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(54) Device for locking and unlocking a connector, connected to a multiconductor cable, with respect to a socket

(57) The connector (1) consists of a printed-circuit board (4) connected to the conductors of the cable (2).

The connector (1) carries a generally U-shaped spring (5), the arms (5a) of which have, at their ends, means (6) which engage with complementary means (7) in order to lock the connector (1) to a socket (18).

The connector (1) has a pivoting lever carrying a member (10) which engages with the base (5b) of the generally U-shaped spring (5), this member being able to move, when the lever pivots, between a position in which this member is inactive with respect to the base (5b) of the spring (5) and the arms (5a) of the spring (5) are locked to the socket (8) and a position in which this member (10) exerts a force on the base (5b) of the spring (5) in order to unlock the arms (5a) of the latter from the socket (8).

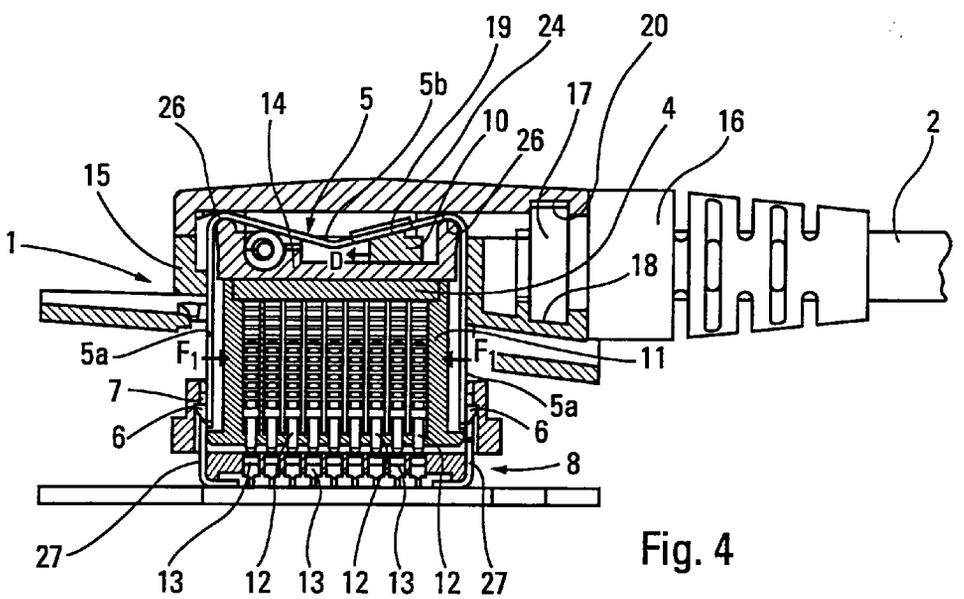

Fig. 4

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Description

[0001] The present invention relates to a device for locking and unlocking a connector, connected to a cable having several conductors, with respect to a socket, the said connector consisting mainly of a printed-circuit board connected to the said conductors.

[0002] The socket may, for example, be fixed to an apparatus such as a mobile telephone intended to be connected, by means of the cable, to a power supply provided inside a motor vehicle.

[0003] In the known embodiments, the connector is connected to the socket by means of a plug carrying several connection pins which can be plugged into female contacts fastened to the socket.

[0004] However, particularly in the case of mobile telephones, the above connection is exposed to considerable tensile or torsional forces so that there is a risk of it being impaired during use.

[0005] Thus, there is a need for users to create a reliable and effective locking and unlocking device which allows the supply cable to be easily connected and disconnected with respect to the socket of an apparatus such as a mobile telephone.

[0006] According to the invention, this device is characterized in that the connector carries a generally U-shaped spring, the arms of which have, at their ends, means which engage with complementary means in order to lock the connector to the socket, and in that the connector has a pivoting lever carrying a member which engages with the base of the generally U-shaped spring, this member being able to move, when the lever pivots, between a position in which the said member is inactive with respect to the base of the said spring and the arms of the spring are locked to the socket and a position in which the said member exerts a force on the base of the said spring in order to unlock the arms of the latter from the socket.

[0007] The generally U-shaped spring constitutes a simple and reliable means for locking the connector to the socket.

