of the Preferred Embodiment:

Referring to the drawings in greater detail, and first to FIGS. 3 and 4, the invention is embodied in an electrical connector assembly, generally designated 40, which includes a receptacle connector, generally designated 42, mateable with a plug connector, generally designated 44. In essence, plug connector 44 includes an elongated, rectangular plug-shaped housing 46 which is inserted into a rectangular receptacle 48 of an elongated housing 50 of receptacle connector 42.

Referring to FIG. 5 in conjunction with FIGS. 1 and 2, housing 50 of receptacle connector 42 mounts a plurality of conductive male terminals 52 which are engageable with a plurality of conductors, generally designated 54 (Figs. 3 and 4), which are terminated within housing 46 of plug connector 44. The conductors may be terminated to a plurality of female terminals (not shown) which receive male terminals 52. Terminals 52 have tail portions 52a for connection to circuit traces on a printed circuit board (not shown).

Housing 50 of receptacle connector 42 is elongated and includes a bottom wall 50a having a pair of latching apertures 56, along with a pair of slots 56a which run from the latching apertures to an edge of the bottom wall to provide flexibility therefor. A pair of guide grooves 58 are formed within end walls of the housing which define opposite ends of receptacle 48. A pair of support blocks 60 project outwardly from opposite ends or sides of housing 50. A pair of L-shaped support members or "fitting nails" 62 are mounted in support blocks 60 for fixing receptacle connector 42 to the printed circuit board.

Housing 46 of plug connector 42 includes an outwardly projecting peripheral flange 64 which engages an edge 65 (Fig. 5) of housing 50 to prevent over-insertion of the plug connector into the receptacle connector. A pair of latch bosses 66 project from one side of the housing for latching engagement within latching apertures 56 of receptacle connector 42. A pair of guide ribs 68 project outwardly from opposite ends of plug housing 46 for riding in guide grooves 58

within receptacle 48 of the receptacle connector. Housing 46, including flange 64, may be molded of dielectric plastic material.

The invention contemplates providing connector assembly 40, particularly receptacle connector 42, with a dual-function latching means or system, generally designated 70, which performs a dual function of (a) preventing lateral movement of the plug connector relative to the receptacle connector and (b) preventing unmating of the connectors. Specifically, a pair of latch arms 72 project in the mating direction from support blocks 60 at opposite ends of housing 50 of receptacle connector 42. The latch arms terminate in latch hooks 74 having chamfered or angled leading surfaces 74a. In the preferred embodiment, housing 50 of receptacle connector 42 is a one-piece structure molded of dielectric plastic material. Support blocks 60 are molded integrally with opposite sides or ends of the housing. Latch arms 72 are molded integrally with the support blocks. Support members 62 are fabricated of metal material for solder connection to the printed circuit board.

FIG. 6 shows how latch arms 72 of receptacle connector 42 are operatively associated with peripheral flange 64 of plug connector 44 to perform the above-described dual function. Specifically, when the connectors are mated, opposite ends of peripheral flange 64 engages chamfered surfaces 74a of latch hooks 74 to bias the latch arms outwardly, as the plastic latch arms are flexible in the direction of double-headed arrow "B". When the connectors are fully mated, latch hooks 74 "snap" back inwardly into latching engagement with peripheral flange 74, as at 80, whereby the latching system performs one function of holding the connectors in mated condition. However, it can be seen in FIG. 6 that the inside surfaces of latch arms 72 are in engagement or at least close proximity to opposite ends of the peripheral flange, as at 82, whereby the latching system performs a second function of preventing lateral movement of the plug connector relative to the receptacle connector. Actually, peripheral flange 64 performs a dual function of providing a latch shoulder for engagement by latch hooks 74 of the latch arms as well as preventing over-insertion of the plug connector into receptacle 48 of the receptacle connector, as the flange abuts edge 66 (Fig. 5) of the receptacle connector when the connectors are fully mated.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and

embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

CLAIMS:

What is claimed is:

