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(71) Applicant (for all designated States except US): **MOLEX INCORPORATED** [US/US]; 2222 Wellington Court, Lisle, IL 60532 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LU, Jing** [SG/SG]; Blk 910 Jurong West Street 91, #04-269, Singapore 648910 (SG).

(74) Agent: **COHEN, Charles, S.**; Molex Incorporated, 2222 Wellington Court, Lisle, IL 60532 (US).

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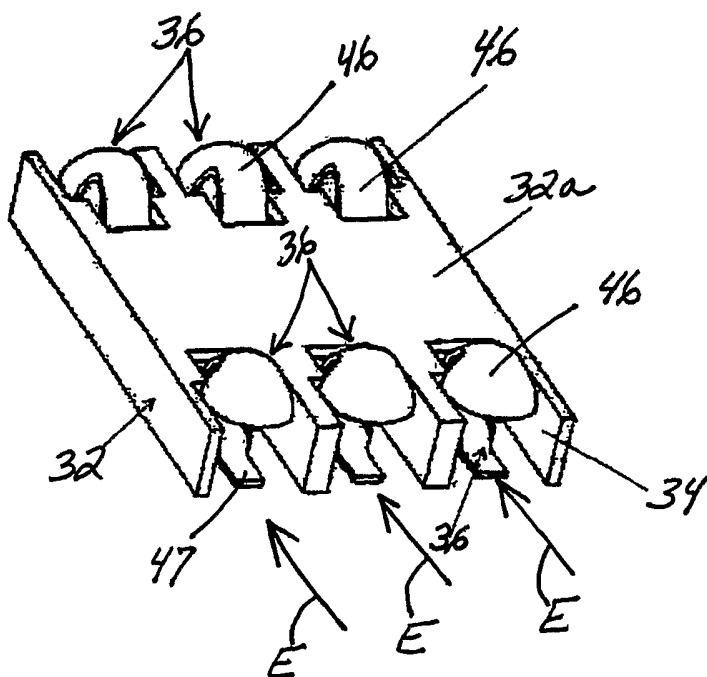
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(54) Title: MEMORY CARD CONNECTOR WITH PRELOADED TERMINALS



(57) Abstract: A memory card connector includes a dielectric housing having at least one terminalreceiving slot with a pair of latch shoulders at opposite sides of the slot. A conductive terminal is mounted in the slot and includes a generally U-shaped section defining a fixing leg and a contact leg joined by a spring bend. The fixing leg is fixed to the housing. The contact leg is resiliently flexible and has a contact portion for engaging an appropriate contact on a memory card. A pair of latch arms extend generally parallel to the contact leg in close proximity to opposite edges of the contact leg and in engagement with the latch shoulders of the housing. This preloads the resiliently flexible contact leg with a preload spring force while allowing the contact leg to flex upon engagement of the contact portion with the memory card.

MEMORY CARD CONNECTOR WITH PRELOADED TERMINALS

Field of the Invention:

This invention generally relates to the art of electrical connectors and, particularly, to a memory card connector having resilient terminals which are preloaded with a preload spring force.

Background of the Invention:

Memory cards are known in the art and contain intelligence in the form of a memory circuit or other electronic program. Some form of card reader reads the information or memory stored on the card. Such cards are used in many applications in today's electronic society, including video cameras, digital still cameras, smartphones, PDA's, music players, ATMs, cable television decoders, toys, games, PC adapters, multi-media cards and other electronic applications. Typically, a memory card includes a contact or terminal array for connection through a card connector to a card reader system and then to external equipment. The connector readily accommodates insertion and removal of the card to provide quick access to the information and program on the card. The card connector includes terminals for yieldingly engaging the contact array of the memory card.

The memory card, itself, writes or reads via the connector and can transmit between electrical appliances, such as a word processor, personal computer, personal data assistant or the like. The card may be used in applications such as mobile or cellular telephones which are actuated and permit data access after identifying an identification code stored on a SIM (subscriber identification module) card. The SIM card has a conductive face with an array of contacts, and the mobile phone has a SIM card connector with terminals for electrical connection with the contacts of the SIM card to ensure the subscriber identification confirmation.

