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(54) **Connector device**

(57) A connector device (1) for connecting a cable (14) to an electronic card (2) in a shelf. The connector device comprises two connection members (11, 12) with connection points thereon, the two connection members being assembled together. The connection device may adopt an open position for allowing entry of the electronic card (2) between the two connection members (11, 12)

and a closed position for performing electrical contact, said open position and said closed position are obtained independently of the position of the connector device with respect to the shelf and the electronic card, and the connector device (1) may be moved from one position with respect to the shelf to another position while having the cable (14) connected thereon.

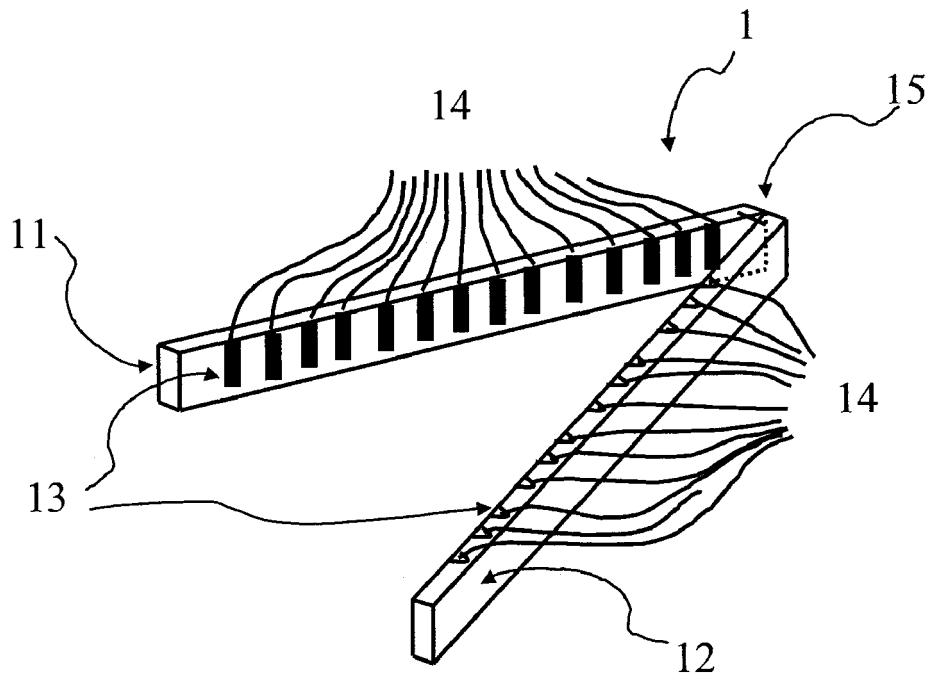


Fig. 1

Description

[0001] The present invention relates to a connector device capable of providing with an electronic card. In particular the connector device of the invention presents an autonomous structure whereby actions related to the assembly of cables, installation on supporting bodies and connecting to an electronic card are performed without a need for the connector device to be fixed in place.

BACKGROUND OF THE INVENTION

[0002] Connectors in many varieties of forms and structures are widely used in electronic equipment. One example of use of such connectors in conjunction with electronic cards, such as for example a printed circuit board (hereinafter referred to as PCB).

[0003] A typical structure of a connector for connecting a cable to a PCB usually consists of two parts, one being the so-called aerial part which is fixed to an end of the cable and the other being the so-called fixed part which is fixed onto the PCB. The aerial part and the fixed part are structured in such a manner that one is adapted to be engaged with the other, for example by having pins and sockets respectively in conformity with each other, so that the pins may be conveniently introduced in the sockets to ensure a good connection. The pins and the sockets are positioned in respective housings which are also engageable with each other when the connection is being performed.

[0004] Another example of known connectors is a type which provides connection from a PCB to another PCB, such as the so-called PCI connectors generally used in computers. In this case a first PCB is provided with connecting pads at one side thereof. The pads are then inserted inside a single connector of a second PCB (the connector may be installed directly on the second PCB or located on a fixed wall of the equipment and connected to the second PCB by means of cables).

