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Female connector and process for mounting this connector

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In order to establish a connection between a cable (6) and a printed circuit (8), a female connector is provided which has two inputs (2, 3) for accommodating the cable and the printed circuit (8) respectively. The cable is held firmly inside the first input by two stops (25, 26). One of these stops allows to establish the electric connection by locally displacing the insulation of the cable conductors (7) when coming in contact with contacts (11) comprised in the connector. The connector has an elastic lever for keeping the connector inside an aperture of a receptacle which contains a printed circuit. The second input surrounds the printed circuit. Contact tongues (16) also establish an electric connection with the metal plating (9) provided along the edge of the printed circuit.

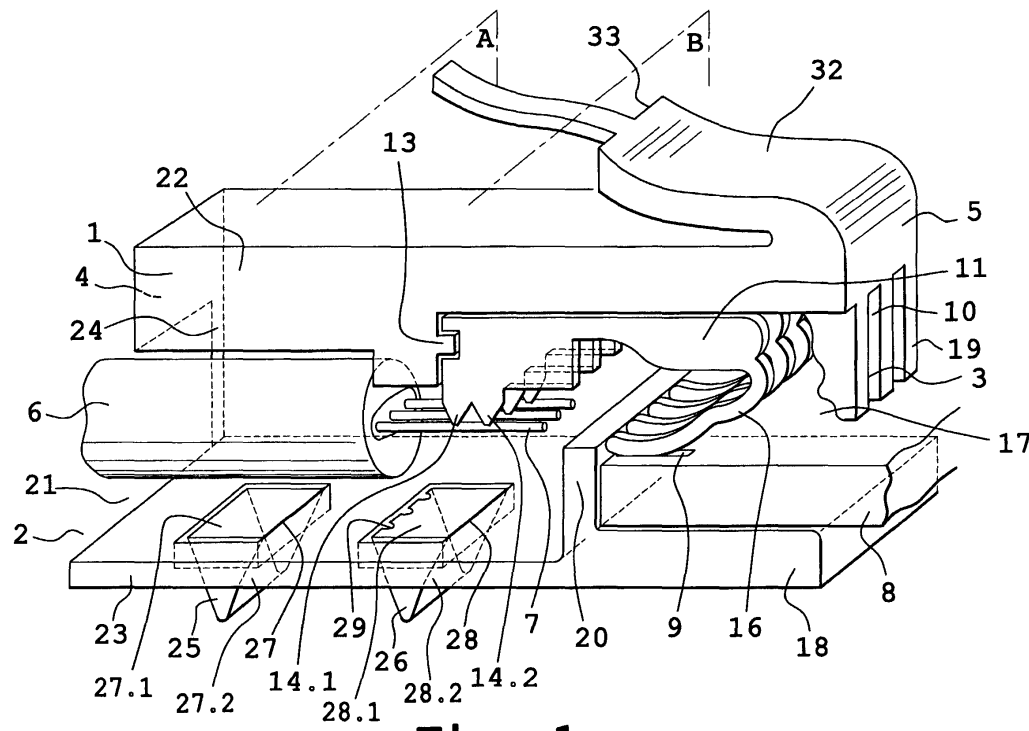


Fig. 1

EP 1 037 313 A1

Description

[0001] The present invention relates to a female connector. It further relates to a process for mounting such female connector between a cable and a printed circuit. It particularly finds use in the field of telephony and computer applications. Here, it especially allows to establish a connection between a cable and a printed circuit. The established connection is an electric connection.

[0002] An electric connection between a cable and a printed circuit is currently established through two elements. The two elements are a male plug and a female socket, the former being fitted onto the cable, the latter being fitted onto the printed circuit. More generally, they will be referred to as a connector and a complementary connector, when connected, these two elements are joined together both mechanically and electrically.

[0003] Therefore, the provision of such type of connection involves fitting one of these elements onto a cable, fitting the other element onto the printed circuit, and finally joining the two elements together to establish the electric connection. For instance, the female connector is fitted onto the printed circuit by welding. It has a receptacle for accommodating a male plug. The male plug is fitted and firmly connected onto the end of the cable. The female connector and the male plug can be reversibly connected.