1. An electrical connector assembly, comprising:
a plug connector including a first dielectric housing mounting a plurality of conductors;
and
a receptacle connector including a second dielectric housing having a receptacle for matingly receiving the first dielectric housing of the plug connector, the second housing mounting a plurality of terminals for connection to the conductors of the plug connector when the connectors are mated, and
a pair of latch arms projecting from opposite sides of the second housing of the receptacle connector into close proximity to opposite sides of the first housing of the plug connector when the connectors are mated, the latch arms having latch portions for engaging the first housing to prevent unmating of the connectors;
whereby the latch arms perform a dual function of (a) preventing lateral movement of the plug connector relative to the receptacle connector, and (b) preventing unmating of the connectors.
2. The electrical connector assembly of claim 1 wherein said first housing of the plug connector has a flange which prevents over-insertion of the first housing into the receptacle of the second housing of the receptacle connector, the flange performing a dual function of providing a latch shoulder for engagement by the latch portions of said latch arms.
3. The electrical connector assembly of claim 2 wherein said latch arms are flexible and the latch portions of the latch arms comprise latch hooks for automatically snapping into latching engagement with the latch shoulder of said flange when the connectors are mated.
4. The electrical connector assembly of claim 1 wherein said receptacle connector includes a pair of support blocks projecting outwardly from said opposite sides of the second housing, a pair of support members mounted in the support blocks and connectable to a printed

circuit board to thereby fix the receptacle connector to the circuit board, and said latch arms project from the support blocks.

5. The electrical connector assembly of claim 4 wherein said second housing is molded of plastic material, the support blocks are molded integrally with the opposite sides of the second housing, the latch arms are molded integrally with the support blocks, and said support members are fabricated of metal material for solder connection to the circuit board.

6. An electrical connector assembly, comprising:
a first connector including a first dielectric housing mounting a plurality of conductors;
and

a second connector including a second dielectric housing for mating with the first dielectric housing of the first connector, the second housing mounting a plurality of conductors for connection to the conductors of the first connector when the connectors are mated, and

a pair of latch arms projecting from opposite sides of the second housing of the second connector into close proximity to opposite sides of the first housing of the first connector when the connectors are mated, the latch arms having latch portions for engaging the first housing to prevent unmating of the connectors;

whereby the latch arms perform a dual function of (a) preventing lateral movement of the first connector relative to the second connector, and (b) preventing unmating of the connectors.

7. The electrical connector assembly of claim 6 wherein said first housing of the first connector has a flange which prevents over-mating of the first housing with the second housing of the second connector, the flange performing a dual function of providing a latch shoulder for engagement by the latch portions of the latch arms.

8. The electrical connector assembly of claim 7 wherein said latch arms are flexible and the latch portions of the latch arms comprise latch hooks for automatically snapping into latching engagement with the latch shoulder of said flange when the connectors are mated.

9. The electrical connector assembly of claim 6 wherein said second connector includes a pair of support blocks projecting outwardly from said opposite sides of the second housing, a pair of support members mounted in the support blocks and connectable to a printed circuit board to thereby fix the second connector to the circuit board, and said latch arms project from the support blocks.

10. The electrical connector assembly of claim 9 wherein said second housing is molded of plastic material, the support blocks are molded integrally with the opposite sides of the second housing, the latch arms are molded integrally with the support blocks, and said support members are fabricated of metal material for solder connection to the circuit board.

11. An electrical connector assembly, comprising:
a plug connector including a first dielectric housing mounting a plurality of conductors;
and
a receptacle connector including a second dielectric housing having a receptacle for matingly receiving the first dielectric housing of the plug connector, the second housing mounting a plurality of terminals for connection to the conductors of the plug connector when the connectors are mated,
a pair of support blocks projecting outwardly from said opposite sides of the second housing,
a pair of support members mounted in the support blocks and connectable to a printed circuit board to thereby fix the receptacle connector to the circuit board, and
a pair of latch arms projecting from said support blocks and having latch portions for engaging the first housing to prevent unmating of the connectors.

12. The electrical connector assembly of claim 11 wherein said second housing is molded of plastic material, the support blocks are molded integrally with the opposite sides of the second housing, the latch arms are molded integrally with the support blocks, and said support members are fabricated of metal material for solder connection to the circuit board.

AMENDED CLAIMS

[received by the International Bureau 08 November 2004 (08.11.04);
original claims 1 to 12 replaced by new claims 1 to 4]

CLAIMS

1. An electrical connector assembly (40), comprising:

2 a plug connector (44) including a first dielectric housing (46) mounting a plurality of conductors (54); and

4 a receptacle connector (42) including a second dielectric housing (50) having a receptacle (48) for matingly receiving the first dielectric housing of the plug connector, the second housing mounting a plurality of terminals (52) for connection to the conductors of the plug connector when the connectors are mated, and

6 a pair of latch arms (72) projecting from opposite sides of the second housing of the receptacle connector into close proximity to opposite sides of the first housing of the plug connector when the connectors are mated, the latch arms having latch portions (74) for engaging the first housing to prevent unmating of the connectors;

8 wherein said receptacle connector (42) includes a pair of support blocks (60) projecting outwardly from said opposite sides of the second housing (50), a pair of support members (62) mounted in the support blocks and connectable to a printed circuit board to thereby fix the receptacle connector to the circuit board, and said latch arms (72) project from the support blocks.