FIG. 1 shows a prior art memory card connector as disclosed in U.S. Patent No. 6,231,394. The connector includes a dielectric housing 10 having a plurality of terminal-receiving slots 12 for receiving a plurality of conductive terminals 14. FIG. 2 shows that each conductive terminal 14 includes a solder tail portion 16 joined to a generally U-shaped section

formed by a first leg 18 which is joined to a second leg 20 by a bent portion 22. The solder tail portion 16 is flat for solder connection to a printed circuit board (not shown) by surface mounting technology. First leg 18 is used to fix the terminal within a respective one of the slots 12 in housing 10. Second leg 20 is resiliently flexible in the direction of double-headed arrow "A" in FIG. 2. The second leg terminates in a dome-shaped contact portion 24 which projects upwardly out of the housing as can be seen in FIG. 1, for contacting a conductive surface of a memory card. Contact portion 24 and flexible leg 20 are preloaded with a preload force by means of a pair of wings 26 of the terminal being captured beneath a plurality of shoulders 28 of housing 10 as can be seen in FIG. 1. Therefore, as the terminals are mounted into slots 12 in the direction of arrow "B" (Fig. 1), legs 20 and contact portions 24 are flexed downwardly so that wings 26 seat beneath shoulders 28 to preload the contact portions.

While prior art connectors of the type shown in FIGS. 1 and 2 are adequate for their intended purposes, wings 26 of the terminals project outwardly and are captured beneath shoulders 28 of the connector housing which increases the overall size or width of the housing to accommodate the preloading means for the terminals. Not only is the overall width of the housing unnecessarily large, but the spacing or "pitch" between the terminals also is relatively large to accommodate the outwardly projecting wings. These size problems are critical with the ever-increasing miniaturization of such connectors. Still further, problems are caused should the wings engage first leg 18 of the terminal which would limit the amount of flexing of contact portion 24. The present invention is directed to solving these problems.

Summary of the Invention:

An object, therefore, of the invention is to provide a memory card connector of the character described, including a new and improved system for preloading the terminals of the connector.

In the exemplary embodiment of the invention, the memory card connector includes a dielectric housing having at least one terminal-receiving slot with a pair of latch shoulders at opposite sides of the slot. A conductive terminal is mounted in the slot and includes a generally U-shaped section defining a fixing leg and a contact leg joined by a spring bend. The fixing leg is fixed to the housing. The contact leg is resiliently flexible and has a contact portion for engaging an appropriate contact on a memory card. A pair of latch arms extend generally

parallel to the contact leg in close proximity to opposite edges of the contact leg and in engagement with the latch shoulders of the housing. This preloads the resiliently flexible contact leg with a preload spring force while allowing the contact leg to flex upon engagement of the contact portion with the memory card.

According to some aspects of the invention, the terminal is mounted in the terminal-receiving slot of the housing in an insertion direction. The latch arms of the terminal extend in the insertion direction for movement into engagement with the latch shoulders as the terminal is inserted into the slot. The latch arms are generally L-shaped, with vertical portions depending from opposite sides of the contact portion and horizontal portions extending generally parallel to the contact leg in the insertion direction.

According to other aspects of the invention, the fixing leg extends from the spring bend to a distal end forming a tail portion for connection to an appropriate printed circuit board. The contact leg extends from the spring bend to a distal end which forms the contact portion. The latch arms depend from opposite sides of the contact portion of the terminal and are spaced wider than the tail portion. As disclosed herein, the contact portion is dome-shaped, and the latch arms are formed as continuations of side walls of the dome-shaped contact portion. The terminal may be stamped and formed of conductive sheet metal material.

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 FIGS. and in which:

FIGS. 1 and 2 are views of a prior art memory card connector as described in the Background, above;

FIG. 3 is a bottom perspective view of a memory card connector embodying the concepts of the invention;

FIG. 4 is an enlarged bottom perspective view of one of the terminals of the connector in FIG. 3;

FIG. 5 is a side elevational view of the terminal;

FIG. 6 is a top plan view of the terminal; and

FIG. 7 is a top perspective view of the connector.