[0004] Such connector has a main drawback. The main drawback consists in the number of actions required to establish the connection between the cable and the printed circuit. Hence, the use of such connection is not practical. A secondary drawback is the connector size. Miniaturized parts generally have more complex constructions than larger parts. In this case, the problem is twofold, because two elements have to be fabricated.

[0005] The invention addresses these drawbacks by providing a single connector for establishing this connection. The interest of the invention lies in that it provides a smaller, and hence less expensive connector for joining together a cable and a printed circuit. This advantage results from the fact that the connector only consists of one element. Further, the mounting process of the invention is more practical, because it only includes two steps: fitting the connector onto the cable and immediately fitting the connector attached to the cable onto the printed circuit.

[0006] The solution provided by the invention consists in conceiving a connector which has two inputs. A first input is for accommodating a cable, the second input is for introduction therein of an edge of a printed circuit. Such connector has contacts in the receptacles between the two inputs. The contacts have two ends. A first end projects into a cavity of the second input. A cable, preferably not completely bare, may be introduced in the cavity of the first input. A printed circuit with metal plating along one of its edges, may be introduced in the cavity of the second input. A first end of the contacts

comes in contact with the conductors of the cable. A second end of the contacts rests on the metal plating. The connection between the printed circuit and the cable is thus established.

[0007] By way of improvement, the connector has strain-relieving devices allowing to hold the cable in place. It also has devices allowing to establish an insulation displacement connection with the insulated conductors of the cable. This insulation displacement connection is preferably established by moving one of the strain-relieving devices towards the first end of the contacts. The second input has a clamp-shaped cavity. A lower jaw of this clamp supports a printed circuit whose metal plating comes to abut against the tongues of the second end of the contacts.

[0008] The invention thus relates to a female connector characterized in that it has a body comprising a first input for accommodating the conductors of a cable, a second clamp-shaped input for accommodating an edge of a printed circuit, receptacles in the body, and contacts extending into the receptacles of the body from the first input to the second input, preferably parallel to each other.

[0009] The invention further relates to a process for mounting a female connector onto a cable and onto a printed circuit. The connector is first connected to an insulation-displaced cable. Insulated conductors of the cable are introduced in the connector together with a portion of the insulation-displaced cable. The insulation-displaced cable is held in place inside the connector by a first movable device, which is in the closed position. The insulated conductors are bared through a second movable insulation displacement device, which is also brought to a closed position. This insulation displacement device forces the insulated conductors against the teeth of the first end of a contact contained in the connector. Hence, the cable is held in the connector, and the connection between the conductors of the cable and the contacts of the connector is thus established. The connector thus attached to the cable is thereafter inserted in an aperture of a receptacle containing a printed circuit. Preferably, the connector attached to the cable is held in the aperture of the receptacle by an elastic lever. At the same time, the printed circuit held inside the receptacle is introduced into the second input of the connector. Tongues provided at the second end of the contacts, projecting into the second input of the connector can come in contact with the metal plating of the printed circuit.

[0010] Then, the invention relates to a process for mounting a female connector which connects a cable and a printed circuit, characterized in that it includes the following steps:

- displacing the insulation of the cable to expose the conductors still covered by their insulating sheath;
- introducing the cable, by its insulation-displaced end, into a first input of the connector;

- moving a first stop of this connector from an open position to a closed position, wherein the cable is forced against the inside of a cavity formed by this first input, and simultaneously moving a second stop of this connector from an open position to a closed position, wherein the insulated conductors of the cable are forced against an end of insulation displacement contacts held inside the connector;
- engaging a clamp, formed by a second input of the connector, against an edge of a printed circuit;
- forcing a tongue at another end of each contact against the metal plating of the printed circuit,

[0011] The invention will be understood more clearly by reading the following description and by analyzing the accompanying figures. The latter are only shown by way of example and do not intend to limit the invention in any manner. The figures show:

Figure 1: a sectional view of a female connector according to the invention;

Figures 2a and 2b: sectional views of the female connector with respect to sectioning planes A and B respectively, as shown in figure 1;

Figure 3: a sectional view of a connector in accordance with the invention, mounted between a cable and a printed circuit;

Figure 4: a view of a preferred embodiment of a contact comprised in the female connector according to the invention.

