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(54) **Plug and socket with assembly consideration**

(57) The present invention discloses a plug and socket structure which can be assembled together. The plug and socket structure are provided with protruding part and recess to connect a plurality of plug or socket together to form male/female connector with all kind of pin layout and pin count.

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Description

FIELD OF THE INVENTION

[0001] The present invention generally pertains to the structure of plug and socket, more particularly, relates to the structure of combinative plug and socket which can be assembled to form diverse male/female connector.

DESCRIPTION OF THE PRIOR ART

[0002] Most of the terminal or connector structures used in current electronics industry are design of male and female connection primary used for electrical connection or data transmission. Various terminals and connectors were developed in the past to fulfill all kinds of transmission specification in the field of industry and consumer electronics, such as audio/video (AV) terminals, S terminal, component terminal, DVI (digital visual interface) terminal, and the most popular HDMI (high definition multimedia interface) terminal for the transmission of high resolution video signal, to name just a few. In the application of printed circuit board, the manner of male-female connection is utilized in the connecting of circuit board with electronic components, flat cables, and other peripheral or hardware equipments. For example, FIG. 1 illustrates the schematic view of a conventional flexible flat cable (FCC) connector for the connection between, hard disk and motherboard. The flat cable 100 is generally provided with a female header 102 in it's free end, while a corresponding box header 104 is fixed and welded on the motherboard 107. The connection of female header 102 and box header 104 allows the transmission of data signal therebetween. As showed in the figure, the box header 104 has two rows of pins 106 in arrangement welded upon the motherboard 107 to support the connection. Each pin has their corresponding socket on the female header 102. Again, every socket has their corresponding wire 108 connected therewith to establish the electrical connection.

[0003] The design of male/female connector structure are widely used in electronic industry, especially for those who need the connection of various peripheral equipments with motherboard, such as supply wire, data cable, CPU socket, RAM slot, etc. The transmission specification is changed and modified as the performance of electronic product became more and more powerful, thus there are diversified structures of male and female connector provided to fulfill this requirement, each with their features, such as different pin count, pin length, pitch, and socket number. The header of main power supply of a conventional ATX spec (Advanced Technology Extended), for example, is a 24-pin structure, while the one of ATX 12V spec is a 4-pin structure; In addition, the flat cable connectors for the floppy is a 34-pin design, the flat cable connector for ATA/IDE (Advanced Technology Attachment / Integrated Device Electronics), and the one for UDMA spec (Ultra Direct Memory Access) is 80-pin

connector structure. Except the variation in the pin count, the pin layout in various connectors may also be significantly different. For example, the aforementioned box header for ATX 12V spec is a 4-pin disposition in a 2x2 arrangement. Within same 4-pin disposition, the power wire for hard disk or CD-ROM player is in a single-rowed 4-pin arrangement. Anticipatively, more and more header specification will be purposed in the future with the development of the electronic product and technology.

SUMMARY OF THE INVENTION

[0004] In order to fulfill the possible modification of current connector and new transmission specification to be developed in the future, the present invention provides a novel, combinative structure to enhance the modifiability of conventional plug and socket. The structures in present invention are composed of a plurality of plugs and sockets combined each other to form pin header or female header with different shapes and pin layout.

[0005] The plug unit and socket unit in present invention are provided with tenons and mortises portion for interlocking to form combined male connector or female connector. In addition, the plug units and socket units are flush-jointed in equal pitch to form the straight, ordered structures of male header or female header to achieve the electron connection.

[0006] One object of present invention is to provide the combinative plug and socket structures to form male/female connectors with different pin layout and pin count.

[0007] The forgoing forms and other forms, objects, and aspects as well as features and advantages of the present invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the present invention rather than limiting the scope of the present invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 illustrates a conventional flexible flat cable connector;

FIG. 2a illustrates several combinative plugs in accordance with one embodiment of the present invention;

FIG. 2b illustrates a pin header form by combinative plug showed in FIG.2a in accordance with one embodiment of the present invention;

FIG. 2c illustrates an irregular pin header form by combinative plugs in FIG.2a in accordance with one embodiment of the present invention;

FIG. 3a illustrates several combinative sockets in accordance with one embodiment of the present invention;

FIG. 3b illustrates a female header form by combinative sockets in FIG 3a in accordance with one embodiment of the present invention;
 FIG. 3c illustrates an irregular female header form by combinative sockets in FIG 3a in accordance with one embodiment of the present invention;
 FIG. 4a illustrates several combinative sockets with dovetail members in accordance with one embodiment of the present invention;
 FIG. 4b illustrates a female header form by combinative sockets showed in FIG.4a in accordance with one embodiment of the present invention;
 FIG. 5a illustrates a double headed plug with dovetail members in accordance with one embodiment of the present invention;
 FIG. 5b illustrates a regular pin header formed by combinative plugs showed in FIG 5a in accordance with one embodiment of the present invention;
 FIG. 5c illustrates an irregular pin header formed by combinative plugs showed in
 FIG. 6 illustrates the pin header and female header formed by the combinative plugs and sockets with identification mark thereon in accordance with one embodiment of the present invention;
 FIG. 7 illustrates the combinative pin header and female header applied on the circuit board in accordance with one embodiment of the present invention;

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] The invention will now be described in greater detail with preferred embodiments of the invention and illustrations attached. Nevertheless, it should be recognized that the preferred embodiments of the invention is only for illustrating. Besides the preferred embodiment mentioned here, present invention can be practiced in a wide range of other embodiments besides those explicitly described, and the scope of the present invention is expressly not limited except as specified in the accompanying Claims.