[0008] According to a preferred version of the invention, the printedcircuit board connected to the cable is pressed against a plug made of insulating material containing several contact pins that are connected to the conductors of the cable via the printed circuit of the said board, these contact pins projecting from the said plug and making electrical connections with female contacts of the said socket when the latter is locked to the connector, the said generally U-shaped spring going around the board and the plug.

[0009] The plug is thus confined inside the U of the spring and this makes it possible to obtain a structure which is compact and simple to produce.

[0010] According to one feature of the invention, a support is placed between the printed-circuit board and the base of the said U-shaped spring.

[0011] Preferably, the plug, the printed-circuit board and the U-shaped spring are housed in a casing, the end of the cable having an end-piece which has a projecting part held in place in a cavity in the casing, and the casing is closed by a cover which covers the base of the U-shaped spring and the said support, this cover having a cavity complementary to that provided in the casing in order to hold the projecting part of the end-piece of the cable in place.

[0012] The connector fitted with the locking and unlocking device according to the invention is thus composed of a small number of pieces and has a very compact structure.

[0013] In particular, the locking and unlocking device composed of a lever and of a U-shaped spring does not complicate the production of the connector and has no appreciable impact on its size.

[0014] Other features and advantages of the invention will appear again in the description below.

[0015] In the appended drawings, given by way of non-limiting examples,

- Figure 1 is a plan view of a connector connected to a cable fitted with a locking and unlocking device according to the invention;
- Figure 2 is an exploded perspective view of the connector shown in Figure 1;
- Figure 3 is a cross-sectional view of the connector;
- Figure 4 is a longitudinal sectional view of the connector;
- Figure 5 is a cross-sectional view of the socket;
- Figure 6 is a longitudinal sectional view of the socket; and
- Figures 7 to 13 are perspective views illustrating the successive steps in assembling the connector.

[0016] Figures 1 and 2 show a connector 1 connected to a cable 2 having several conductors 3. This connector consists of a printed-circuit board 4 connected to the conductors 3.

[0017] According to the invention, the connector 1 carries a generally U-shaped spring 5 (see Figures 2 and 4), the side arms 5a of which have, at their ends, means 6 which engage with complementary means 7 in order to lock the connector to a socket 8.

[0018] The connector 1 has, on the other hand, (see Figures 2 and 3) a pivoting lever 9 carrying a member 10 (see Figures 2 and 4) which engages with the base 5b of the generally U-shaped spring 5. This member 10 can move, when the lever 9 pivots, between a position (that shown in Figure 4) in which this member 10 is inactive with respect to the base 5b of the spring 5 and the arms 5a of the spring are locked to the socket 8 and a position (not shown) in which this member 10 exerts a force on the base 5b of the spring in order to unlock the arms 5a of the latter from the socket 8.

[0019] As may be seen in Figure 4, the printed-circuit board 4 connected to the cable is pressed against a plug 11 made of insulating material containing several

contact pins 12 that are connected to the conductors 3 of the cable 2 via the printed circuit of the board 4. These contact pins 12 project from the plug 11 and make electrical connections with female contacts 13 carried by the socket 8 (see also Figure 6) when the latter is locked to the connector 1.

[0020] Figure 4 also shows that the generally U-shaped spring 5 goes around the board 4 and a plug 11.

[0021] As indicated in Figures 2, 3 and 4, a support 14 is placed between the printed-circuit board 4 and the base 5b of the U-shaped spring.

[0022] Moreover, the plug 11, the printed-circuit board 4 and the U-shaped spring are housed in a casing 15. The end of the cable 2 has an end-piece 16 which has a projecting part 17 held in place in a cavity 18 in the casing 15 (see Figures 2 and 4).

[0023] Moreover, the casing 15 is closed by a cover 19 which covers the base 5b of the U-shaped spring 5 and the support 14. This cover 19 has a cavity 20 complementary to that provided in the casing 15 in order to hold the projecting part 17 of the end-piece 16 of the cable 2 in place.