[0012] The female connector of the invention is shown in figure 1. The connector comprises a body 1, a first input 2, and a second input 3. Here, the body 1 as a whole has the shape of a parallelepiped. The first input 2 opens out a face 4 of the parallelepiped formed by the body 1. The second input 3 opens out a second face 5 of the parallelepiped formed by the body 1, opposite to the face 4. The two faces 4 and 5 may be parallel.

[0013] The first input 2 accommodates a cable 6 introduced therein. In order to establish a proper connection, the cable 6 is partially bared, and exposes its conductors 7. The conductors 7 are preferably still covered by their insulating sheath. The second input 3 is clamp-shaped. This clamp is in the open position. It can accommodate, a printed circuit 8 introduced therein. The printed circuit 8 has a metal plating 9. This metal plating 9 is provided along the edge of the printed circuit which is introduced into the clamp of the body 1.

[0014] The body 1 further has receptacles 10 extending between the first input 2 and the second input 3. Contacts 11 are housed inside the receptacles 10. The contacts 11 extend from the first input 2 to the second input 3. Preferably, the connector comprises several contacts like 11. These are preferably parallel to each other in their respective receptacles. However, due to the size of the metal plating 9 or of conductors 7, these receptacles and contacts can be arranged in a fan shape. As

shown in figures 1, 2a and 2b, in a preferred variant, the connector has three receptacles 10 and three contacts 11.

[0015] A contact 11 is shown in figure 4. The contact 11 has an elongated shape. In one example, the contact 11 has a flat shape. It has two ends with respect to its elongated shape. At a first end 12, the contact 11 has a mortise 13 and an insulation displacement tip 14. In a preferred example, the insulation displacement tip 14 consists of two teeth 14.1 and 14.2. The two teeth 14.1 and 14.2 are aligned and pierce the core of the conductor at its center. At a second end 15 of the contact 11, the latter has a tongue 16. The tongue 16 is folded over the extension which connects the first end 12 to the second end 15. The tongue 16 has elastic properties and can be substantially movable within the plane formed by the contact 11.

[0016] The contact 11 is held inside a receptacle 10 of the body 1. In this receptacle 10, it is held in position by a mortise 13. The mortise 13 is engaged, for instance, with a tenon provided at the end of a receptacle 10. In this embodiment, the contact 10 is slid from the face 5 of the second input 3, into the receptacle 10 up to engagement of the mortise with the tenon. Also, the contact is fastened by one or more bosses 15.1, formed on the side walls of the contact 11, preferably on the front part, as shown in figures 3 and 4, so that the contact can be fastened in the receptacle 10 over a short distance, when the longest part of the contact 11 is inserted inside the receptacle 10. The contact 11 can also be included in the material of the body 1, upon molding of said body. In this case, the receptacle is naturally formed around the contact 11.

[0017] The tongues 16 project into a cavity 17 formed by the second input 3. The tongues 16 are curved. The distance between a low end of the tongue and a lower jaw 18 of the second input 3 is smaller than the thickness of an edge of the printed circuit 8. Therefore, when a printed circuit 8 is inserted, the tongues 16 are forced against the printed circuit 8.

[0018] The cavity 17 is delimited by the lower jaw 18, an upper jaw 19 and an edge 20. The edge 20, at the bottom of the cavity 17, separates in a non integral manner the first input 2 from the second input 3. The lower jaw 18 is used as a support for accommodating the printed circuit 8. The distance between the upper jaw 19 and the lower jaw 18 is greater than the thickness of an edge of a printed circuit. Here, the jaw 19 is notched by the receptacles 10 to allow the introduction of the contacts 11. The curved tongue 16 of a contact extends beyond a plane formed by the base of the upper jaw 19.

[0019] The first input 2 also forms a cavity 21 having an upper part 22 and a lower part 23. The cavity 21 also has side walls 24. The side walls 24, the upper part 22 and the lower part 23 delimit a cavity for accommodating a cable 6. The lower part 23 has two movable stops 25 and 26.

