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(54) Securing device for electrical connectors and application thereof

(57) The present invention concerns a securing device (1) for maintaining a first electrical connector (C1) in contact with a second electrical connector (C2) through at least one window (11) of a panel (10), the second connector being arranged behind that panel.

The securing device comprises at least two clips (2, 3) arranged on a front end (8) to be directed towards the panel. The clips are squeezed towards each other and inserted into the panel through the window and then slackened so as to press against the panel, for maintaining the securing device fastened thereto. They are squeezed again towards each other and removed from the panel for releasing the securing device.

The latter also comprises at least one hollow (4) starting from the front end and extending towards a rear end (9) of the securing device, having a laterally decreasing side in the direction from the front end to the rear end, and at least one outward opening (5) leading into it. That hollow receives the first connector through the outward opening, for maintaining the first connector in the securing device and for connecting it to the second connector at the front end through that opening. The first connector is positioned in the securing device by sliding it inside the hollow in the direction from the front end to the rear end; it is removed by a reverse operation.

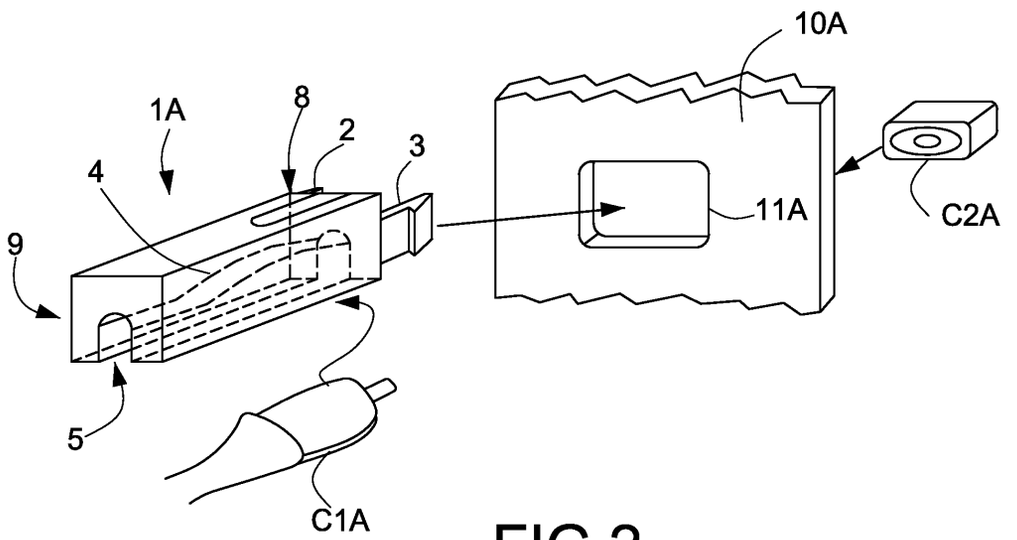

FIG.2

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Description

[0001] The present invention relates to a securing device for maintaining in contact electrical connectors, one of them being arranged behind a panel. It also relates to the connection of a power-supply unit and of an electrical apparatus.

[0002] For connecting electrical apparatus such as a DSL modem (for "Digital Subscriber Line") to power-supply, it is increasingly required that a power-supply cord be securely connected so as to avoid accidental disconnects.

[0003] The document US-4812133 discloses a floating mount for electrical connector assembly, which has retaining clip snapped over receptacle for securing on panel. More precisely, a floating first electrical connector (receptacle) has contacts adapted to mate with complementary contacts carried by a second electrical connector (plug) and has a limited floating movement within the plane of an opening in a panel; the retaining clip is snapped over the receptacle from externally of the power supply.

This achievement results in special installations and elements, and hence causes additional costs and no possibility to exploit common power-supply unit (hereinafter referred to as "PSU").

[0004] Also, the patent US-5228865 discloses a float mount flanged type electrical connector, which has opposite coplanar flanges received between inner faces of straps. Those straps mount connector in a mounting panel cutout, and are secured to the rear face of that panel by means of bolts.

This mounting involves tedious operations by the end users.

[0005] One could also provide for special clips on a PSU, to secure the PSU to a panel. However, this would involve special manufacturing, and thus additional costs and no possibility to exploit existing PSU.