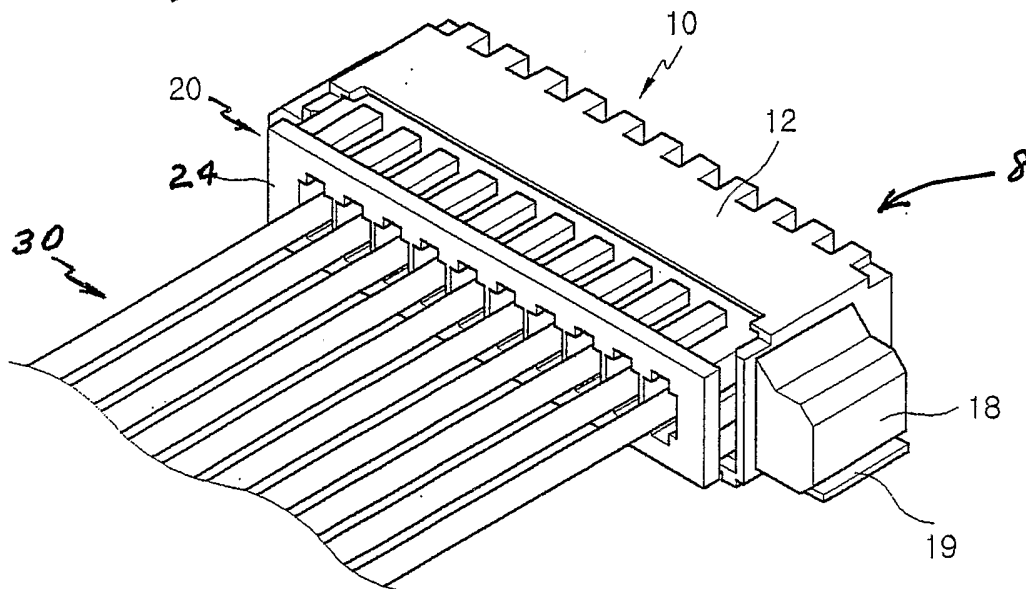
10 whereby the latch arms (72) perform a dual function of (a) preventing lateral movement of the plug connector (44) relative to the receptacle connector (42), and (b) preventing unmating of the connectors.

2 2. The electrical connector assembly of claim 1 wherein said first housing (46) of the plug connector (44) has a flange (64) which prevents over-insertion of the first housing into the receptacle (48) of the second housing (50) of the receptacle connector (42), the flange performing a dual function of providing a latch shoulder for engagement by the latch portions (74) of said latch arms (72).