[0005] One problem associated with using two engaging parts, as described with respect to the first known example of connectors, is that in practice these connectors require a sophisticated assembly.

[0006] On the other hand, a problem associated with the use of a single connector, as described in relation to the second known example of connectors, is that it is required that the first PCB is inserted into a connector which is fixed in place on the second PCB, or on a wall of the equipment such as a back-plane of a shelf. This type of arrangement is limited to only one connection and prevents the card from being simultaneously connected to another connector in a perpendicular plane in the shelf of the equipment because the card can only be inserted in one direction which is the one towards the connector in the second PCB or on the wall of the shelf.

[0007] In order to be able to connect a card simultaneously to various connectors disposed in a various perpendicular planes in the shelf of the equipment, some

solutions have been proposed. One of such solutions is that of using a connector having two connection members with conductor terminals installed on said members being capable of entering into connection with electronic pads of an electronic card. The two members are disposed face to face with respect to each other and are engaged with a moving mechanism which is capable of moving the two members from a first open position in which the two members are at a distance away from each other to provide an empty space there-between for entry of an electronic card, to a second closed position in which the two members are moved towards each other such that when the electronic card is inserted between the two members, its electronic pads enter in contact with the conductor terminals of the connector. This structure is particularly useful for connections where the card is entered in contact with various connectors installed in different walls of the shelf. For example, if a conventional connector (with non-movable members) is fixed to the wall of the back-plane of the shelf, a connector having movable members, as described above, may be installed on a lateral wall of the shelf in order to enter in connection with a lateral edge of the card. In the open position, the card is inserted in the conventional connector installed in the back-plane and by such insertion, one of its edges slides at the same time in-between the open space provided between the two connection members of the connector with moveable members such that the corresponding edge finally rests in a position in-between said two members. At this moment, the two members are moved, by the moving mechanism, to the closed position, thereby establishing contact between the electronic pads of the card and the conductor terminals of the connector.

[0008] This type of connectors with movable members, however presents certain drawbacks. The drawbacks arise from the fact that these connectors have a base structure which needs to be fixed onto the wall of the shelf for example by soldering. Thus the fixing on the wall of the shelf is done before the cables are connected to the connection terminals of the connector. As it is known, the connection of the cables to the terminals of the connector is usually done by soldering. Thus the soldering needs to be performed on site and in practice the number of cables to be soldered is considerable.

[0009] It is therefore clear that the time and manpower required for on-site soldering the cables, especially when a large number of cables need to be soldered to the connector is an important issue to take into consideration giving rise to a considerable drawback.

[0010] Also, in occasions the contact terminals (connection points) of the connector may be damaged and thus may require repair, for example in order to perform soldering on the terminals. This repair task, in case of connectors which are fixed in place, may not be possible or at least easy, unless the whole connector is removed from the place it is fixed to. Removal of the connector in such cases, especially when the connector is itself soldered on the wall of the shelf - which is frequently the

case - requires extra work.

[0011] Furthermore, the fact that the connector is fixed to the wall of the shelf makes the connector usable only in that position. Thus if there is a need that the connector is disconnected from one card and connected to another one, it is the card itself needs to be changed as the connector is fixed in place. This change, in the case where the other connections of the card (with other connectors on other edges) should not be changed, makes the whole assembly unusable.

[0012] It is therefore desired to provide a connector device for use in electronic equipment which avoids the above drawbacks.

DESCRIPTION OF THE INVENTION

[0013] The above objective is reached by using the solution proposed by the present invention according to which a connector device is provided which is removable as regards its position inside the shelf. In other word, the connector device of the invention is not permanently fixed to any part of the shelf, but is connected to a respective end of a cable (the cable may have a plurality of wires). At the same time, the connector device of the invention, allows an easy connection to a metallic pad area at selected edges of an electronic card such as a PCB by opening and closing movements of respective connection.