[0006] Patent US-5525074 describes a panel mounted connector, mountable in removable way to an opening of a panel. The connector includes a male connector and a female connector mated with the latter, the female connector including a housing formed with an engagement hood position having an inner cavity engaged with the male connector and an outer periphery engaged with the mount opening of the panel.

Again, like for document US-4812133, specific installation and elements are necessary.

Document US-5525074 further discloses as the described prior art, another panel mounted connector in which a connection fixture is used for mounting a connector plug into a panel mount hole. The connection fixture is formed with two opposing openings at both ends, and comprises a pair of lock arms with lock claws on its outer peripheral. These lock arms are intended to be inserted into two respective through holes in the panel.

Though such a system is rather practical and user-friendly, it is exposed to frequent failures, due to movements of the connector plug through the back-panel.

[0007] The present invention concerns a securing device for maintaining a first electrical connector in contact with a second electrical connector, that second electrical connector being intended to be arranged behind a panel placed between the securing device and the second electrical connector, the panel having at least one window for connecting the first and the second connectors through that window.

[0008] The securing device comprises:

- at least two clips arranged on a front end of the securing device, that front end being intended to be directed towards the panel, the clips being provided for being squeezed towards each other and inserted into the panel through the window and for being then slackened so as to press against parts of the panel neighboring the window, thus maintaining the securing device fastened to the panel, and for being squeezed again towards each other and removed from said panel, thus releasing the securing device,
- at least one hollow inside the securing device, that hollow starting from the front end of the securing device and extending towards a rear end of the securing device opposed to the front end,
- and at least one outward opening leading into that hollow.

[0009] The hollow is intended to receive the first electrical connector through the outward opening, so that the first connector remains maintained in the securing device and can be connected to the second electrical connector through the outward opening at the front end of the securing device.

[0010] According to the invention, the hollow has a laterally decreasing size in the direction from the front end to the rear end of the securing device, enabling a user to position the first connector in the securing device by sliding the first connector inside the hollow, in the direction from the front end to the rear end of the securing device, and to remove the first connector from the securing device by sliding the first connector inside the hollow in the direction from the rear end to the front end of the securing device.

[0011] Thus, like in patent US-5525074, an intermediary device is used for securing the two connectors, that device being able to receive the first connector in its hollow and to be secured to the panel by means of the clips for providing the link to the second connector. However, by contrast thereto, the laterally decreasing size of the outward opening offers a very convenient way to fix the first connector while enabling to receive several possible models and sizes of that first connector.

A significant advantage of this solution is that the first electrical connector is liable to be hold safely in the securing device. Further, this can be true for various models of this first electrical connector, having different sizes and forms. Also, the securing device may enable

user-friendly and convenient installation for end users.

[0012] The lateral decreasing of the size is not necessarily regular, but may involve size jumps. For example, in one particular embodiment, the outward opening comprises at least two rectangular openings having sizes in descending order.

By "towards the rear end", it is meant that the rear end of the securing device is not necessarily reached by the hollow.

[0013] Preferably, the outward opening extends along the hollow from the front end towards the rear end of the securing device. This can make operations easier for the user.

It is then advantageous that the outward opening has itself a laterally decreasing size in the direction from the front end to the rear end of the securing device.

In a variant embodiment, two outward openings are provided, one at the front end and one at the rear end of the securing device. Those openings are designed for passing first into the hollow a thin and long part linked to the first connector, such as wiring, through both outward openings, and for introducing thereafter the first electrical connector in the hollow through the front-end outward opening, before maintaining it inside the securing device.

[0014] Complementary maintaining means can be provided. Notably, in a specific embodiment in which the outward opening has two opposite sides along the hollow in the direction from the front end to the rear end of the securing device, a maintaining arm of the securing device is articulated on one of the sides of the outward opening and able to be jammed on the opposite side of the outward opening.

In still another embodiment, the securing device contains a flexible matter inside, forming the limits of the hollow, so flexible as to allow expansion of the outward opening under internal pressure. This enables to introduce by forcing the first connector into the hollow, the connector being maintained therein by pressure thereon, and to take it off likewise by forcing.

[0015] Preferably, the securing device is flexible and makes easier to move the clips closer together.

Also, in a more specific achievement, the clips are two, the first connector is a PSU connector, the securing device is flexible and its hollow is intended to receive the first connector by means of sliding there inside, and the panel is a back-panel of an electrical apparatus.