[0020] Here, the movable stops 25 and 26 have a tri-

angular profile. Each of them is fastened to the body 1 by one edge only. The movable stop 25 is fastened thereto by an edge 27 and the stop 26 by an edge 28. The edges 27 and 28 act as hinges of the stops 25 and 26 respectively. Such a hinging effect is obtaining by making the body 1 and the stops 25 and 26 integrally from a plastic material, for example polycarbonate. The stop 26 has the characteristic that one of its edges has notches 29 formed therein. The notches 29 are formed in an edge parallel to the hinge edge 28.

[0021] The stop 25 is a strain-relieving device. This device allows to keep the cable 6 in position inside the body 1. The main function of the device 26 is to establish the electric connection by removing the insulator of the conductors 7 of the cable 6 between the teeth 14.1 and 14.2, but it also acts as a strain-relieving device. Before fitting the connector onto a cable 6, the hinges 27 and 28 are in the open position, as shown in figure 1. Figure 3 shows them in the closed position. In the open position, the stops 25 and 26 are not inside the cavity 21.

[0022] According to a preferred characteristic of the invention, the connection of a cable in such connector is established by moving the stops 25 and 26 from an open position to a closed position. In the closed position, the stops 25 and 26 exert a stress on the cable 6 and on the conductors 7 respectively, and displace the insulation of the conductors. The stop 25 has two faces 27.1 and 27.2, sharing the edge 27. In the open position, the face 27.1 is parallel to the lower part 23. In the closed position, the face 27.2 is parallel to the lower part 23, and rests on an edge 23.1 of the lower part 23. The stop 26 also has two faces 28.1 and 28.2 sharing the edge 28, and having the same orientations as the stop 25 in the open and closed positions. Further, the stops 25 and 26 are integral with the lower part 23, so that the edges 27 and 28 are the closest edges to the edge 20 separating the cavity 20 from the cavity 17.

[0023] In figure 2b, the notches 29 of the stop 26 have a semicircular shape. Each of these notches 29 is to accommodate a conductor 7 of the cable 6. The semicircle formed by the notches 29 has, for example, the same radius as the conductors 7 of the cable 6. With respect to the notches 29, the receptacles 10 include a housing, for example also having a semicircular shape, for a conductor 7. Figure 2b shows a conductor with its insulating sheath 7.1 and its conductive core 7.2 engaged in these notches and housings.

[0024] In figure 3, the body 1 of the connector is to be mounted in an aperture 30 of a receptacle 31 containing the printed circuit 8, whereon the connector is to be fitted. The body 1 has an elastic lever 32 on an upper, or lower, face. The upper face of the body 1 consists of the upper jaw 19 and of the upper part 22. The metal plating 9 of the printed circuit 8 has to face the aperture 30 of the receptacle 31 which contains the printed circuit 8. The metal plating 9 may also be held by a rigid tongue projecting out of the printed circuit, which would be narrower than the aperture 30.

[0025] The process for mounting this connector, in accordance with the invention, onto a cable 6 at one end and onto a printed circuit 8 at the other end only includes two main steps.

[0026] A first step consists in fitting the cable 6 into the connector. To this end, the cable 6 has to be bared over a length of a few millimeters, preferably 5 to 10 millimeters. The conductors 7 of the cable 6 are thus exposed. The conductors 7 are not bared, the sheaths 7.1 covering the cores 7.2. The cable 6 and the conductors 7 are introduced by the insulation-displaced end into the first input 2 of the body 1 of the connector. In order to establish a proper connection, in one example, the cable is slightly squeezed by hand to place the conductors 7 on the same plane, parallel to each other. The conductors 7 are thus introduced into the cavity 21 of the first input 2. Each conductor 7 is inserted between the ends of the teeth 14.1 and 14.2 of each contact 11 comprised in the body 1 of the connector. The spacing between the teeth 14.1 and 14.2 partly acts as a guide for the connectors 7. The cable is then maintained in its position inside the cavity 21 by rotating the stop 25. The stop is thereby moved to a closed position. The stop 25 is forced against the cable 6 and held in that position by the lower part 23 of the first input 2. Next, or at the same time, the actual electric connection between the conductors 7 and the contacts 11 is established by rotating the stop 26. The stop 26 pushes its notches 29 against the conductors 7. The pressure exerted by the stop forced against these conductors is such that the conductors 7 are locally bared by the sharp edges of the teeth 14.1 and 14.2. Therefore, these conductors come in electric contact with the contacts 11. The connection is termed insulation displacement connection or insulator removing connection. These actions form the first mounting step. A connector is thereby attached to a cable.