Detailed Description of the Preferred Embodiment:

Referring to the drawings in greater detail, and first to FIG. 3, the invention is embodied in a memory card connector, generally designated 30, which includes a dielectric housing, generally designated 32, having a plurality of terminal-receiving slots 34 which mount a plurality of conductive terminals, generally designated 36. Housing 32 has a top mating face 32a against which a memory card (not shown) is juxtaposed, and a bottom face 32b which is generally planar for mounting on a printed circuit board. The housing may be molded of plastic material or the like, and a pair of latch shoulders 38 are formed at opposite sides of each slot 34.

Referring to FIGS. 4-6 in conjunction with FIG. 3, each terminal 36 includes a generally u-shaped section which defines a fixing leg 40 and a contact leg 42 joined by a spring bend 44. Fixing leg 40 is used to fix the terminal in a respective one of the terminal-receiving slots 34 of the housing. Therefore, the side edges of the fixing leg have projections 40a for biting into the plastic material of the housing within the slot to securely fix the terminal in the slot. Contact leg 42 is cantilevered over the fixing leg and is resiliently flexible toward and away therefrom in the direction of double-headed arrow "C". The contact leg extends from spring bend 44 to a distal end which forms a rounded or dome-shaped contact portion 46 for engaging a contact on the memory card. The dome-shaped contact portion has a top surface 46a for engaging the contact on the memory card, along with a bottom edge or surface 46b. Fixing leg 40 extends from the spring bend to a distal end which forms a tail portion 47 for connection to an appropriate circuit trace on a surface of the printed circuit board. Terminal 36 may be stamped and formed of conductive sheet metal material.

Still referring to FIGS. 4-6, each terminal includes a pair of latch arms, generally designated 48, for engaging latch shoulders 38 of housing 32 and for preloading the resiliently flexible contact leg 42 with a preload spring force while allowing the contact leg to flex upon engagement of contact portion 46 with the memory card. The latch arms are generally planar

and extend generally parallel to contact leg 42 in close proximity to opposite edges of contact portion 46.

More particularly, latch arms 48 are generally L-shaped with vertical portions 48a depending from opposite sides of the dome-shaped contact portion 46, and horizontal portions 48b which extend generally parallel to contact leg 42. Latch arms 48 actually form a continuation of the opposite sides of contact portion 46. The latch arms are spaced wider than the width of tail portion 47 so that the latch arms do not engage the tail portion when contact portion 46 and contact leg 42 flex downwardly in the direction of arrow "D".

Referring to FIG. 7, it can be seen that contact portions 46 of terminals 36 project upwardly beyond mating face 32a of housing 32 for engaging appropriate contacts on the memory card. Terminals 36 are inserted into the terminal-receiving slots 34 of the housing in the direction of arrows "E". Horizontal portions 48b (Figs. 4-6) of latch arms 48, therefore, extend in the insertion direction "E" of the terminals. The horizontal portions of the terminals can easily be positioned beneath latch shoulders 38 (Fig. 3) of the housing by simply depressing the contact portions as the terminals are inserted into the housing. With the horizontal portions of latch arms 48 captured beneath latch shoulders 38, the resiliently flexible contact legs 42 and contact portions 46 of the terminals are conditioned with preload spring forces while allowing the contact legs to flex upon engagement of the contact portions with the memory card.

Referring back to FIG. 3, a distance "d1" represents a distance between the very top surface 46a of contact portion 46 and mating surface 32a of housing 32. Distance "d2" represents the distance between bottom surface or edge 46b of the contact portion and the top surface of fixing leg 40. Distance "d3" represents the distance between latch arms 48. Distance "d4" represents the width of tail portion 47. With these dimensional relationships, terminals 36 have been designed so that distance "d1" is smaller than distance "d2" so that bottom surface 46b of contact portion 46 of each terminal does not engage the respective fixing leg or tail portion of the terminal, when the memory card presses down on the contact portions of the terminals in the direction of arrow "D" (Figs. 4 and 5). The distance "d3" between latch arms 48 is larger than the width of tail portion 47 and any subjacent portion of fixing leg 40 so that the latch arms do not engage these lower portions of the terminal. To that end, it can be seen in FIG. 4 that a portion 40b of fixing leg 40 has been reduced in width so that it is narrower than the distance "d3" between the latch arms.