[0010] Referring now to FIG 2a, which illustrates one of the combinative plug units 201 in the embodiment of present invention. The combinative plug in present invention has various forms and shapes. As showed in figure every individual plug unit is comprised of a body portion 203, a wire portion 205, and a pin portion 207. The wire portion 205 of plug unit 201 is coupled with pin portion 207 within the body portion 203 to provide electrical connection. The wire portion 205 is extended from the top side of body portion 203. The other end of the wire portion 203 may be coupled with an identical combinative plug or other connector for the data transmission. The pin portion 207 of plug unit 201 is firmly attached on body portion 203 and also coupled with the wire portion 205 within the body portion 203. The pin portion 207 can be inserted into a corresponding socket to achieve the electrical connection. The detail will be described in following embodiment.

[0011] As the left of. FIG. 2a showing the plug unit 201 of present invention, the body portion 203 in the embodiment of present invention is in rectangular shape. Two circular tenons 209 are formed on the sidewall thereof for interlocking with corresponding mortises to achieve the assembly. In the mid of FIG. 2a, two circular mortises 208 are formed on the sidewall of plug unit 201. The mortise 208 is dimensioned to receive the tenon 209 and interlock with each other. In the embodiment of present invention, other forms of plug unit may be provided to achieve better modifiability. As showed in the right of FIG 2a, except two tenons 202 formed on the front sidewall of the body portion 203, two more tenons 204 are formed on the other sidewall of body portion 203. Tenon 202 and Tenon 204 can interlock with the plug unit in different directions respectively to form a complicated pin header structure with particular pin layout.

[0012] Referring now to FIG 2b, which is the schematic view of a pin header form by the combinative plug unit 201 showed in FIG.2a. As showed in the figure, the plug units 201 are combined with each other by the interlocking member (ex. the tenons and mortises) on the body portion 203. A plurality of combinative plug units 200 can form a one-row pin header 206 with equal pitch. Except the single row arrangement, the structure with multiple rows is also provided in the embodiment of present invention. As showed in FIG 2c, combinative plug unit 201 can achieve free arrangement by tenon 202 and 204 on different sidewalls. Further, user may decide the desired numbers and sizes of combinative plug unit 200 to be used, including the dimension of the body portion 203, the length and thickness of pin portion 207, the type of wire portion 205 for data transmission, to form various male/female connectors and achieve better modifiability.

[0013] In another embodiment of present invention, a combinative socket unit 301 corresponding to the combinative plug unit 201 of FIG. 2 is provided in FIG. 3a. In the figure, the combinative socket unit 301 has a rectangular body portion 303 similar to the body portion 203. Different interlocking members are formed on the sidewall of body portion 303, including the circular tenon 305 and mortise 307 showed in the figure. A plurality of socket units 301 may be combined together to form a female header in particular shape. The body portion 303 is fixed and welded on a base or a printed circuit board. An opening 309 is formed on the top of body portion 303 allowing the insertion of corresponding pin portion to establish the electrical connection. The pin portion is firmly clipped in the body portion 303 after inserting to maintain good contact. Similar to FIG 2a, the combinative socket unit 301 may form female header 302 in different size and shape by interlocking members, as showed in the FIG. 3b and FIG. 3c. The combined female header 302 in FIG. 3b and FIG. 3c can connect with corresponding pin header 206 in FIG. 2b and FIG. 2c to achieve the electrical connection.

[0014] Note that the female header 302 formed by combinative socket units 301 is welded on the circuit

board, while the pin header 206 structure formed by combinative plug units 201 is disposed on the free end of flat cable to connect with female header 302. However, in other embodiment, pin header 206 structure may also be welded on circuit board, while the socket base 302 structure be the free end of flat cable depending on the user consideration.

[0015] In still another embodiment of present invention, the combinative plug and socket can be combined by interlocking members different from the FIG 2. As show in the FIG. 4a and FIG. 4b, the structures of socket unit 401 and female header 402 with dovetail joint members are provided respective. In the figure, every combinative socket unit 401 has a rectangular body portion 403, where different interlocking members are formed thereon, such as the dovetail tenon 405 and dovetail recess 409 showed in the figure, to provide the combinative property. The dovetail tenon 405 of socket unit 401 can be slid into the dovetail recess 406 of another socket unit 401 to interlock two socket units. A plurality of socket units 401 may be combined together for forming a female header with particular shape or pin layout, as showed in the FIG 4b. In the embodiment, female header of different sizes and shapes may be obtained by the interlocking of dovetail members. The combined female header 402 can be connected with a corresponding pin header to establish the electrical connection. Note that the drawings of embodiment are for the description only, the dovetail members on every socket unit 401 may not be in specific form or number. For example, one single socket unit 401 may be provided with two dovetail tenons 405 or recess 409 to attain better stability, and the size and the position of dovetail members on the body portion may be different too. Moreover, the manner of dovetail joint can be applied in the aforementioned combinative plug unit. As showed in the FIG. 5a, which illustrate a double headed plug unit 500 with dovetail members. The double headed plug unit 500 has pin portion 501 on both sides, two dovetail tenons 505 and two dovetail recesses 507 are formed on the sidewalls of body portion 503 to interlock with other plug unit 500 for forming particular pin header. FIG 5b illustrates the structure of a regular double headed pin header. The pin header in FIG 5b is composed of twelve plug units 500 with dovetail joint. Note that the design of the present invention may also be applied in the combination of conventional plug and socket unit various male/female connectors. Another example is showed in FIG 5c, which illustrates an irregular structure of double headed pin header. In the present invention, the structure with all kinds of pin layout and pin number can be achieved by the interlocking of respective interlocking members as long as the arrangement of the plug unit and socket unit is practicable. Moreover, the plug unit and socket unit in present invention may be alternatively combined to form a structure comprising both plug and socket feature for better modifiability and wider application.