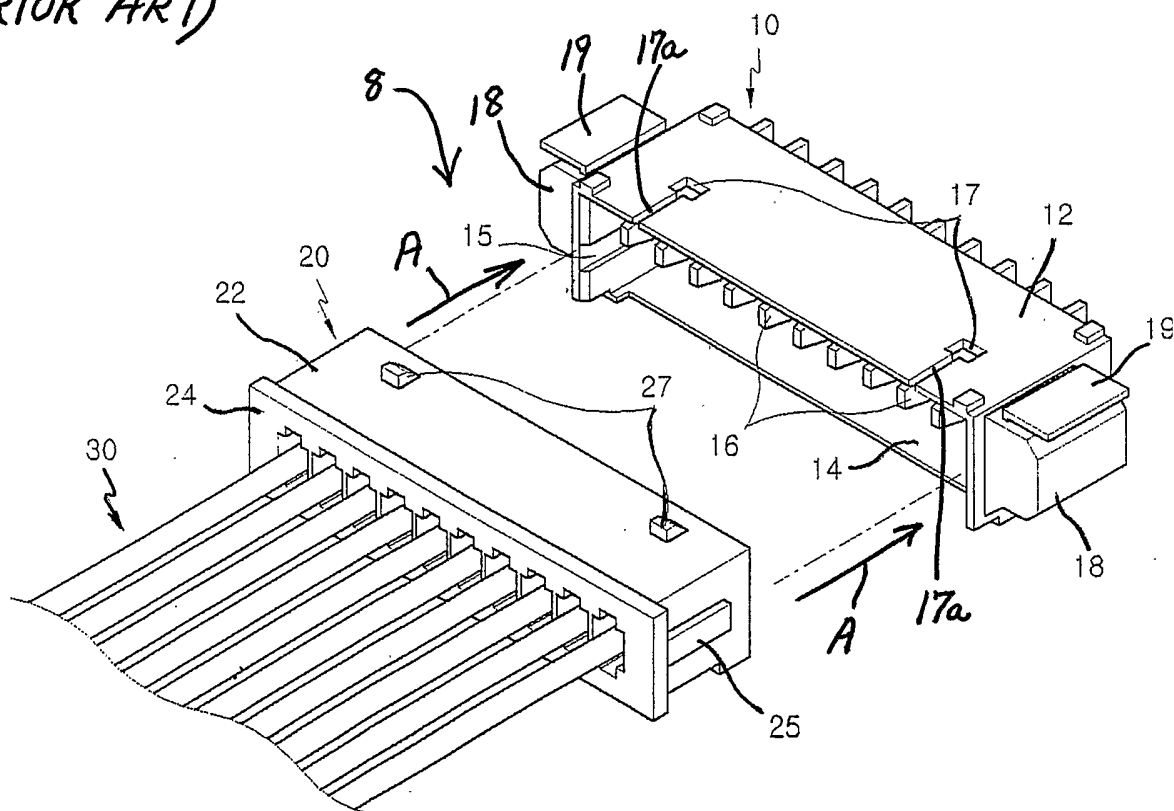
3. The electrical connector assembly of claim 2 wherein said latch arms (72) are flexible and the latch portions of the latch arms comprise latch hooks (74) for automatically snapping into latching engagement with the latch shoulder of said flange (64) when the connectors are mated.

2 4. The electrical connector assembly of claim 1 wherein said second
housing (50) is molded of plastic material, the support blocks (60) are molded integrally
with the opposite sides of the second housing, the latch arms (72) are molded integrally with
4 the support blocks, and said support members (62) are fabricated of metal material for
solder connection to the circuit board.

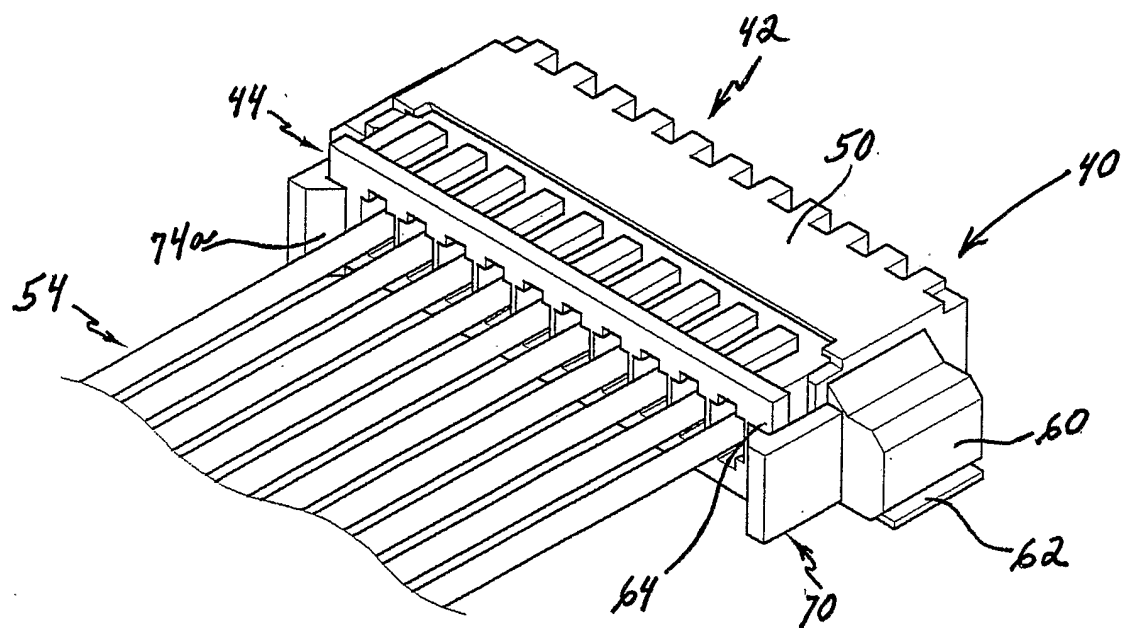
【 FIG. 1 】
(PRIOR ART)