[0014] The selected edges may be all the four edges of the electronic card or some of the edges thereof, in which case the edges are preferably in perpendicular direction with respect to other edges used for conventional type of connections. For example the other edges may have conventional connectors or may have metallic pads for connection to another PCB or to a back-plane of a shelf in a conventional manner, as described further above.

[0015] The connector device of the invention is suitable for, but not limited to, use in horizontal-cabling plane, *i.e.* connection is done at a top or bottom side of a front access shelf in which electronic cards are inserted vertically. Likewise, the connector device of the invention may be suitable for use in vertical-cabling *i.e.* connection is done at a lateral side of a front access shelf in which electronic cards are inserted horizontally.

[0016] Accordingly one object of the present invention is that of providing a connector device for providing electrical connection between a cable and an electronic card adapted for being installed in a shelf, the connector device comprising two connection members, at least one of said connection members having connection points arranged at selected positions on a respective surface thereof, the two connection members being assembled together by means of an assembly element, the assembly of the two connection members being adapted to have an open position suitable for allowing entry of an electronic card between the two connection members and a closed position suitable for allowing electrical contact be-

tween the connection points of the connector device and respective connection pads of the electronic card, characterized in that said open position and said closed position are obtained independently of the position of the connector device with respect to the shelf, and in that the connector device is capable of being moved from one position with respect to the shelf to another position while having the cable connected thereon.

[0017] These and further features of the present invention are explained in more detail in the following description as well as in the claims with the aid of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Figure 1 is a schematic representation of a first exemplary embodiment of the connector device according to the present invention.

Figure 2 is a schematic representation of an electronic card for being engaged with the connector device according to the present invention.

Figure 3 is a cross-sectional view of a connector device shown in a position suitable for engaging with an electronic card.

Figure 4 is a representation of the assembly of figure 3, in closed position with connection being engaged.

Figures 5a and 5b show side view and front view schematic representations of a second exemplary embodiment of the connector device of the present invention.

EXAMPLES OF PREFERRED EMBODIMENTS

[0019] According to the scheme represented in figure 1, a connector device 1 is shown having two connector members 11 and 12. Each of the two connection members 11, 12 have a plurality of connection points 13, made of electrically conductor material, such as for example copper, installed on selected areas on the surface of the connection members 11, 12 in such a manner that after engagement with an electronic card the connection points enter in contact with connection pads of the electronic card (as will be described below), thus providing electrical connectivity there-between. The two connection members are joined together by means of an assembly element 15 which will be described further below.

[0020] Although in the example of figure 1, both connection members 11 and 12 are shown to have connection points 13, it is to be understood that the connector device 1 of the invention may also be made with connection points 13 installed only on one of the connection members 11, 12, the other member being without connection points.

[0021] The connection points 13 are further connected to the end of a cable 14 in any known manner. The cable 14 may have a plurality of conductive wires. In practice

the connector device of the invention may have the conductive wires already connected thereon before it is installed on an electronic card or fixed on a wall of a shelf.

[0022] Figure 2 shows an electronic card 2, which in this example may be a PCB, having a base plate 21 upon which electronic components and other elements are installed. On a surface of the PCB, or on both front and rear surfaces thereof, connection pads 22 are installed. These connection pads 2 may be installed at selected edges of the PCB and other conventional connection elements such as connectors or pads may be installed at other edges of the PCB as represented in figure 2 by reference numeral 25. The conventional connection elements 25 may be used for connection in known manners for example to a back-plane of a shelf.

[0023] In figure 2, a front surface 23 of the PCB is shown to have two rows of connection pads 22 installed on the upper and lower sides of the PCB. Likewise, connection pads 22 may be installed on the rear surface 24 of the PCB. Connection pads 22 on both surfaces 23 and 24 of the PCB are shown in figures 3 and 4. The connection pads 22 may be made of any conductive material such as for example copper.

[0024] The two connection members 11 and 12 are preferably assembled together in such a way that the corresponding sides of the connection members 11 and 12 where connection points 13 are installed may face each other.