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. A memory card connector, comprising:
a dielectric housing having at least one terminal-receiving slot with a pair of latch shoulders at opposite sides of the slot; and
a conductive terminal mounted in said slot and including a generally U-shaped section defining a fixing leg and a contact leg joined by a spring bend, the fixing leg being fixed to the housing, the contact leg being resiliently flexible and having a contact portion for engaging an appropriate contact on a memory card, and a pair of latch arms extending generally parallel to the contact leg in close proximity to opposite edges of the contact leg and in engagement with the latch shoulders of the housing for preloading the resiliently flexible contact leg with a preload spring force while allowing the contact leg to flex upon engagement of the contact portion with the memory card.
2. The memory card connector of claim 1 wherein said terminal is mounted in the terminal-receiving slot of the housing in an insertion direction, and the latch arms of the terminal extend in said insertion direction for movement into engagement with the latch shoulders as the terminal is inserted into the slot.
3. The memory card connector of claim 1 wherein said housing is configured for mounting on a printed circuit board, and the terminal includes a tail portion beneath the contact portion for connection to an appropriate circuit trace on the printed circuit board.
4. The memory card connector of claim 3 wherein said latch arms are spaced wider than the tail portion.
5. The memory card connector of claim 1 wherein said latch arms depend from opposite sides of the contact portion of the terminal.

6. The memory card connector of claim 5 wherein said contact portion is dome-shaped, and the latch arms are formed as continuations of side walls of the dome-shaped contact portion.

7. The memory card connector of claim 1 wherein said latch arms are generally L-shaped with vertical portions depending from opposite sides of the contact portion and horizontal portions extending generally parallel to the contact leg.

8. The memory card connector of claim 1 wherein said terminal is stamped and formed of conductive sheet metal material.

9. The memory card connector of claim 1 wherein said fixing leg extends from said spring bend to a distal end forming a tail portion for connection to an appropriate printed circuit board.

10. The memory card connector of claim 1 wherein said contact leg extends from said spring bend to a distal end which forms said contact portion.

11. A memory card connector, comprising:
a dielectric housing having at least one terminal-receiving slot with a pair of latch shoulders at opposite sides of the slot; and
a conductive terminal stamped and formed of sheet metal material and mounted in said slot, the terminal including a generally U-shaped section defining a fixing leg and a contact leg joined by a spring bend, the fixing leg being fixed to the housing and extending from the spring bend to a distal end forming a tail portion for connection to an appropriate printed circuit board, the contact leg being resiliently flexible and having a contact portion for engaging an appropriate contact on a memory card, the contact leg being cantilevered over the fixing leg and extending from the spring bend to a distal end forming said contact portion, and a pair of latch arms extending generally parallel to the contact leg in close proximity to opposite edges of the contact leg and in engagement with the latch shoulders of the housing for preloading the resiliently

flexible contact leg with a preload spring force while allowing the contact leg to flex upon engagement of the contact portion with the memory card.

12. The memory card connector of claim 11 wherein said terminal is mounted in the terminal-receiving slot of the housing in an insertion direction, and the latch arms of the terminal extend in said insertion direction for movement into engagement with the latch shoulders as the terminal is inserted into the slot.

13. The memory card connector of claim 11 wherein said latch arms are spaced wider than the tail portion.

14. The memory card connector of claim 11 wherein said latch arms depend from opposite sides of the contact portion of the terminal.

15. The memory card connector of claim 14 wherein said contact portion is dome-shaped, and the latch arms are formed as continuations of side walls of the dome-shaped contact portion.