[0016] In addition, because the plug and socket of

present invention can be combined to form various complicated male/female connector structures, it is important to identify every insert unit among numerous identical plug units and socket units. Accordingly, FIG. 6 shows the combinative plug and socket structures with the feature of identification mark. In this figure, the identification mark 605 is formed on the blank sidewall of body portion in every unit. Before the combination, user may define the marks and their corresponding pin and function. For example, number "1" may denotes the pin for power-on, number "2" may denote the pin for reset, number "3", "4", "5" may denote the pins for every supply port (PW1, PW2, PW3), etc. After the numbers and sequence of the combinative unit are defined, user may combine the plug units and/or socket units into a integrated pin header and/or female header with diverse shapes and pin layouts.

[0017] Referring to FIG 7, which illustrates the combinative plug units and socket units applied on PCB board. The most preferable advantage of present invention is that user can obtain various male/female connector structure depending on their demand or configuration to adapt to all kinds of circuit design and layout. As showed in the embodiment of FIG 7, all kinds of circuit devices are disposed on the specific area of circuit board 700, such as chip 701, capacitor 703, resistor 705, and so on. For the disposition of normal circuit board, circuit designer usually reserves certain rectangular area for all kinds of functional I/O terminals to be disposed, such as the female header 706 for supply wire showed in the figure. For those circuit boards with high device density, it is difficult to reserve enough rectangular area for disposition use. Accordingly, the design of irregular male/female connector structure in present invention is adaptive to all kinds of circuit layout As showed in FIG 7, a U-shape pin header 707 is disposed around the chip 701 on the circuit board 700. The U-shape pin header 707 is formed by a plurality of plug units combined together, and a corresponding U-shape female header 709 may connect with pin header 707 to achieve the electrical connection for power supply or data transmission. The shape of pin header 707 and female header 709 is not limited in rectangular and U-shaped. Any shapes formed by the arrangement of plug units and socket units are desirable to apply in the circuit board. The pin layout can be modified by easy swapping of the plug units and/or socket units to obtain better modifiability and adaptability

[0018] While the embodiments of the present invention disclosed herein are presently considered to be preferred embodiments, various changes and modifications can be made without departing from the spirit and scope of the present invention. The scope of the invention is indicated in the appended claims, and all changes that come within the meaning and range of equivalents are intended to be embraced therein.

Claims

1. Combinative plug and socket structure, comprising:

body portion, wherein at least one interlocking member is formed on the sidewall of said body portion to combine said combinative plug and socket structure with at least one other said combinative plug and socket structure to form connectors. 5

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2. The combinative plug and socket structure of claim 1, wherein said connectors have various pin counts and pin layouts. 15
3. The combinative plug and socket structure of claim 1, wherein said connectors are used as transmission terminal for all kinds of electronic devices.
4. The combinative plug and socket structure of claim 1, further comprising a transmission line coupled with said structure. 20
5. The combinative plug and socket structure of claim 1, wherein said connector is fixed and welded on a PCB board (printed circuit board). 25
6. The combinative plug and socket structure of claim 1, wherein said connector is a male or female connector. 30
7. The combinative plug and socket structure of claim 1, wherein said interlocking members are tenons and mortises. 35
8. The combinative plug and socket structure of claim 1, wherein said interlocking members are dovetail tenons and dovetail recesses.
9. The combinative plug and socket structure of claim 1, further comprising an identification mark formed on said structure to identify every plug unit and socket unit. 40