[0024] As shown in Figure 2, the lever 9 has, at one of its ends, a pivot 21 mounted in complementary recesses 22, 23 made in the cover 19 and in the casing 15, the axis of the pivot being approximately parallel to the contact pins 12 of the plug 11 and perpendicular to the printed-circuit board 4.

[0025] Moreover, the member 10 which engages with the base 5b of the U-shaped spring 5 lies between the pivot 21 of the lever 9 and its end opposite this pivot.

[0026] As shown particularly in Figure 4, the member 10 has a cam 24 engaged between the base 5b of the approximately U-shaped spring 5 and the support 14.

[0027] The base 5b of the U-shaped spring 5 is shaped in the form of a dihedron (see Figures 2 and 4), the apex of which faces the support 14. The cam 24 of the member 10 carried by the lever 9 is inserted between an inclined part of the dihedron and a rectilinear face of the support 14.

[0028] Moreover, a return spring 25 (see Figures 2 and 3) is placed between the support 14 and a part of the lever 9 which lies between the pivot 21 and the member 10 having the cam 24.

[0029] Furthermore, the support 14 (see Figures 2 and 4) has, at its two opposite ends, a rounded surface 26 for supporting and for guiding the opposite ends of the base 5b of the U-shaped spring 5.

[0030] In addition, the ends of the arms 5a of the U-shaped spring 5 have catches 6 which face the outside and are engaged in openings 7 made in tabs 27 (see Figures 5 and 6) fastened to the socket 8.

[0031] The operation of the device that has just been described will now be explained.

[0032] In the locked position, the catches 7 of the arms 5a of the U-shaped spring are engaged in openings 7 in the tabs 27 fastened to the socket 8.

[0033] Moreover, the lever 9 is pushed back sideways, towards the outside of the connector, by the return spring 25.

[0034] In order to unlock the connector from the socket 8, all that is rehired is to press on the lever 9 in the direction of the arrow F shown in Figure 3.

[0035] The pivoting of the lever 9 causes the cam 24 of the member 10 carried by the lever to be moved in the direction of the arrow D shown in Figure 4.

[0036] The movement of the cam 24 deforms the dihedrally-shaped base 5b upwards, which in turn causes the arms 5a of the spring to move in the direction of the arrows F_1. This movement is possible because of the clearance provided between the arms 5a of the spring and the plug 11.

[0037] The movement of the arms 5a of the spring causes the catches 6 to disengage from the openings 7 made in the tabs 27 of the socket 8.

[0038] In order to remove the casing 15 from the socket 8, all that is then required is to disengage it.

[0039] To lock the connector to the socket 8, all that is required is to press on the lever 9 in the direction of the arrow F in order to move the arms 5a of the spring towards the plug 11, then to fit this plug into the socket 8 and to release the lever 9 so that the catches 6 of the arms of the spring 5 engage in the openings 7 in the tabs 27 of the socket 8.

[0040] In order to assemble the device which has just been described, the procedure is as follows (see Figures 7 to 13).

[0041] The contact pins 12 and the springs 12a are put into place (see Figure 7) in the plug 11.

[0042] The end of the cable 2 and the printed-circuit board 4 are put into position (see Figure 8) in the casing 15.

[0043] The support 14 is placed (see Figure 9) on the board 4 lying in the casing 15.

[0044] The U-shaped spring 5 is engaged (see Figure 10) on the support 14 and the return spring 25 is put into place.

[0045] The lever 9 is put into position (see Figure 11) by engaging the member 10 of the latter between the base of the spring 5 and the support 14.

[0046] The cover 19 is placed (see Figure 12) on the casing 15.

[0047] Next (see Figure 13), the assembly is high-frequency welded in order to weld the cover 19 to the casing 15.

[0048] Of course, the invention is not limited to the illustrative embodiment that has just been described and many modifications may be made to the latter without departing from the scope of the invention.