[0027] During the second step, the connector attached to the cable is fitted onto a printed circuit 8. In figure 3, the printed circuit 8 is held inside a receptacle 31 which has an aperture 30. An edge of the printed circuit 8 overhangs near this aperture. The metal plating 9 of the printed circuit 8 which contacts the connector is provided at the edge of the printed circuit 8 in front of the aperture. The jaws 18 and 19 of the second input are to surround the printed circuit 8. To this end, the elastic lever 32 is lowered to allow the introduction of the body 1 into the aperture 30 of the receptacle. As a variant, the elastic lever 32 has an automatic lowering ramp. The introduction of the body 1 is such that the jaw 18 is under the printed circuit and the jaw 19 is over it. The lever is then released so as to hold the connector, with the cable attached thereto, in its position around the printed circuit 8. A lock consisting of a release 33 of the lever 32 rests on an edge of the aperture 30. The tongues 16 of the contacts 11 are pushed upwards by the thickness of the printed circuit 8. This movement forces the tongues 16 against the metal plating 9. The connection is thereby established between a cable 6

and a printed circuit 8.

Claims

1. A female connector characterized in that it comprises a body (1) having a first input (2) for accommodating the conductors (7) of a cable (6), a second clamp-shaped input (3) for accommodating an edge of a printed circuit (8), receptacles (10) in this body and contacts (11) extending in the receptacles of the body from the first input to the second input, preferably parallel to each other. 5
2. A connector as claimed in claim 1, characterized in that a contact comprises an insulation displacement part (14) in the first input, and an elastic tongue (16) in the second input. 10
3. A connector as claimed in claim 2, characterized in that the insulation displacement part has two slightly spaced teeth (14.1, 14.2) on either side of a plane formed by a contact. 15
4. A female connector as claimed in any one of claims 2 to 3, characterized in that a contact tongue has a curved shape, and extends beyond a plane formed by an upper jaw (19) of the clamp of the second input. 20
5. A female connector as claimed in any one of claims 1 to 4, characterized in that the contacts comprise a mortise (13) for being held in their respective receptacles. 25
6. A female connector as claimed in any one of claims 1 to 5, characterized in that it has two movable stops (25, 26) on the same side of the first input, each fastened to the connector body by an edge (27, 28), an edge forming a hinge about which a stop can rotate. 30
7. A female connector as claimed in claim 6, characterized in that a first stop has smooth edges. A second stop has notches (29) formed in one of its edges, and receptacles also comprise housings for the notches of the second stop in the tilted position. 35
8. A female connector as claimed in any one of claims 1 to 7, characterized in that the body has a lever (32) with an elastic lock (33) for engagement into an aperture for access to a printed circuit. 40
9. A female connector as claimed in any one of claims 1 to 8, characterized in that the contacts comprise, preferably at one end, a boss (15.1) for being held inside the receptacles. 45
10. A process for mounting a female connector which connects a cable and a printed circuit, characterized in that it includes the steps of:
 - displacing the insulation of the cable to expose the conductors still covered by their insulating sheath;
 - introducing the cable, by its insulation-displaced end, into a first input of the connector;
 - moving a first stop of this connector from an open position to a closed position, wherein the cable is forced against the inside of a cavity formed by this first input, and simultaneously moving a second stop of this connector from an open position to a closed position, wherein the insulated conductors of the cable are forced against an end of insulation displacement contacts held inside the connector;
 - engaging a clamp, formed by a second input of the connector, against an edge of a printed circuit;
 - forcing a tongue at another end of each contact against the metal plating of the printed circuit.
11. A process as claimed in claim 10, characterized in that it includes the step of:
 - pressing an elastic lever outside the connector for inserting or removing the connector into or out of an aperture of a receptacle containing a printed circuit.