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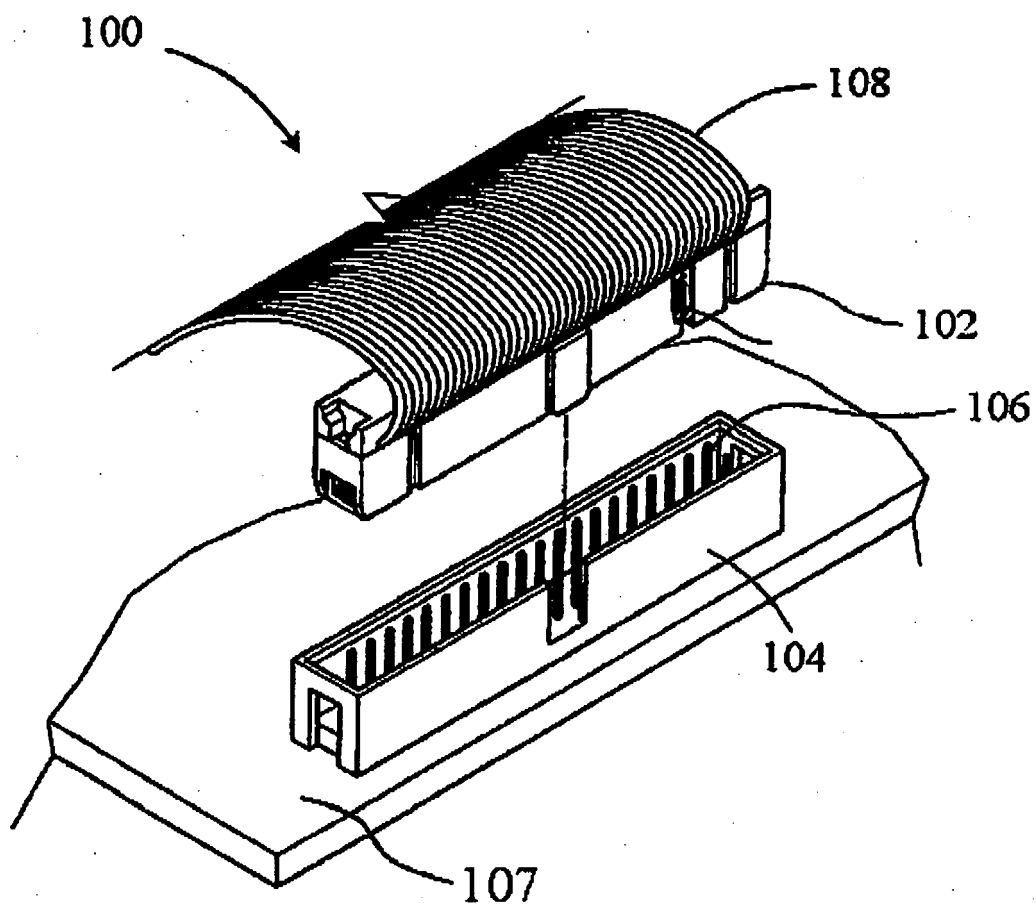