Claims

1. Device for locking and unlocking a connector (1) connected to a cable (2) having several conductors (3), with respect to a socket (8), the said connector (1) consisting mainly of a printed-circuit board (4)

connected to the said conductors (3), characterized in that the connector (1) carries a generally U-shaped spring (5), the arms (5a) of which have, at their ends, means (6) which engage with complementary means (7) in order to lock the connector (1) to the socket (8), and in that the connector has a pivoting lever (9) carrying a member (10) which engages with the base (5b) of the generally U-shaped spring (5), this member (10) being able to move, when the lever (9) pivots, between a position in which the said member (10) is inactive with respect to the base (5b) of the said spring (5) and the arms (5a) of the spring are locked to the socket (8) and a position in which the said member (10) exerts a force on the base (5b) of the said spring (5) in order to unlock the arms (5a) of the latter from the socket (8).

2. Device according to Claim 1, characterized in that the printed-circuit board (4) connected to the cable (2) is pressed against a plug (11) made of insulating material containing several contact pins (12) that are connected to the conductors (3) of the cable via the printed circuit of the said board (4), these contact pins (12) projecting from the said plug (11) and making electrical connections with female contacts (13) of the said socket (8) when the latter is locked to the connector (1), the said generally U-shaped spring (5) going around the board (4) and the plug (11).

3. Device according to Claim 2, characterized in that a support (14) is placed between the printed-circuit board (4) and the base (5b) of the said U-shaped spring (5).

4. Device according to Claim 3, characterized in that the plug (11), the printed-circuit board (4) and the U-shaped spring (5) are housed in a casing (15), the end of the cable (2) having an end-piece (16) which has a projecting part (17) held in place in a cavity (18) in the casing (15).

5. Device according to Claim 4, characterized in that the casing (15) is closed by a cover (19) which covers the base (5b) of the U-shaped spring (5) and the said support (14), this cover (19) having a cavity (20) complementary to that provided in the casing (15) in order to hold the projecting part (17) of the end-piece (16) of the cable (2) in place.

6. Device according to Claim 5, characterized in that the lever (9) has, at one of its ends, a pivot (21) mounted in complementary recesses (22, 23) made in the cover (19) and in the casing (15), the axis of the pivot (21) being approximately parallel to the contact pins (12) of the plug (11).

7. Device according to Claim 6, characterized in that the member (10) which engages with the base (5b) of the U-shaped spring (5) lies between the pivot (21) and its end opposite this pivot.

8. Device according to Claim 7, characterized in that the said member (10) has a cam (24) engaged between the base (5b) of the approximately U-shaped spring (5) and the support (14).

9. Device according to Claim 8, characterized in that the base (5b) of the U-shaped spring (5) is shaped in the form of a dihedron, the apex of which faces the support (14), the said cam (24) of the member (10) carried by the lever (9) being inserted between an inclined part of the dihedron and a rectilinear face of the support (14).

10. Device according to one of Claims 7 to 9, characterized in that a return spring (25) is placed between the support (14) and a part of the lever (9) which lies between the pivot (21) and the member (10) having the cam (24).

11. Device according to either of Claims 9 and 10, characterized in that the support (14) has, at its two opposite ends, a rounded surface (26) for supporting and for guiding the opposite ends of the base (5b) of the U-shaped spring (5).

12. Device according to one of Claims 1 to 11, characterized in that the ends of the arms (5a) of the U-shaped spring (5) have catches (6) which face the outside and are engaged in openings (7) made in tabs (27) fastened to the socket (8).

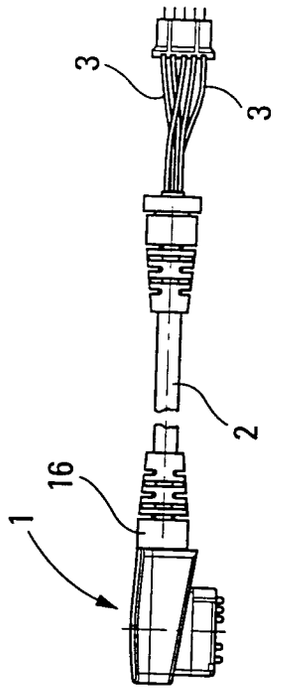
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Fig. 1