Then, in practice, an end user may take the first connector, which in a special embodiment may be a normal connector having standard dimension, and slide the securing device over it. The first connector thus fits into the securing device. The end user may further squeeze the ends of the securing device so that the two clips come closer to each other. In that way, the securing device is inserted into the back-panel. Once this is done, the PSU connector cannot be removed anymore unless the end user squeezes the ends of the securing device once again so that the clips come closer to each other again and the connector can be removed.

[0016] Advantageously, the securing device is made of plastic.

[0017] The invention also concerns an application process of the securing device of any embodiment of the invention comprising connecting a power-supply unit including the first electrical connector, and an electrical apparatus having a rear face constituting the panel. The electrical apparatus is then provided for containing the second electrical connector.

[0018] In a particular advantageous application, that electrical apparatus is a modem, like an xDSL modem. In other advantageous applications, the electrical apparatus is a set-top box or a radio receiver. The invention is more generally applicable to every apparatus having a power connector for which a secure connection is needed.

[0019] The invention will be better understood and illustrated by means of the following embodiment and execution examples, in no way limitative, with reference to the appended figures on which:

- Figure 1A is a upper view of a securing device according to a first embodiment of the invention;
- Figure 1B is a side view of the securing device of Figure 1A;
- Figure 1C is a lower view of the securing device of Figures 1A and 1B;
- Figure 1D is a rear view of the securing device of Figures 1A, 1B and 1C;
- Figure 2 is a view in perspective of the securing device of Figures 1A to 1D, showing also two connectors to be linked through a back-panel of an electrical apparatus, associated to the first embodiment;
- Figure 3 is a view in perspective of a securing device according to a second embodiment of the invention, showing also two connectors to be linked through a back-panel of an electrical apparatus, associated to the second embodiment;
- Figure 4 shows the elements of Figure 3 with one of the connectors in position within the securing device;
- Figure 5 represents a rear view of the elements of Figure 4;
- Figure 6 is a front-side view of the securing device of Figures 3 to 5;
- Figure 7 is an upper-front view of the securing device of Figures 3 to 6;
- Figure 8 is an upper-rear view of the securing device of Figures 3 to 7;
- Figure 9 is a view in perspective of a securing device according to a third embodiment of the invention, showing also two connectors to be linked through a back-panel of an electrical apparatus, associated to the third embodiment.

[0020] In the Figures, the references of the first and second embodiment may be completed with suffixes

"A", "B" and "C" corresponding respectively to the first, second and third embodiments. The notation without those suffixes then relates to a generic designation of the concerned objects. Also, corresponding parts of the securing device in both embodiments may be noted with the same references.

[0021] A securing device 1 according to a first embodiment, noted 1A, (Figures 1A to 1D and 2) is intended to maintain a PSU connector C1 with an electrical connector C2 internal to an electrical apparatus (such as for example a DSL modem) having a back-panel 10 (notation 10A in that embodiment). The PSU connector C1, noted C1A, has a contact pin and the internal connector C2, noted C2A, is intended to receive that pin and to have it maintained inside. The two connectors C1A and C2A are provided for being linked through a window 11 of the panel 10A, noted 11A in that embodiment and having a rectangular shape,.

[0022] The securing device 1A is made of a flexible material, such as plastic. It comprises two clips 2 and 3 arranged on a front end 8 thereof directed towards the panel 10A in operation. The clips 2 and 3 are provided for being squeezed towards each other, advantageously by squeezing the front end 8 of the securing device 1A.

[0023] Such a deformation makes possible to insert the clips 2 and 3 through the window 11A of the panel 10A, so as to maintain the securing device 1A fastened to the panel 10A - by pressing against the internal part of the panel 10A, at the vicinity of the window 11A. That deformation also enables to squeeze the clips 2 and 3 towards each other when the securing device 1A is fixed within the panel 10A, so as to release the securing device 1A.

[0024] The securing device 1A is further provided with a hollow 4 in its lower part and with an outward opening 5 leading into this hollow 4, which extend from the front end 8 to a rear end 9 of the securing device 1A by crossing the latter in its length. The hollow 4 and the outward opening 5 have a laterally decreasing width and a decreasing height (though not regular decreasing) from the front end 8 to the rear end 9.