FIG 1

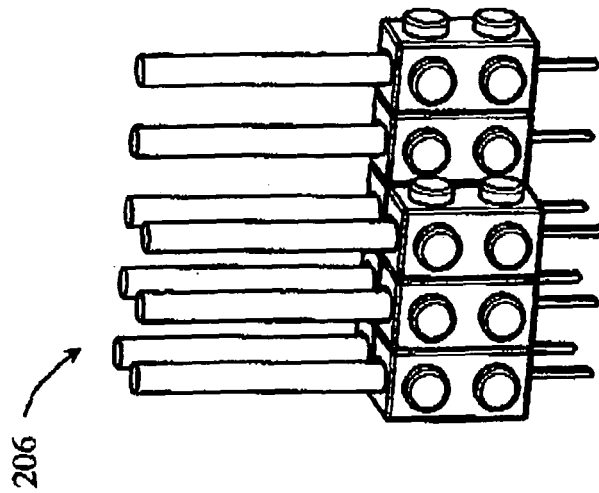


FIG 2c

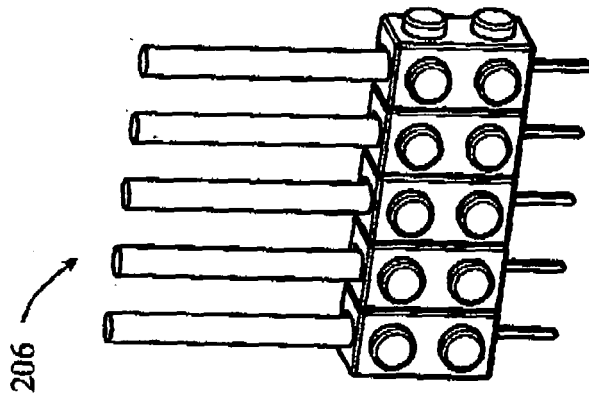


FIG 2b

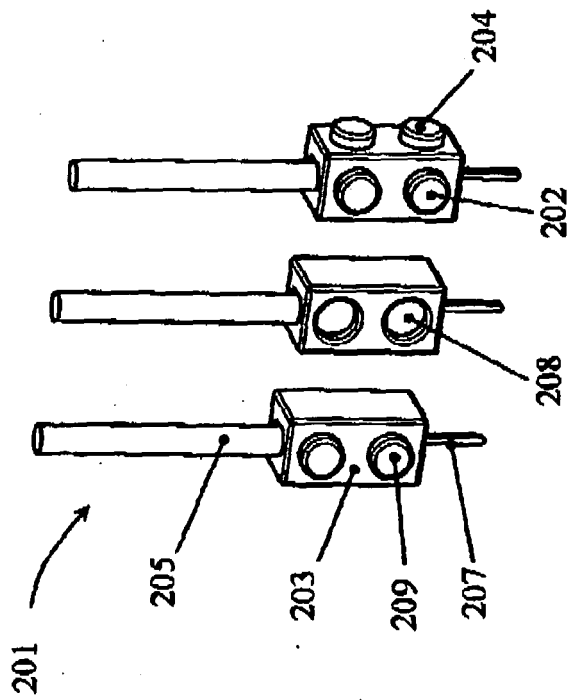


FIG 2a

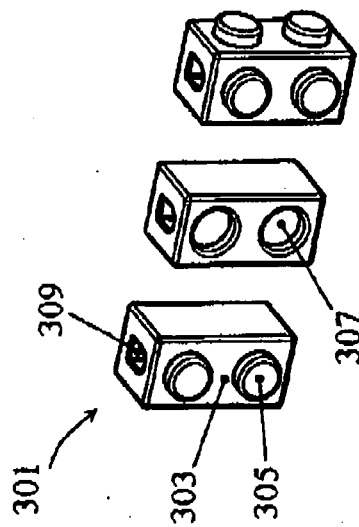


FIG 3a

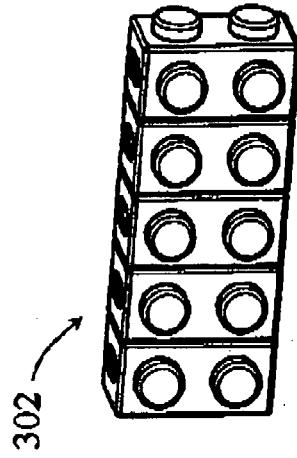


FIG 3b

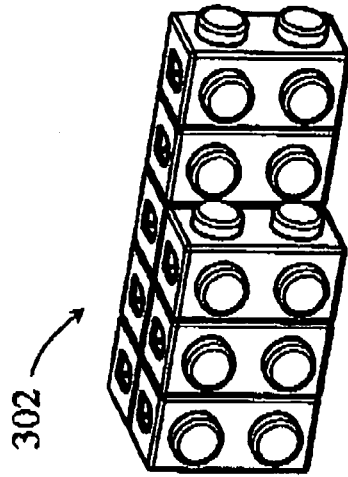


FIG 3c

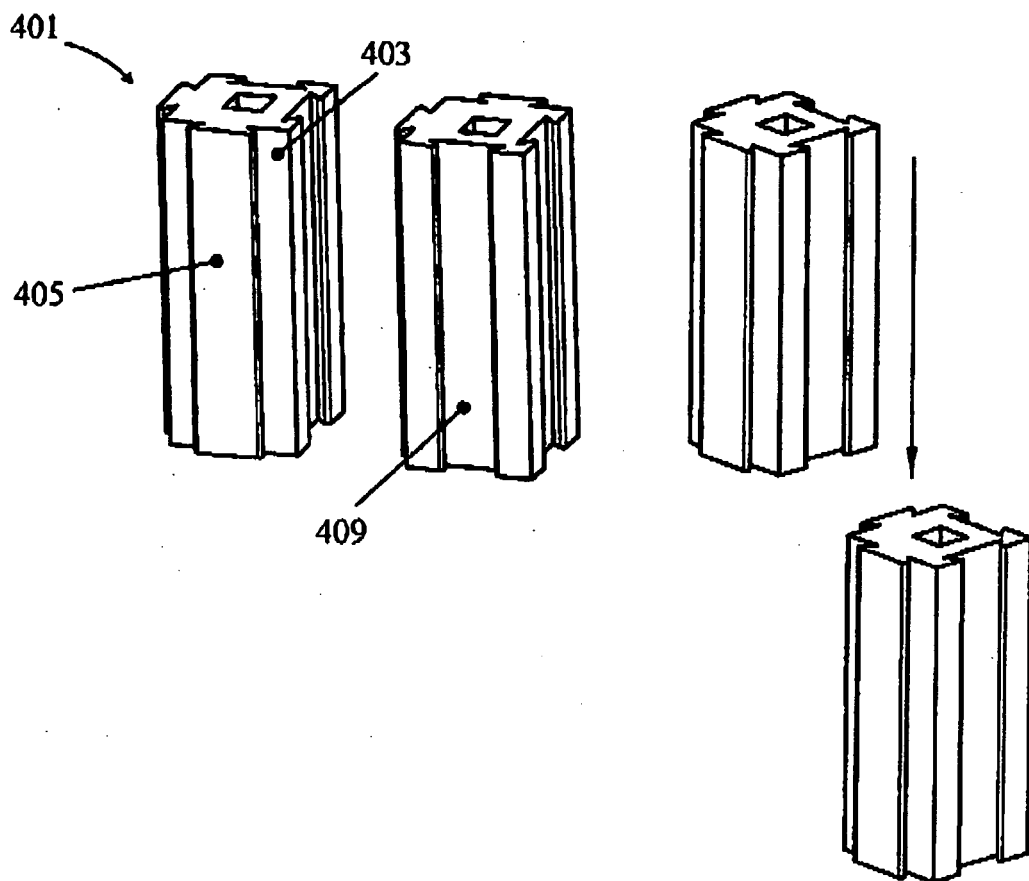


FIG 4a

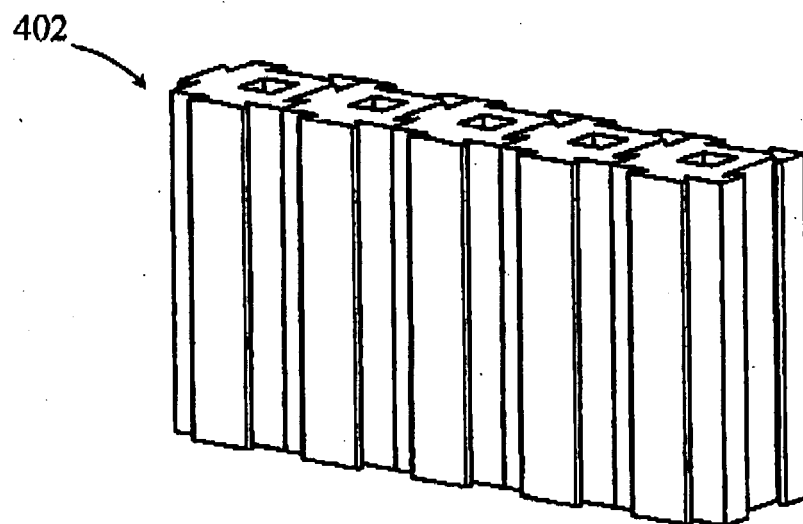


FIG 4b

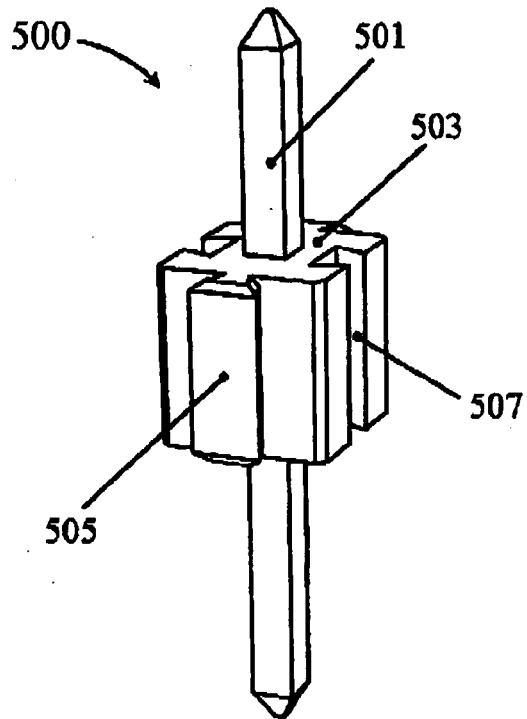


FIG 5a

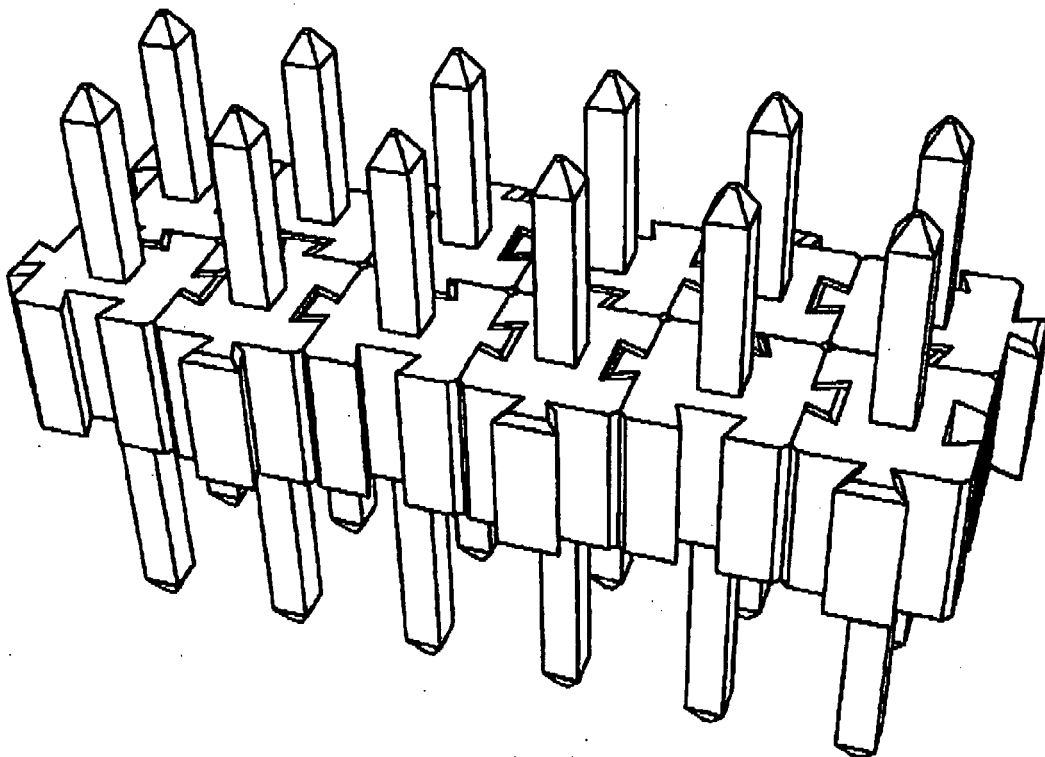


FIG 5b

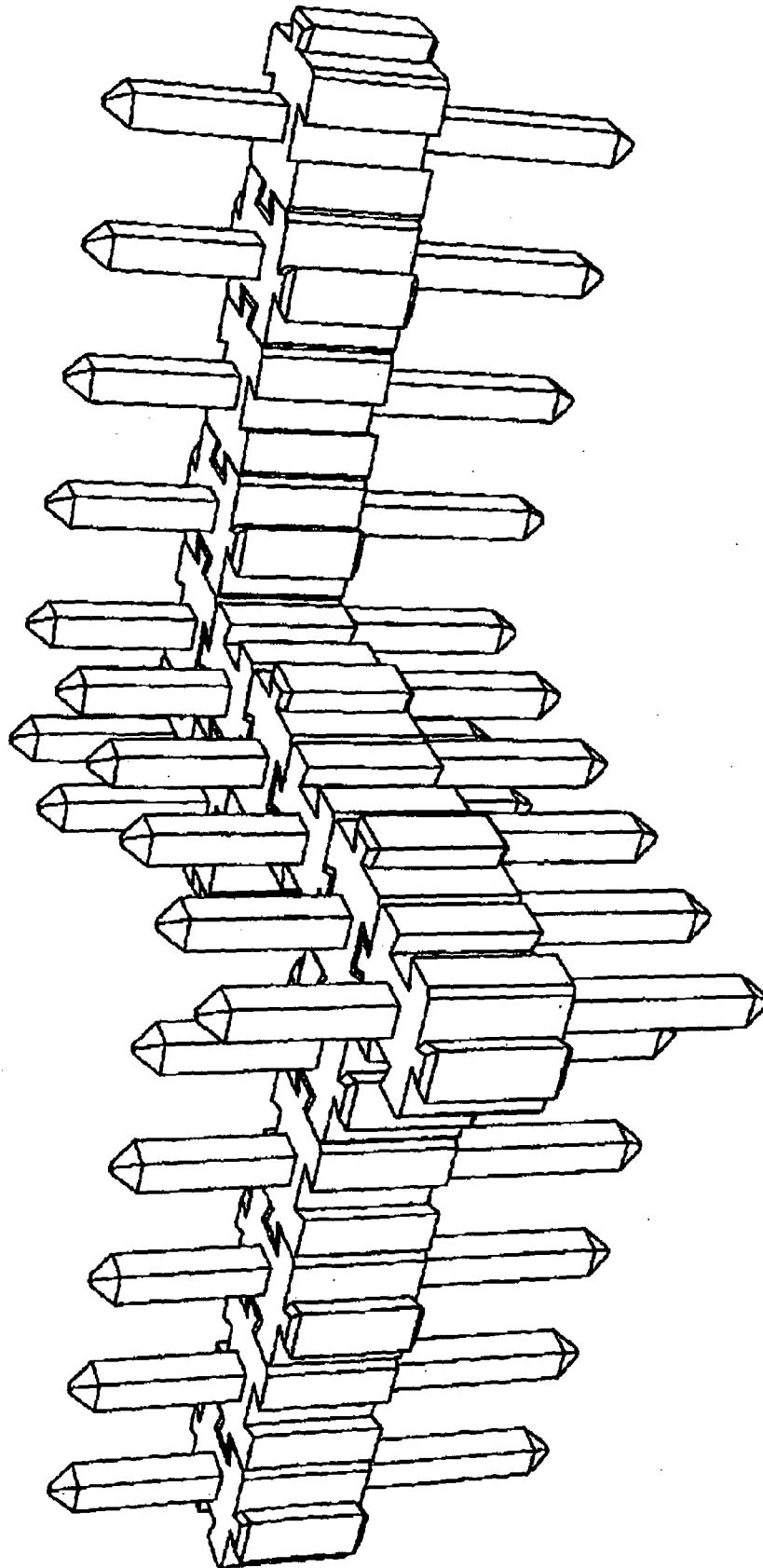