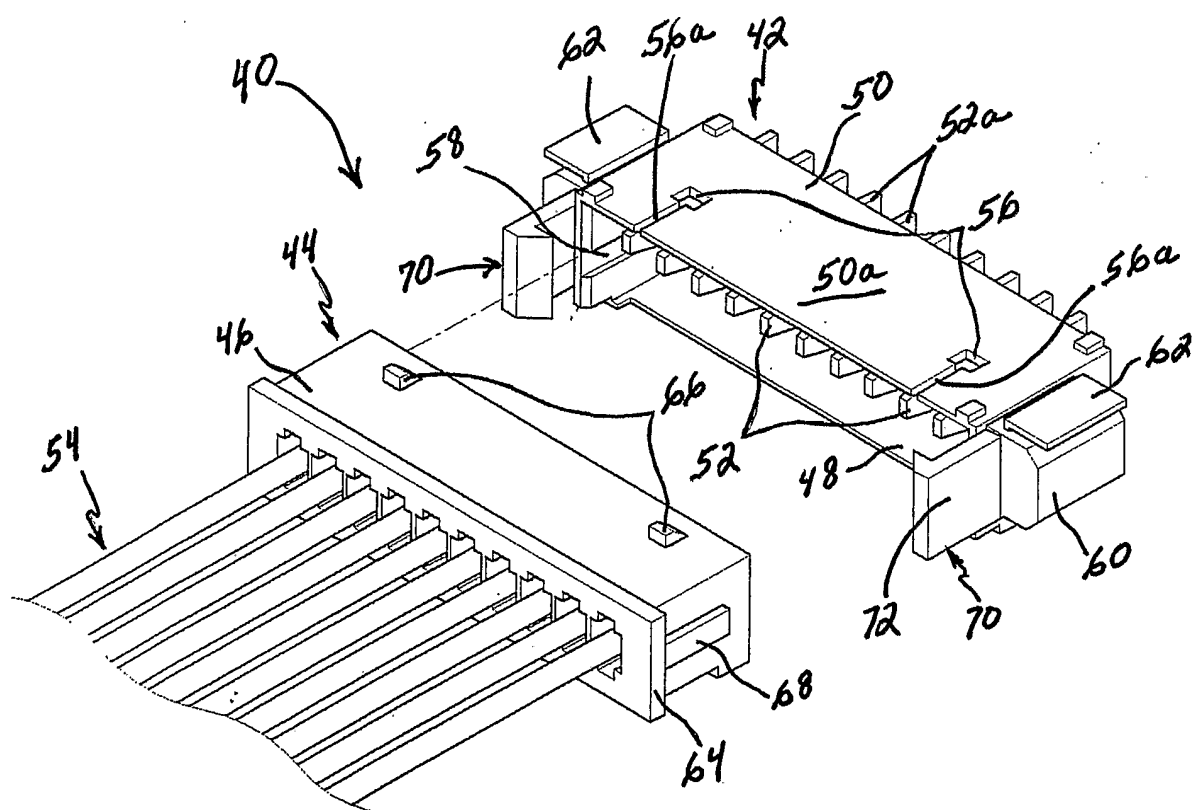
【 FIG. 2 】
(PRIOR ART)