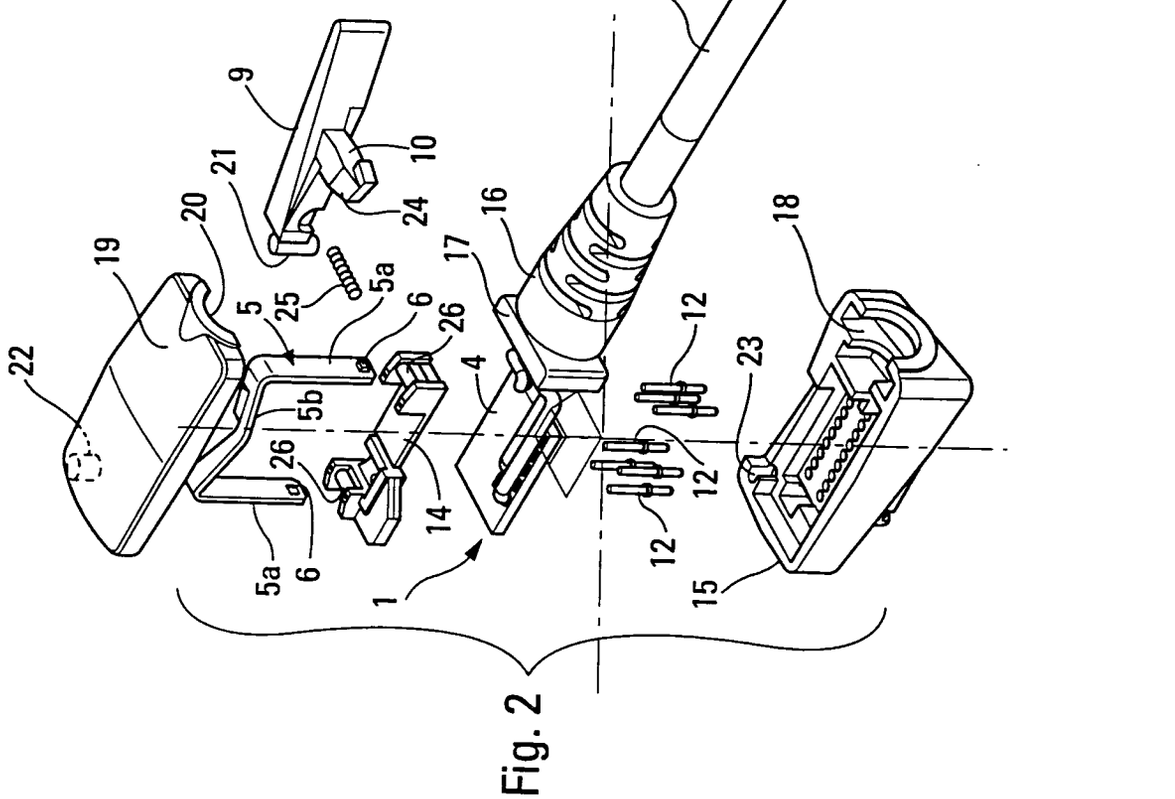
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Fig. 2