[0025] The hollow 4 is able to receive the PSU connector C1A, which can be positioned in the securing device 1A by sliding inside the hollow 4 through the outward opening 5 from the front end 8 towards the rear end 9. In that way, the PSU connector C1A may be maintained in the securing device 1A and then connected to the internal connector C2A through a front part of the outward opening 5 (at the side of the front end 8) and through the opening 11A of the panel 10A.

[0026] In a second embodiment (Figures 3 to 8), the hollow 4 and the outward opening 5 of the securing device 1, noted 1 B, differ essentially from the first embodiment in that they are laterally delimited by stepped edges E1 and E2 parallel with the longitudinal axis of the securing device 1 B. Also, the back-panel 10, noted 10B has its window 11 B with a cross shape (instead of a rectangle), through which the front part of the securing device 1, noted 1 B, may be positioned.

[0027] In a third embodiment (Figure 9), the main differences with the second embodiment rely on the nature of the connectors C1 and C2, noted here C1C and C2C. Indeed, the electrical connectors C1C and C2C respectively consist in a plug USB-connector (for "Universal Serial Bus") and a corresponding internal USB connector, intended to be connected through the window 11, noted 11C, of the back-panel 10, noted 10C.

Claims

1. Securing device (1) for maintaining a first electrical connector (C1) in contact with a second electrical connector (C2), said second electrical connector (C2) being intended to be arranged behind a panel (10) placed between the securing device (1) and the second electrical connector (C2), said panel (10) having at least one window (11) for connecting the first (C1) and the second (C2) connectors through said window (11),

said securing device (1) comprising:

- at least two clips (2, 3) arranged on a front end (8) of the securing device (1), said front end (8) being intended to be directed towards the panel (10), said clips (2, 3) being provided for being squeezed towards each other and inserted into the panel (10) through said window (11) and for being then slackened so as to press against parts of said panel (10) neighboring said window (11), thus maintaining the securing device (1) fastened to the panel (10), and for being squeezed again towards each other and removed from said panel (10), thus releasing the securing device (1),
- at least one hollow (4) inside the securing device (1), said hollow (4) starting from said front end (8) of the securing device and extending towards a rear end (9) of the securing device opposed to said front end (8),
- and at least one outward opening (5) leading into said hollow (4),

said hollow (4) being intended to receive the first electrical connector (C1) through said outward opening (5), so that said first connector (C1) remains maintained in the securing device (1) and can be connected to the second electrical connector (C2) through the outward opening (5) at the front end (8) of the securing device (1),

characterized in that said hollow (4) has a laterally decreasing size in the direction from the front end (8) to the rear end (9) of the securing device, enabling a user to position the first connector (C1) in the securing device (1) by sliding the first connector (C1) inside the hollow (4), in the direction

from the front end (8) to the rear end (9) of the securing device, and to remove the first connector (C1) from the securing device (1) by sliding the first connector (C1) inside the hollow (4) in the direction from the rear end (9) to the front end (8) of the securing device.

2. Securing device (1) according to claim 1, **characterized in that** said outward opening (5) extends along said hollow (4) from said front end towards said rear end (9) of the securing device (1).

3. Securing device (1) according to claims 1 or 2, **characterized in that** said securing device is made of plastic.

4. Application process of the securing device (1) of any of claims 1 to 3 comprising connecting a power-supply unit including said first electrical connector (C1), and an electrical apparatus having a rear face constituting said panel (10), said electrical apparatus being provided for containing said second electrical connector (C2).

5. Application process of the securing device (1) according to claim 4, **characterized in that** said electrical apparatus is a modem.