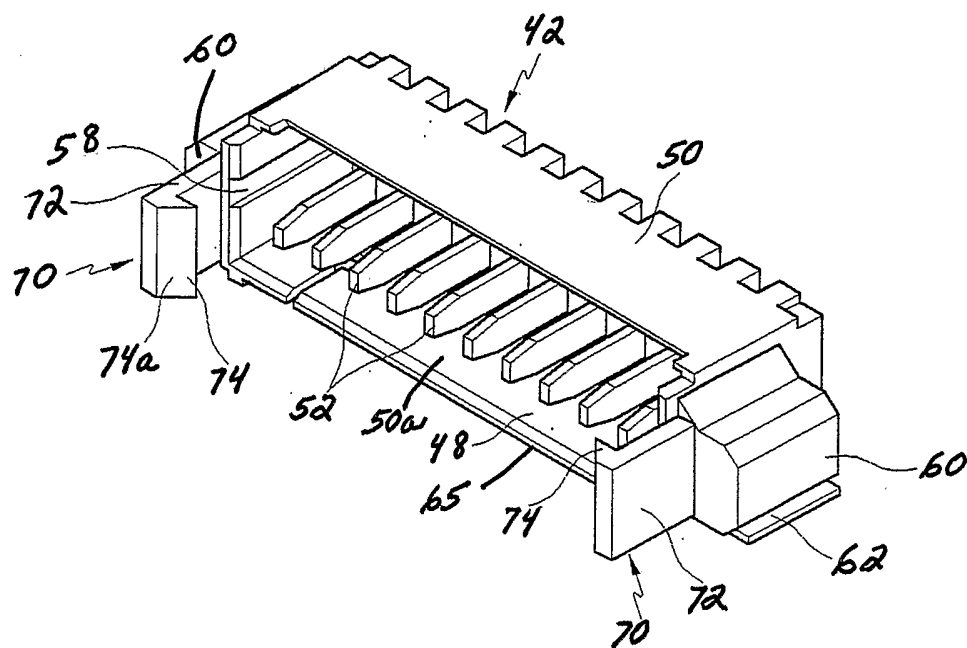
【 FIG. 3 】



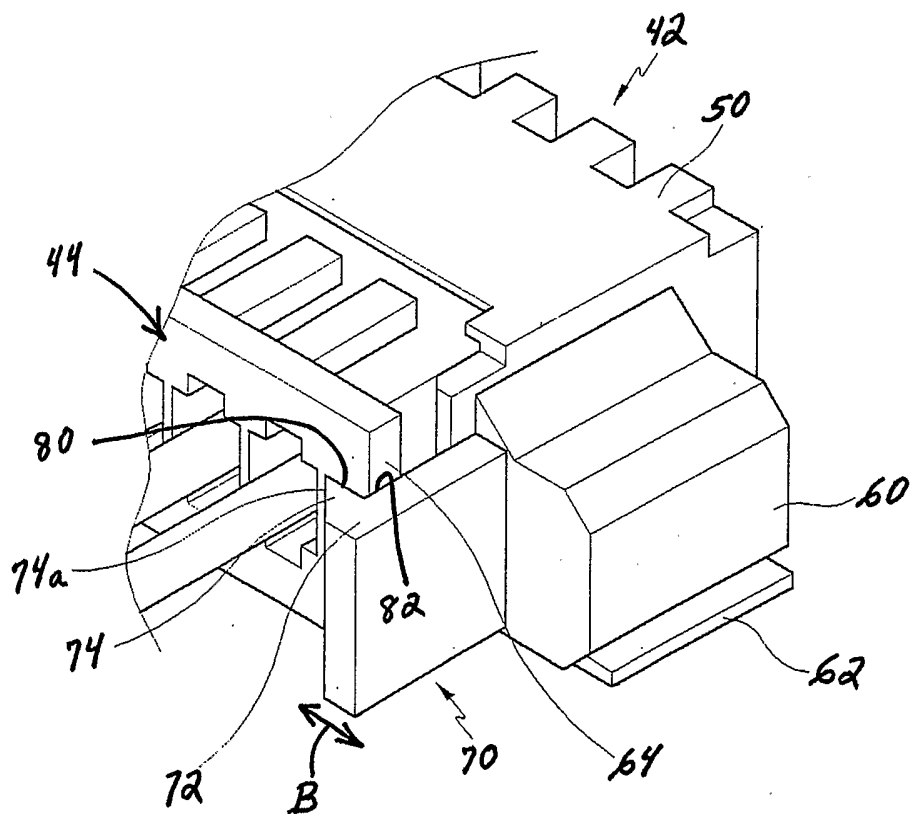
【 FIG. 4 】



【 FIG. 5 】



【 FIG. 6 】



INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/014591

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01R13/627

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 042 411 A (CHOY EDMOND) 28 March 2000 (2000-03-28) column 2, line 16 - column 3, line 22 figures 1-4	1,4-6, 9-12
X	US 6 132 234 A (AYDT GABRIELE ET AL) 17 October 2000 (2000-10-17) column 4, line 22 - column 5, line 26 figures 1-4	1-3,6-8
X	US 6 398 579 B1 (BANAS HENRY J ET AL) 4 June 2002 (2002-06-04) column 2, line 66 - column 3, line 61 figures 1-9	1-3,6-8
X	DE 299 23 756 U (GROTE & HARTMANN) 15 March 2001 (2001-03-15) page 18, line 10 - page 19, line 4 figures 8-10	1,6 3,8,11

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search

8 September 2004

Date of mailing of the international search report

15/09/2004

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/014591

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