[0025] The assembly of the two connection members 11, 12 is made by means of an assembly element 15 such that the assembly element permits one, or the two connection members, to be rotated around the axis of the assembly element 15 with respect to each other or with respect to the assembly element 15. The assembly element 15 is in fact installed on the connection members and not on any external supporting piece such as for example the wall of a shelf, which is the case for some known connector devices with moveable connection elements. The fact that the assembly element 15 is installed on the connection member has the advantage that in this manner the connector device is made autonomous in the sense that it is capable of being used without a need to be first fixed in place. The connector device of the invention is capable of being already connected to the cable 14, for example in manufacturing stage or at any other moment before being installed on the wall of a shelf.

[0026] Another advantage of the fact that the connector device is made autonomous is that it may be easily removed from the position of connection on an electronic card in order to be left at a convenient storage place within the shelf until a time when further use is required and thus it is put back in connection with an electronic card, or simply it may be removed from one electronic card and connected on another electronic card inside the shelf.

[0027] In the example of the embodiment of figures 1, 3 and 4 the assembly element 15 is assumed to be made

by means of a hinge installed at a respective end of each of the two connection members 11,12 such that the two connection members 11 and 12 may rotate around the hinge 15 for opening and closing of the assembly of the connection members 11 and 12 in order to allow insertion or extraction of an electronic card 2 to or from the assembly. In figure 3, the assembly of the two connection members 11 and 12 is shown in open position while they are maintained together by means of the hinge 15, and an electronic card 2 is shown to be inserted inside the assembly.

[0028] Figure 4 shows a situation where the two connection members 11, 12 are in closed position and the electronic card 2 is placed inside the assembly. The assembly element 15 may be such that each of the connection members 11, 12 may rotate freely around it; or alternatively, provision may be made such that only one of the two connection members 11, 12 is rotatable, the other being fixed with respect to the assembly element 15, in which case one can assume that one connection member rotates with respect to the other - fixed - member.

[0029] In order to maintain the connection points 13 in permanent contact with connection pads 22 of the electronic cards 2, the assembly of the two connection members 11 and 12 is equipped with a locking means 16. In figure 3, the locking means 16 is shown in open (unlocked) position while in figure 4, the locking means is shown in locked position. The locking means 16 may be of any known type.

[0030] In the closed position as shown in figure 4, the connection points 13 of the connector device 1 enter in physical contact with the connection pads 22 of the electronic card 2 thus ensuring electrical connectivity therebetween. The assembly may then be locked by means of the locking means 16.

[0031] In locked position, the connector device 1 and the electronic card 2 remain attached to each other due to the locking action of the locking means 16. However, should there be a need for a more secure attachment of the connector device 1 to the electronic card 2, additional fixing means may be employed (not shown) by means of any known fixing structure such as clips, screws, adhesive material or the like in order to ensure a stronger hold between the connector device 1 and the electronic card 2.

[0032] As shown in figures 3 and 4 the position of the connection points 13 and that of the connection pads 22 are determined in conformity to each other such that by simple closing action exercised on the connection member 11 and 12, precise connection is achieved between respective connection points 13 and connection pads 22. This conformity in positioning is achieved by adequate layout design of each unit. Furthermore, as described above, the electronic card 2 may have connection pads 22 installed only on one surface, front 23 or rear 24 thereof. In such case, the connector device 1 may have connection points 13 installed only on the connection member 11 or 12 which corresponds to the surface of the

electronic card on which the electronic pads 22 are installed.

[0033] In this manner, the solution proposed by the present invention provides the possibility of easily accessing to the connection points 13 in case of need, for example for soldering or cleaning the connection points 13. Another advantage of the connection device of the present invention is that in case the connector need to be removed from one card and connected to another, or kept unconnected, this can be done by simply opening the connector device and removing it from the place it was connected without any change in the position of the electronic card.

[0034] Figures 5a and 5b show schematic representations in front and side view of an alternative embodiment of the connector device of the present invention in which like elements have been given like reference numerals. Thus the connector device 1 of figures 5a and 5b has two connection members 11 and 12 and connections points 13 installed on respective surfaces of the connection members 11 and 12. Cable 14, which as shown in the figure may be comprised of a plurality of wires is connected to the connection members 11, 12 (however in practice it is possible to have the cable connected to only one of the connection members).