16. An electrical connector, comprising:
a dielectric housing having at least one terminal-receiving slot with a pair of latch shoulders at opposite sides of the slot; and
a conductive terminal mounted in said slot and including a generally U-shaped section defining a fixing leg and a contact leg joined by a spring bend, the fixing leg being fixed to the housing, the contact leg being resiliently flexible and having a contact portion for engaging an appropriate contact on an electrical device, and a pair of latch arms extending generally parallel to the contact leg in close proximity to opposite edges of the contact leg and in engagement with the latch shoulders of the housing for preloading the resiliently flexible contact leg with a preload spring force while allowing the contact leg to flex upon engagement of the contact portion with the electrical device.

17. The electrical connector of claim 16 wherein said terminal is mounted in the terminal-receiving slot of the housing in an insertion direction, and the latch arms of the terminal extend in said insertion direction for movement into engagement with the latch shoulders as the terminal is inserted into the slot.

18. The electrical connector of claim 16 wherein said housing is configured for mounting on a printed circuit board, and the terminal includes a tail portion beneath the contact portion for connection to an appropriate circuit trace on the printed circuit board.

19. The electrical connector of claim 18 wherein said latch arms are spaced wider than the tail portion.

20. The electrical connector of claim 16 wherein said latch arms depend from opposite sides of the contact portion of the terminal.

21. The electrical connector of claim 20 wherein said contact portion is dome-shaped, and the latch arms are formed as continuations of side walls of the dome-shaped contact portion.

22. The electrical connector of claim 16 wherein said latch arms are generally L-shaped with vertical portions depending from opposite sides of the contact portion and horizontal portions extending generally parallel to the contact leg.

23. The electrical connector of claim 16 wherein said terminal is stamped and formed of conductive sheet metal material.

24. The electrical connector of claim 16 wherein said fixing leg extends from said spring bend to a distal end forming a tail portion for connection to an appropriate printed circuit board.

25. The electrical connector of claim 16 wherein said contact leg extends from said spring bend to a distal end which forms said contact portion.

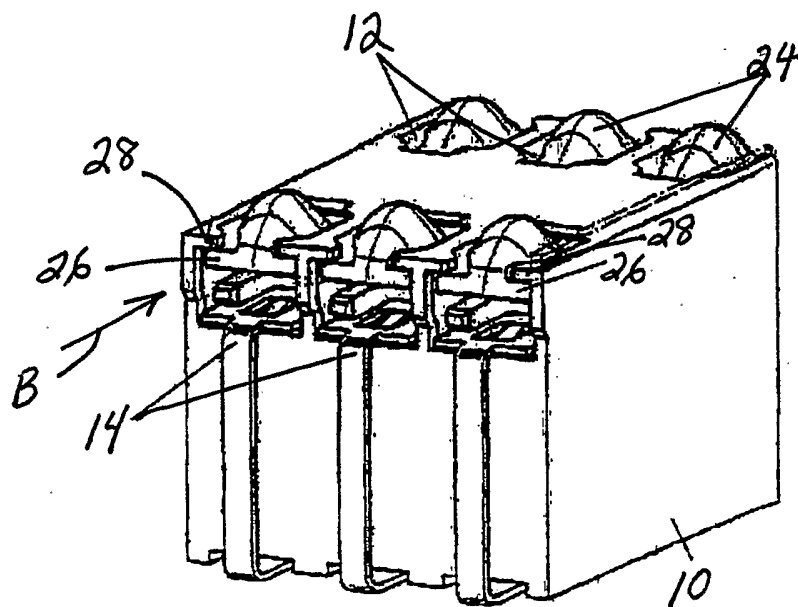


FIG. 1
(PRIOR ART)