FIG 5c

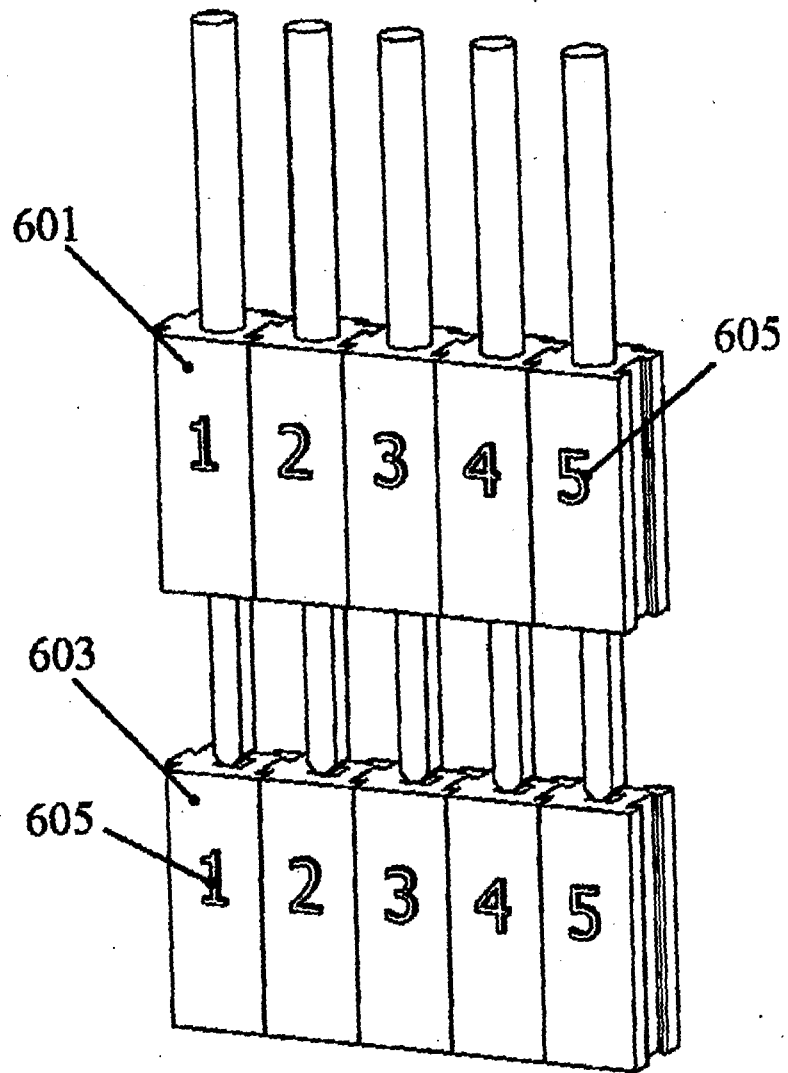


FIG 6

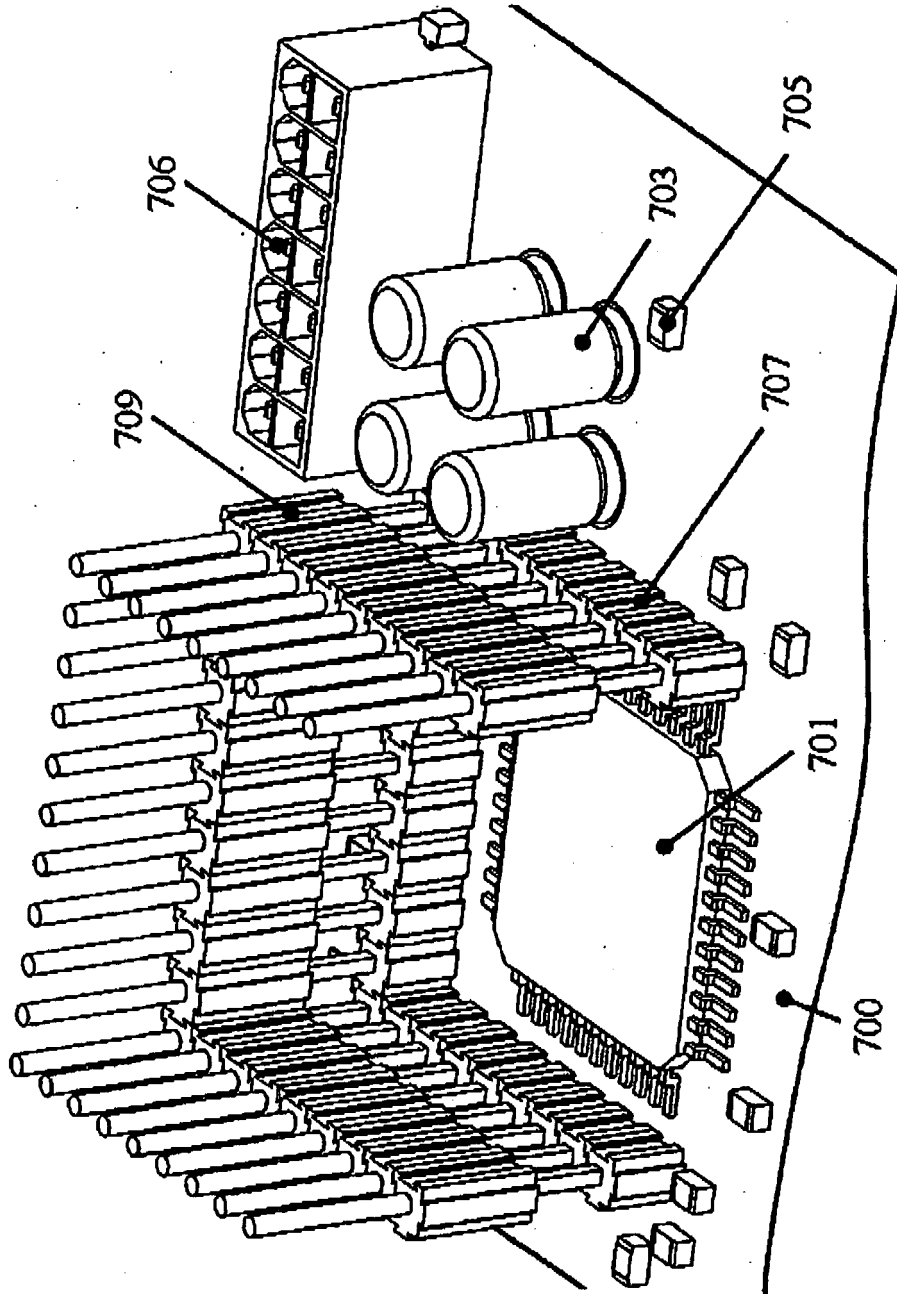


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 08 01 9477

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2008/020645 A1 (FUERST ROBERT M [US] ET AL FUERST ROBERT M [US] ET AL) 24 January 2008 (2008-01-24) * abstract; figures 1-8 * * paragraph [0049] - paragraph [0063] * -----	1-9	INV. H01R13/514 H01R9/24
X	NL 8 500 043 A (DU PONT NEDERLAND) 1 August 1986 (1986-08-01) * abstract; figures 1-4 * * page 3, line 1 - page 5, line 14 * -----	1-9	
A	FR 2 665 044 A (SOFYCOM [FR]) 24 January 1992 (1992-01-24) * abstract; figures 1,3 * * page 4, line 24 - page 6, line 10 * -----	9	
X	US 2004/072472 A1 (BARRY JOHN BRETT [US] ET AL) 15 April 2004 (2004-04-15) * abstract; figures 1-11 * * paragraph [0019] - paragraph [0034] * -----	1,4,5	
A	US 6 290 548 B1 (YEH JEFF [TW]) 18 September 2001 (2001-09-18) * abstract; figure 7 * * column 2, line 61 - column 3, line 18 * -----	1,5,6	TECHNICAL FIELDS SEARCHED (IPC) H01R
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 April 2009	Examiner Serrano Funcia, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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The members are as contained in the European Patent Office EDP file on
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03-04-2009

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 2008020645	A1	24-01-2008	W0	2009009097 A1	15-01-2009
NL 8500043	A	01-08-1986	NONE		
FR 2665044	A	24-01-1992	NONE		
US 2004072472	A1	15-04-2004	NONE		
US 6290548	B1	18-09-2001	TW	446223 Y	11-07-2001

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