[0035] The connection members 11 and 12 are assembled together by means of an assembly element. In this embodiment however, the assembly element is in fact comprised of two assembly members 15a and 15 b placed at respective sides of the connection members 11, 12 in such a way that the connection members 11 and 12 are capable to move side-ways within a space provided between the assembly members 15a and 15b as shown by arrows next to the connection members 11 and 12. A third assembly member 15c is also shown in figures 5a and 5b. This third assembly member 15c is capable of moving upward and downward as shown by an arrow. The shape of the third assembly element is designed such that when it moves in downward direction, a head portion thereof enters into a space in-between the two connection members 11 and 12 and pushes the latter members side-ways away from each other due to a force exerted on both these members as a result of its downward movement.

[0036] When the two connection members 11, 12 are moved away from each other, sufficient space is provided between the two in order to allow the electronic card 2 enter in-between the connection members 11, 12. Here gain the electronic card 2 is entered in-between the two connection members in such a way that the connection pads 22 of the electronic card are in a position which is in conformity with the connection points 13.

[0037] Once the electronic card 2 is inserted in place, the third assembly member 15c is made to move outward (upward in figures 5a and 5b) from its position in-between the two connection members 11, 12. When the third assembly member is moved completely out, the two connection members 11, 12 are made to move towards each

other. In this manner, the connection points 13 of the connection members 11, 12 enter into contact with the connection pads 22 of the electronic card 2. The movement of the two connection members 11, 12 within the space provided in the assembly members 15a and 15b may be governed by any known means. For example, the movement may be governed by respective resilient mechanisms such as for example springs (not shown) located between each connection member 11, 12 and the respective assembly members 15a, 15b.

[0038] The movement of the third assembly member 15c may be performed by any known means. For example, the assembly member 15c may be made to move up and down in a guiding structure such a sliding rail. Alternatively, the assembly element may be made to rotate around a fixed axis located at one side of the connector device.

[0039] In this embodiment also, locking means may be provided by any known means in order to maintain the whole structure secure as long as the connector device in maintained in contact with the electronic card.

[0040] The connector device of the present invention, in any of its embodiments, is capable of being fixed, on a supporting surface, such as for example the wall of a shelf. As already discussed above, an advantage of the connector device of the invention is that cables may be installed thereupon before it being fixed on a supporting surface. Once the cable is connected, the connector may be fixed, permanently or provisionally, on a supporting surface and it may be connected to an electronic card at any desired time. The fixing may be made by any known means such as for example screws and knots.

[0041] It is to be noted that the above embodiments are only examples of possible realizations of the solution of the present invention. The invention is not to be construed as being limited to these embodiment. In particular all known manners in which the connection members may be moved away and toward each other are included within the scope of the present invention.

Claims

1. A connector device (1) for providing electrical connection between a cable (14) and an electronic card (2) adapted for being installed in a shelf, the connector device (1) comprising two connection members (11, 12), at least one of said connection members having connection points (13) arranged at selected positions on a respective surface thereof, the two connection members (11, 12) being assembled together by means of an assembly element (15, 15a, 15b, 15c), the assembly of the two connection members (11,12) being adapted to have an open position suitable for allowing entry of an electronic card (2) between the two connection members and a closed position suitable for allowing electrical contact between the connection points (13) of the connector

device and respective connection pads (22) of the electronic card, **characterized in that** said open position and said closed position are obtained independently of the position of the connector device with respect to the shelf and the electronic card, and **in that** the connector device (1) is capable of being moved from one position with respect to the shelf to another position while having the cable (14) connected thereon.