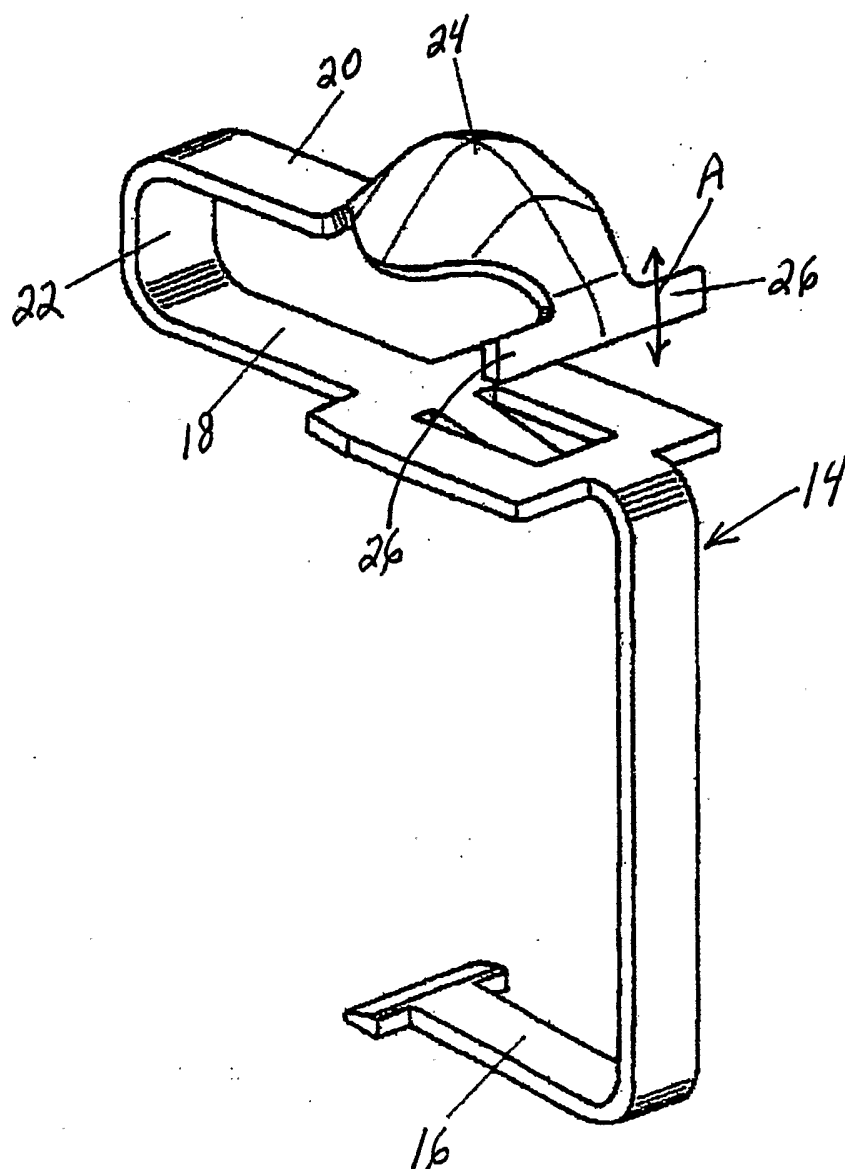


FIG. 2
(PRIOR ART)