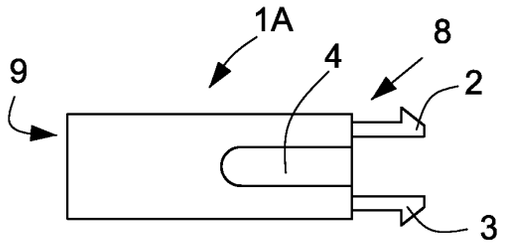

FIG.1A

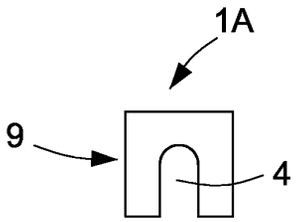

FIG.1D

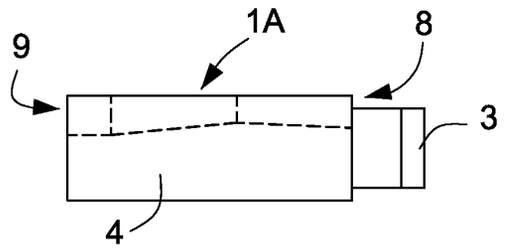

FIG.1B

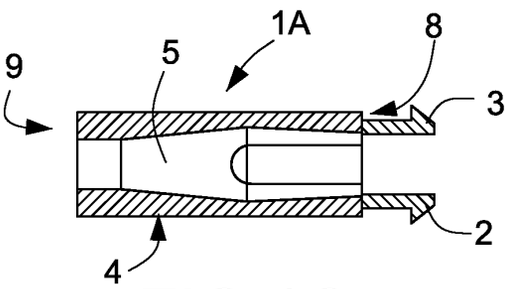

FIG.1C

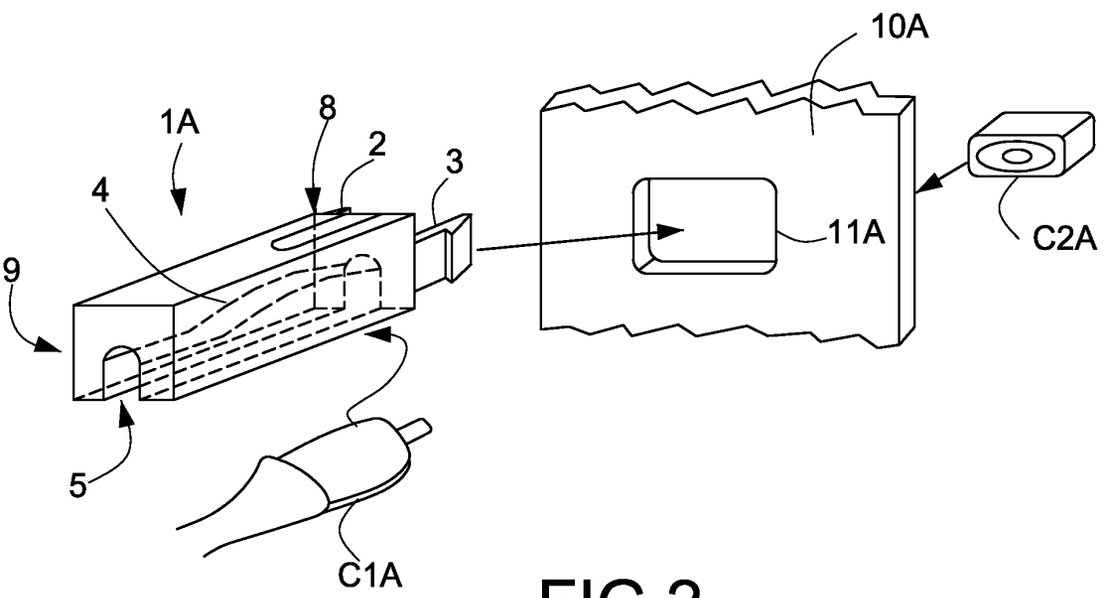

FIG.2

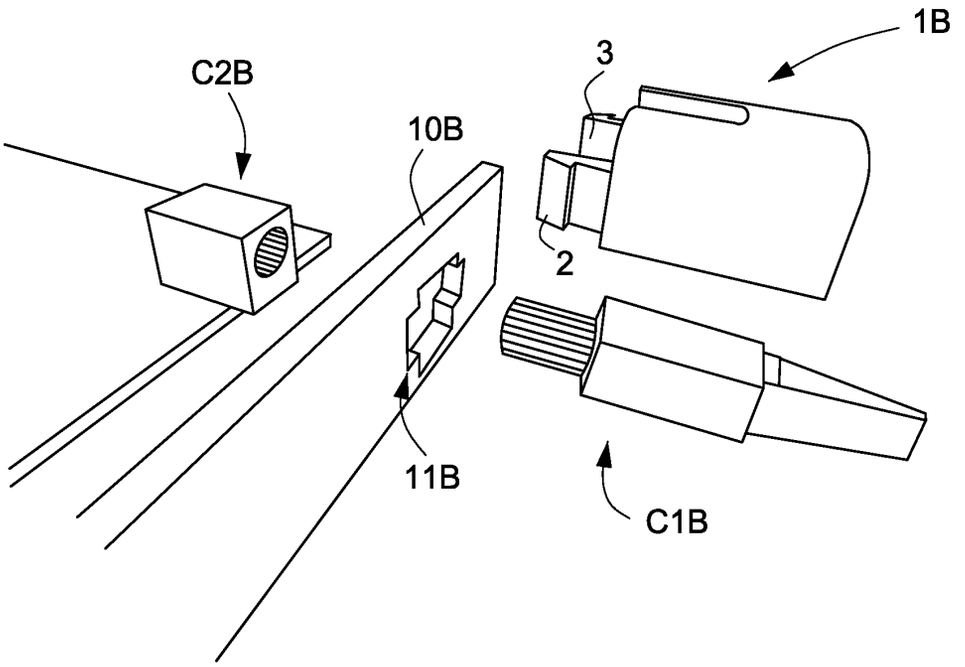

FIG.3