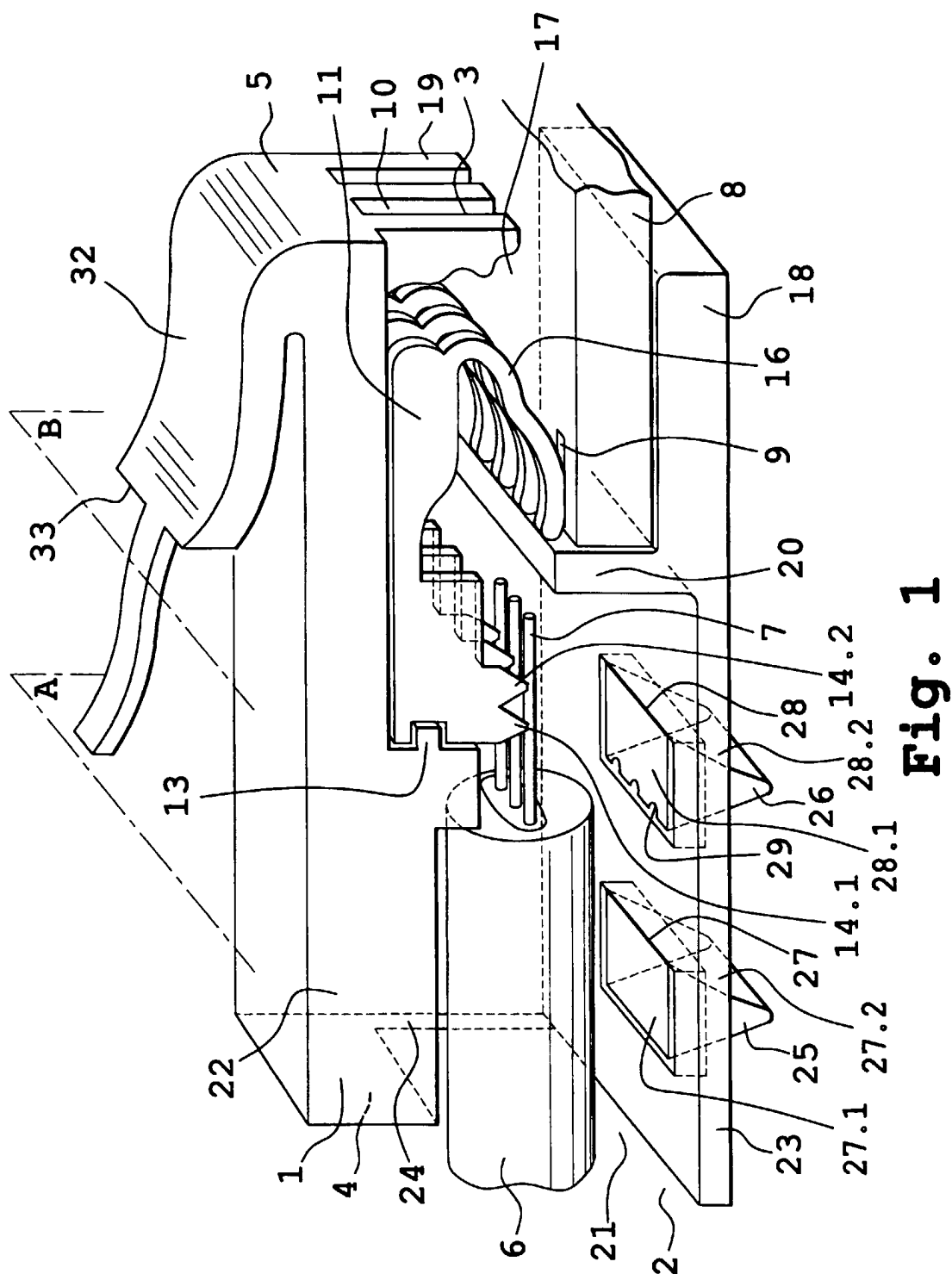


Fig. 1

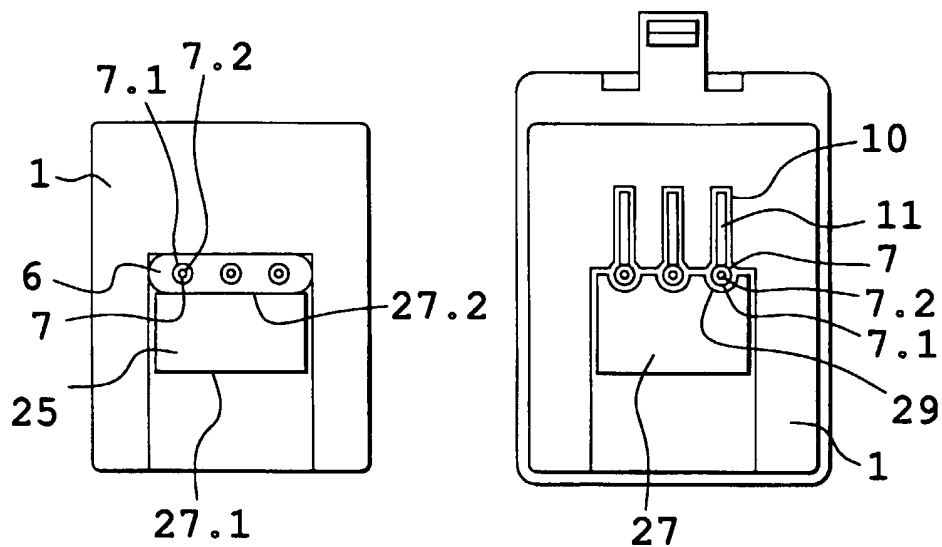


Fig. 2a

Fig. 2b

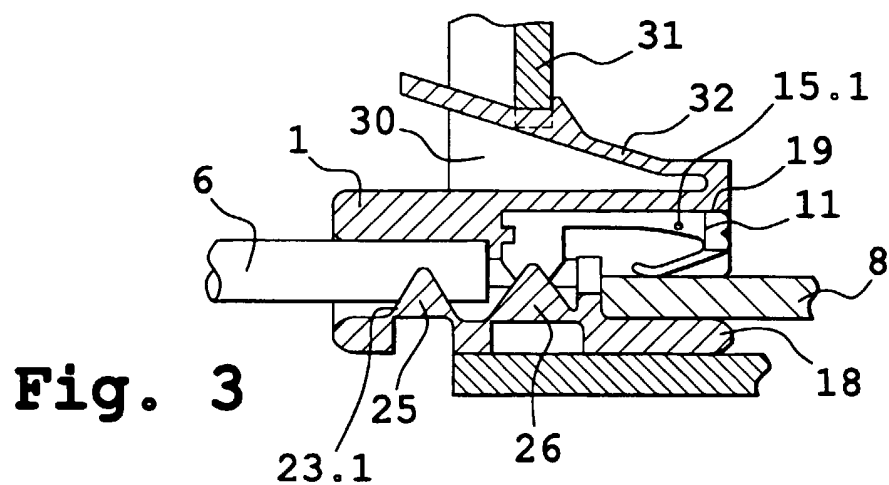


Fig. 3

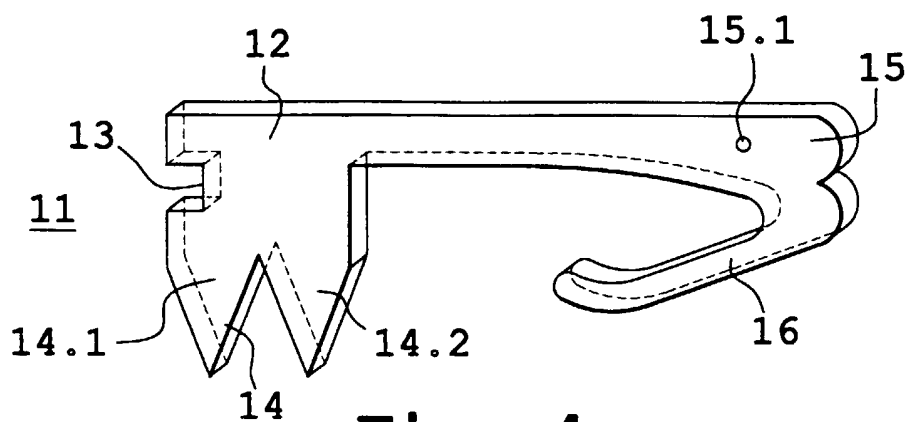


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 00 40 0618

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 13 July 2000	Examiner Alexatos, G
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
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