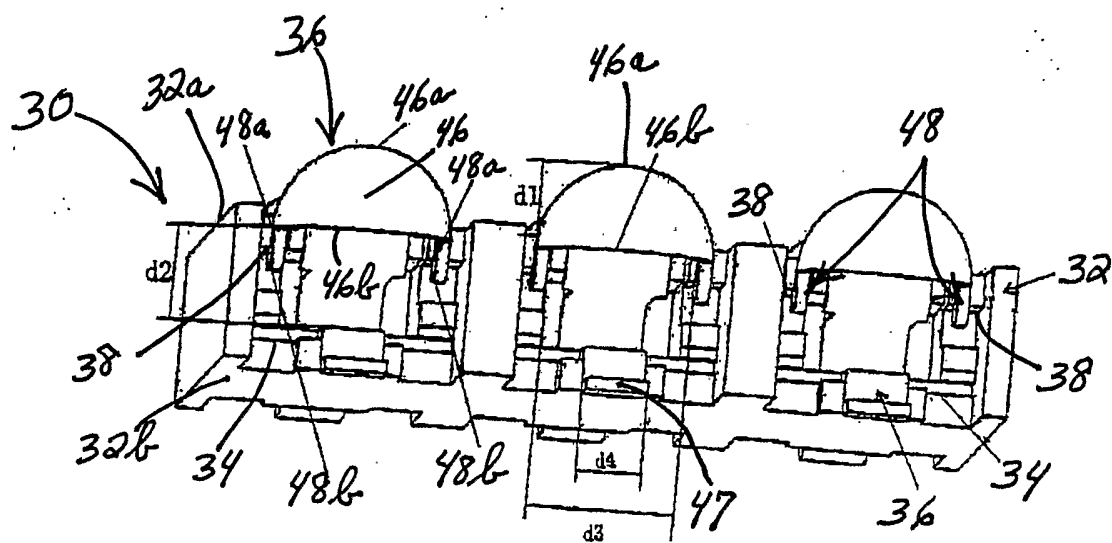


FIG. 3

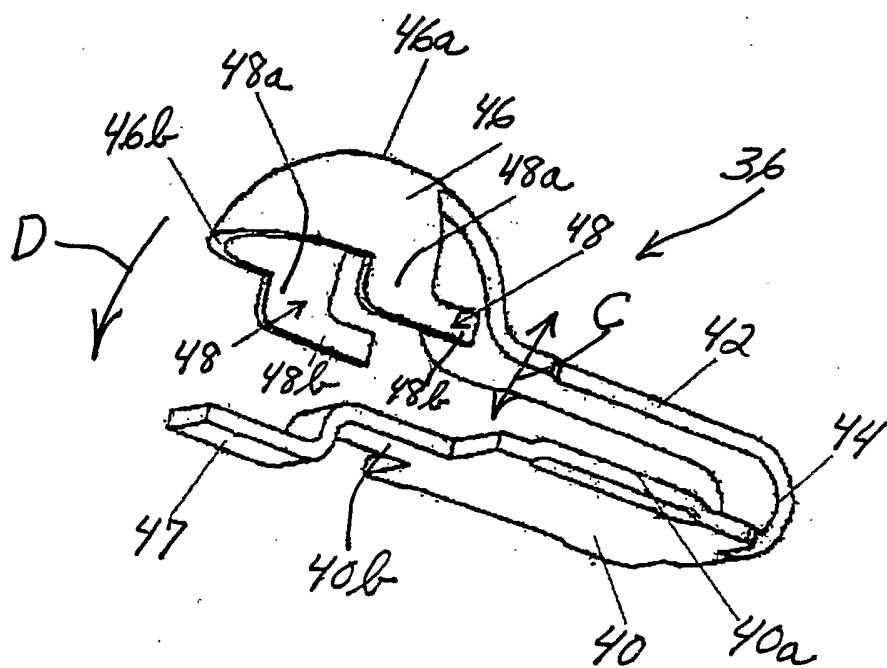


FIG. 4

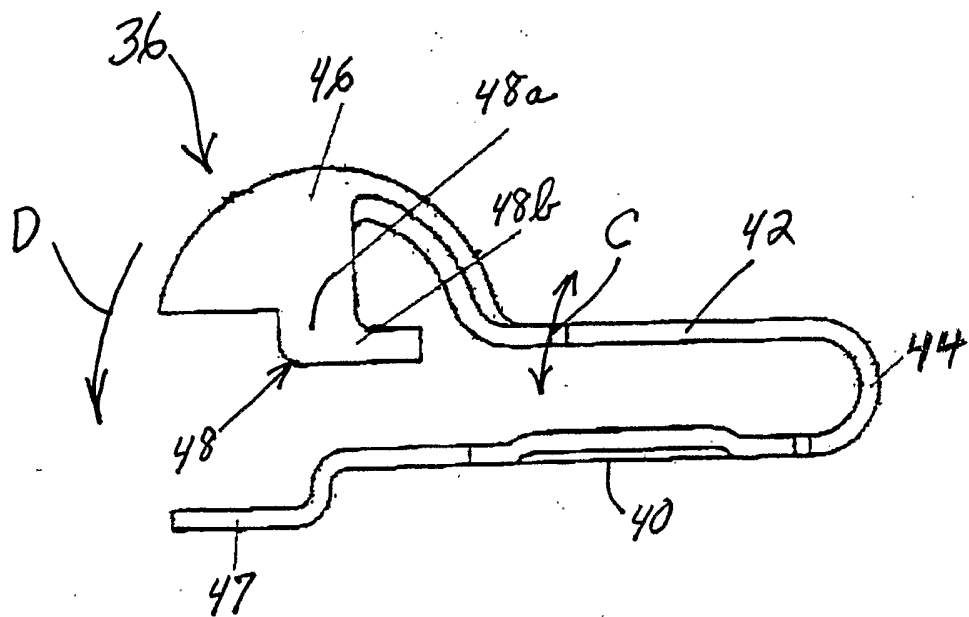


FIG. 5

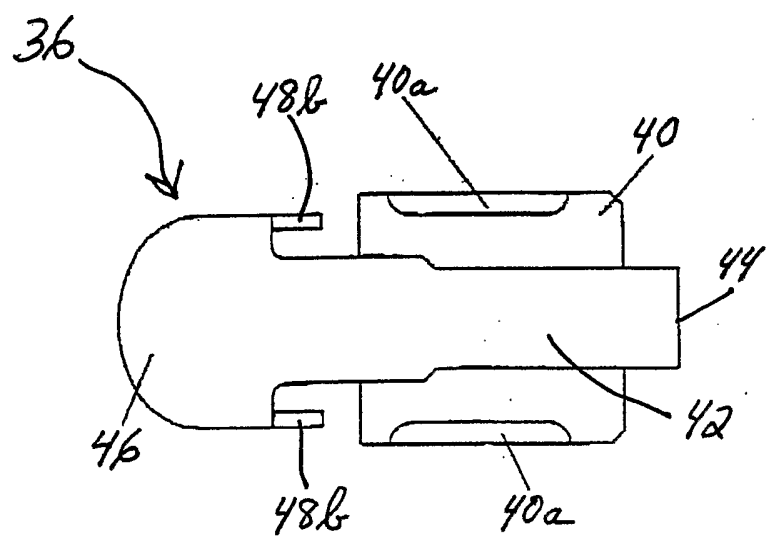


FIG. 6

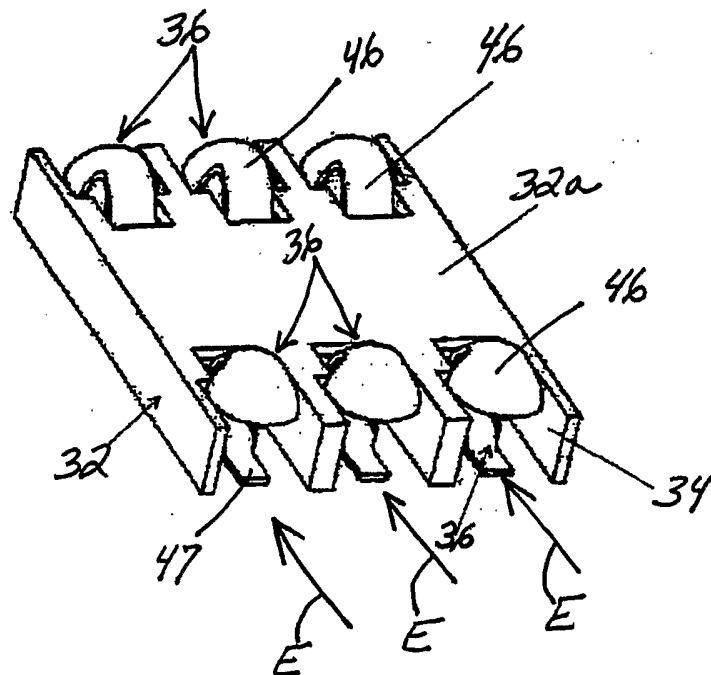


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2005/017872

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06K7/00

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 G06K 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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 100 27 600 C1 (AMPHENOL-TUCHEL ELECTRONICS GMBH) 22 November 2001 (2001-11-22) paragraph '0040!; figures 1-3	1-25
A	US 6 231 394 B1 (SCHNELL THOMAS ET AL) 15 May 2001 (2001-05-15) cited in the application abstract; figures 1,2	1,11,16
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Jiménez, J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2005/017872

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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