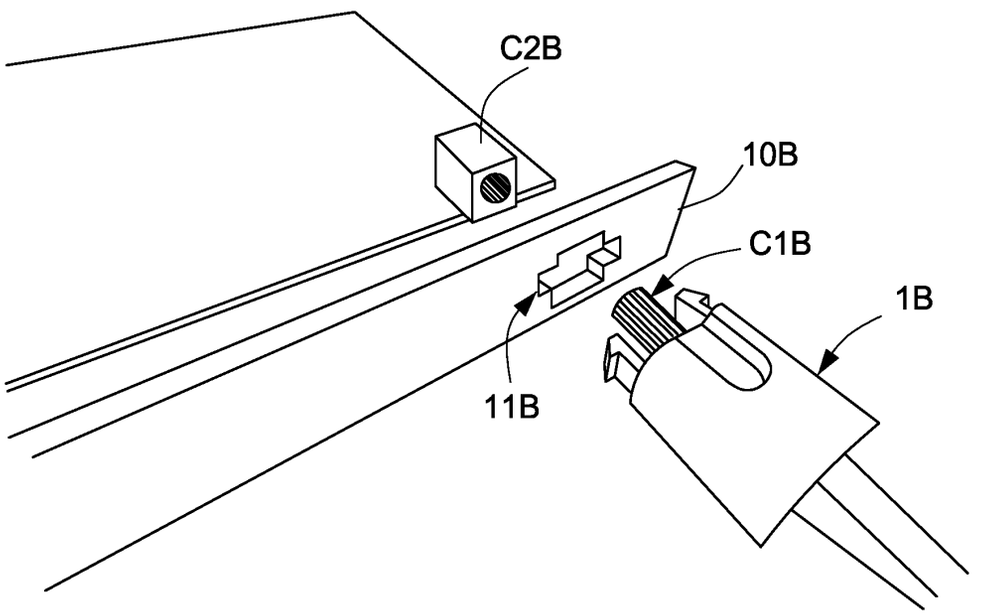

FIG.4

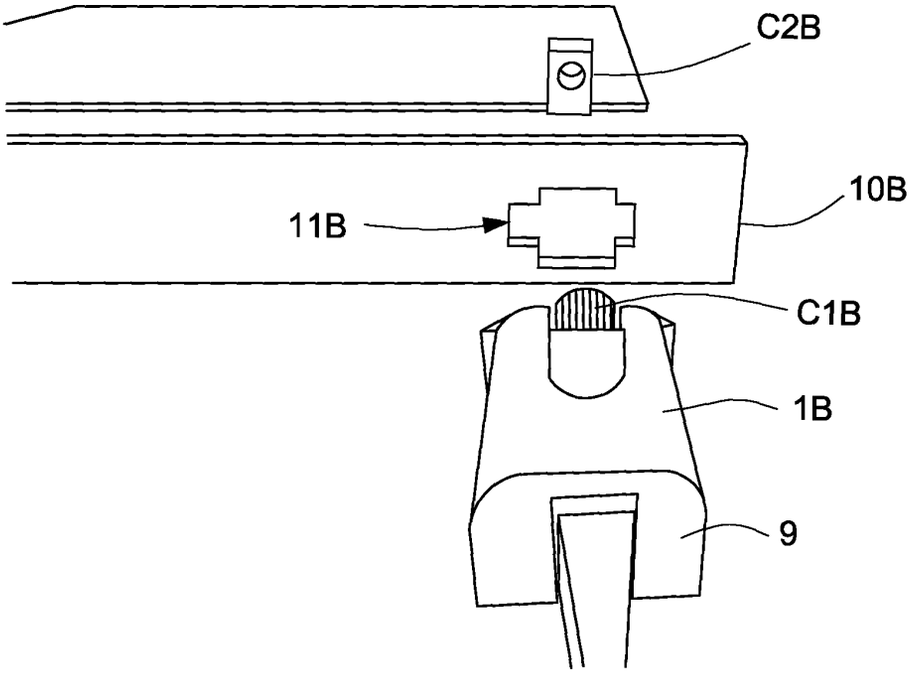

FIG.5

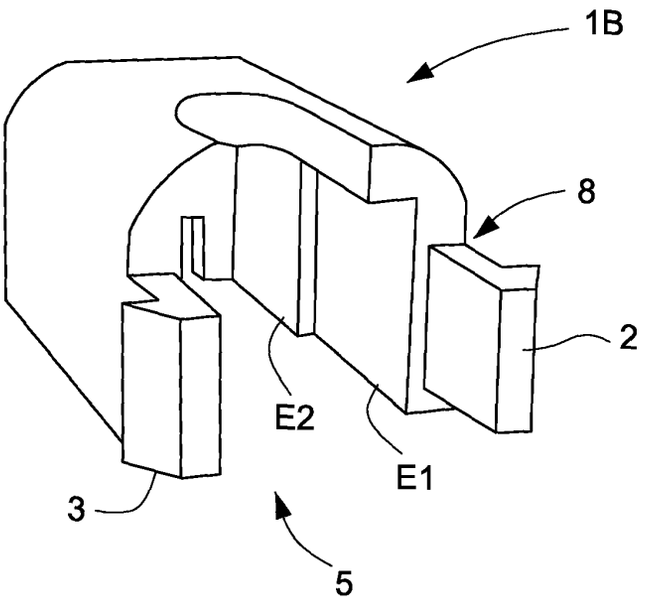

FIG.6

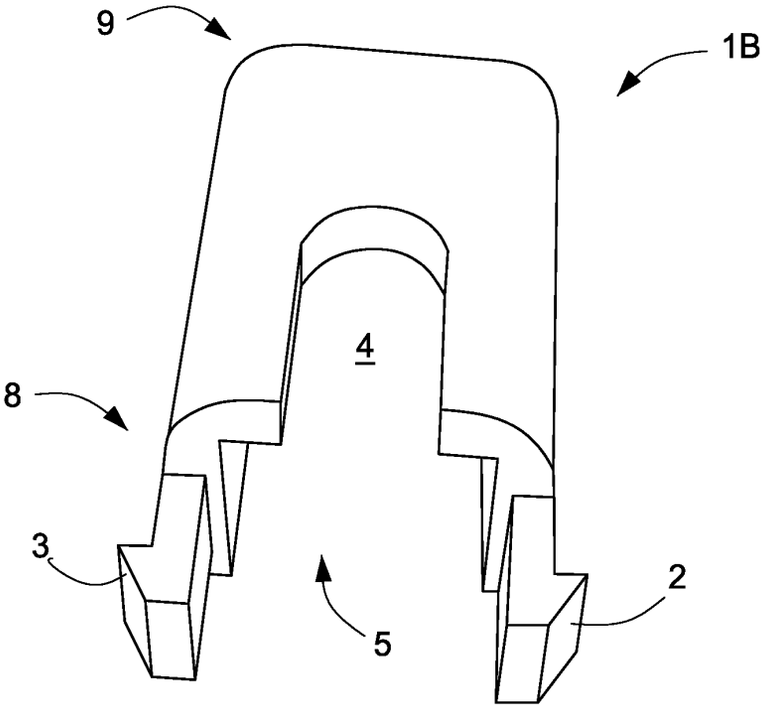

FIG.7

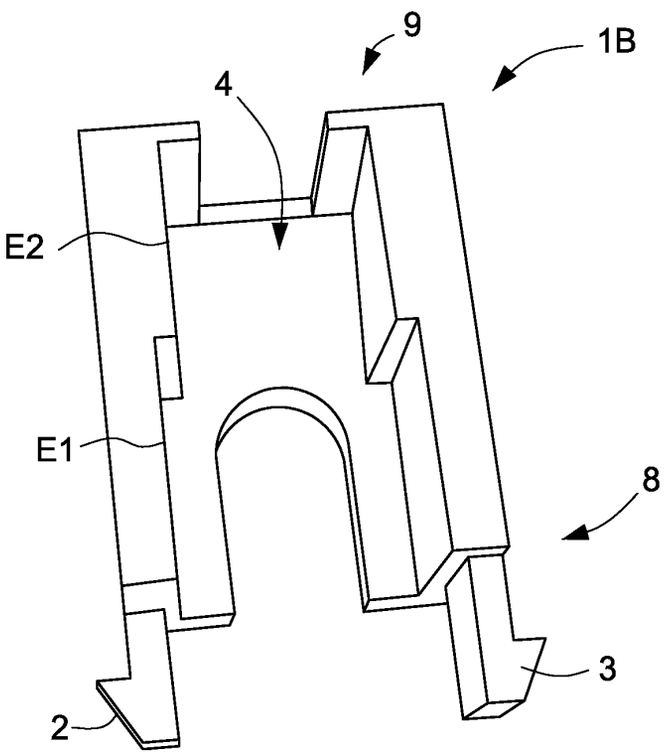

FIG.8

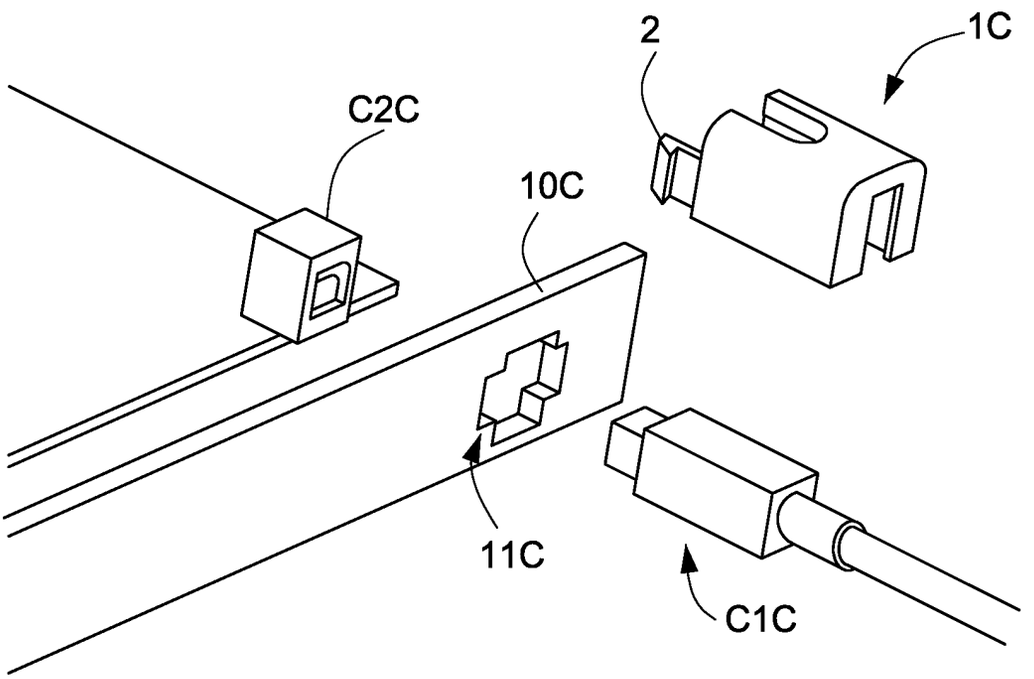

FIG.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 1446

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 5 525 074 A (TSUJI ET AL) 11 June 1996 (1996-06-11) * column 1, line 11 - column 1, line 61; figures 1A-2B * -----	1-5	H01R13/74
Y	GB 1 367 992 A (AMF INC) 25 September 1974 (1974-09-25) * page 1, line 12 - page 2, line 15; figure 2 * -----	1-5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	8 June 2005	Segerberg, T

CATEGORY OF CITED DOCUMENTS

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08-06-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5525074 A	11-06-1996	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82