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2. A connector device according to claim 1, wherein the assembly element (15) is installed on the connection members (11, 12).
- 15
3. A connector device according to any one of the previous claims wherein the assembly element (15) is adapted for allowing rotation of one or both connection members (11, 12) with respect to the assembly element (15) and/or to each other.
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4. A connector element according to claim 3 wherein the assembly element is a hinge.
- 25
5. A connector device according to any one of the claims 1 or 2 wherein the assembly element comprises two assembly members (15a, 15b) and is adapted for allowing a side-way movement of one or both connection members (11, 12) with respect to each other within the assembly members (15a, 15b).
- 30
6. A connector device according to claim 5 wherein a third assembly member (15c) is adapted for forcing the one or both connection members (11, 12) to perform the side-way movement of one or both connection members (11, 12).
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7. A connector device according to any one of the previous claims, wherein the connector device comprises locking means (16) adapted for locking and unlocking the assembly of the two connection members (11, 12) together when the latter are in closed position.
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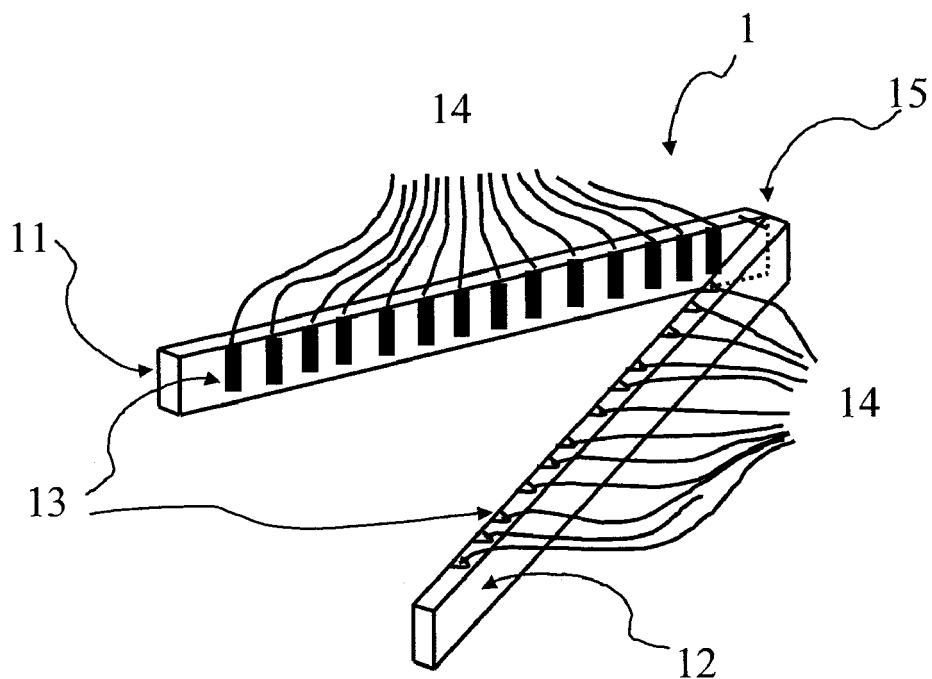


Fig. 1

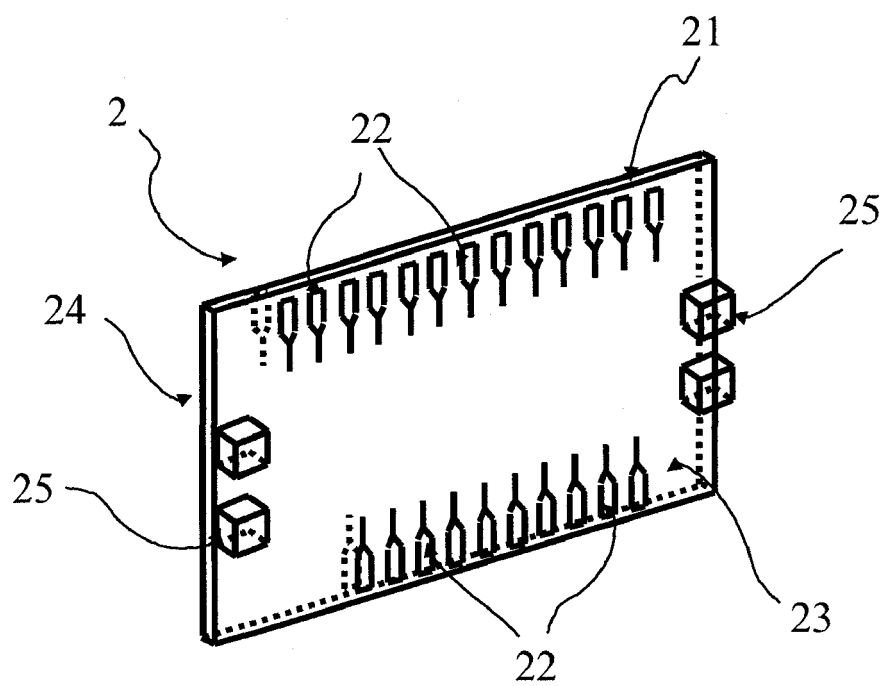


Fig. 2

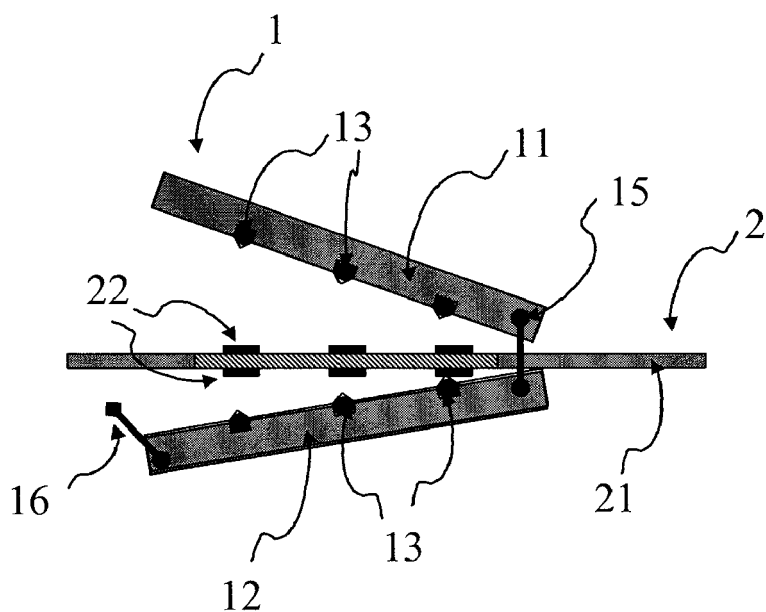


Fig. 3

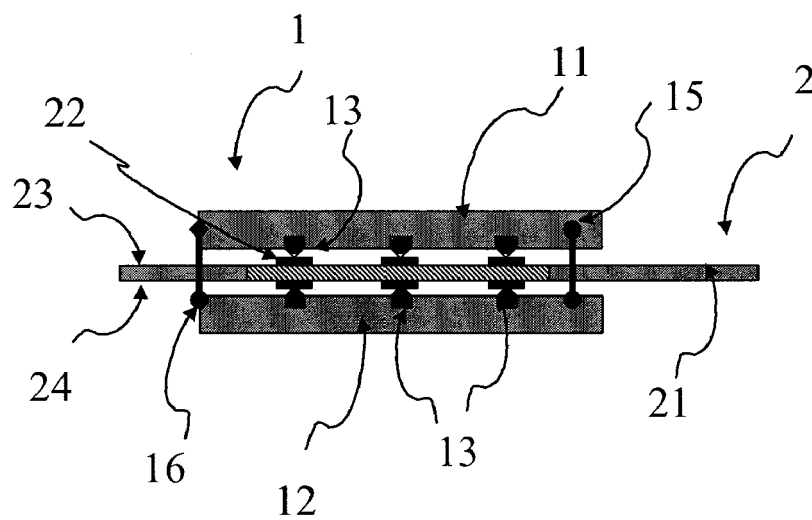


Fig. 4

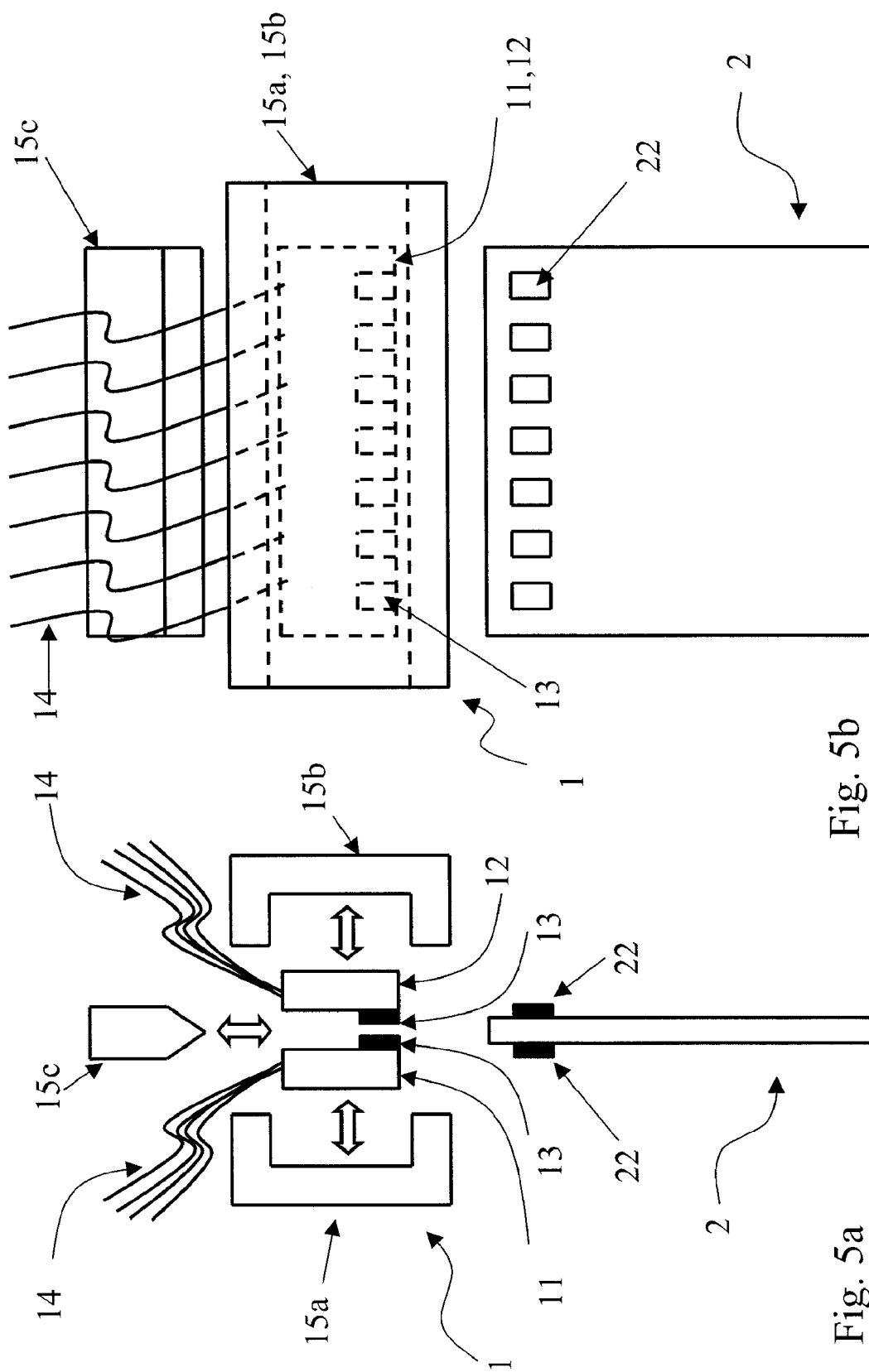


Fig. 5b

Fig. 5a



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 30 1086

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 May 2006	Examiner Whittington, J
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EPO FORM 1503 03.82 (P04C01)

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

EP 05 30 1086

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