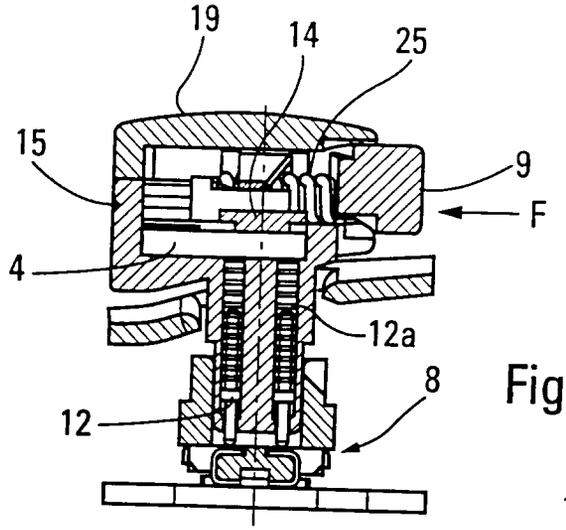

Fig. 3

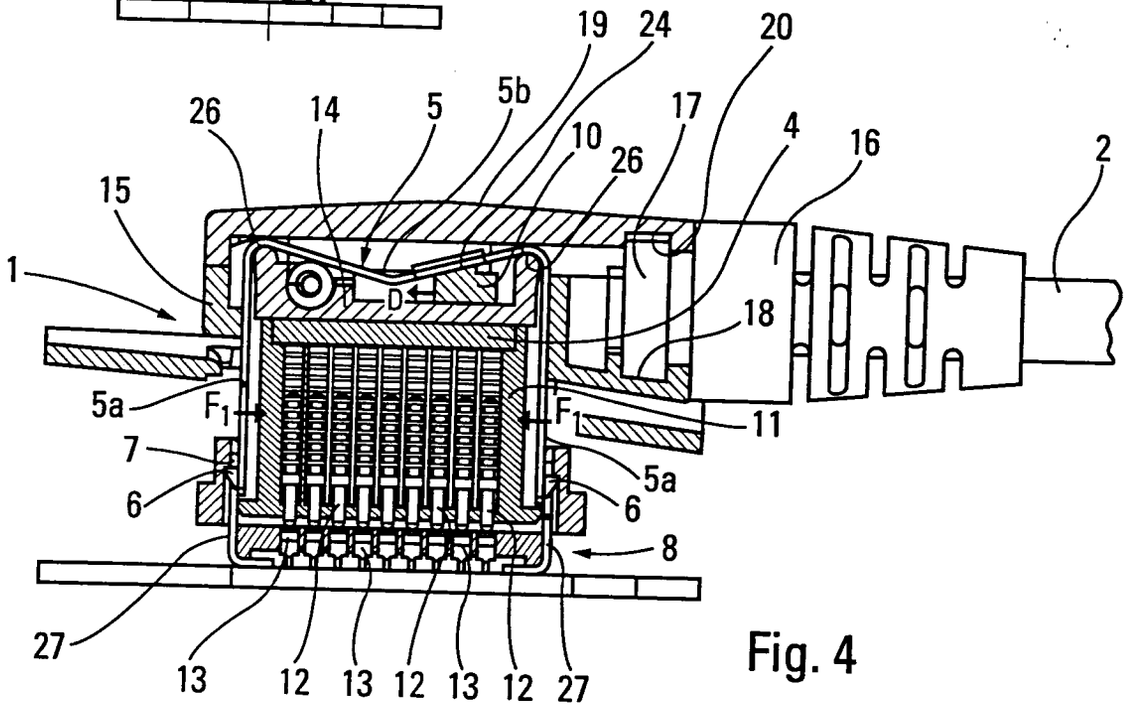

Fig. 4

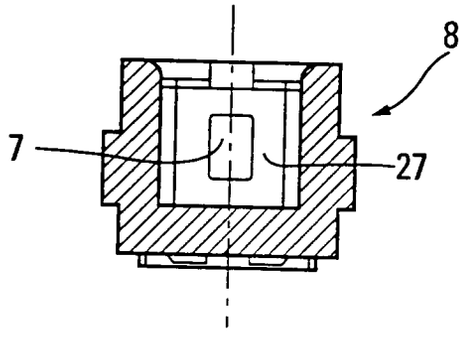

Fig. 5

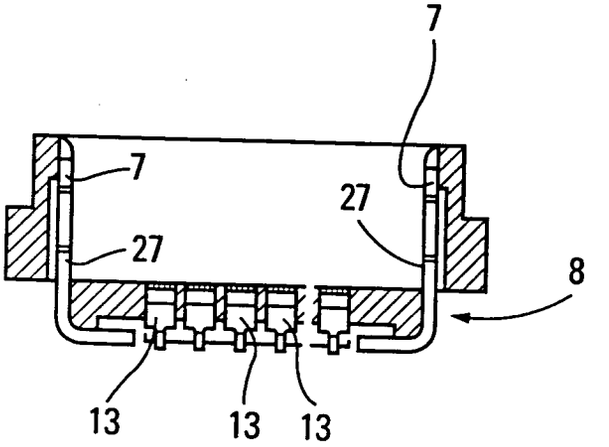

Fig. 6

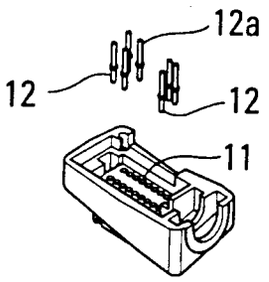

Fig. 7

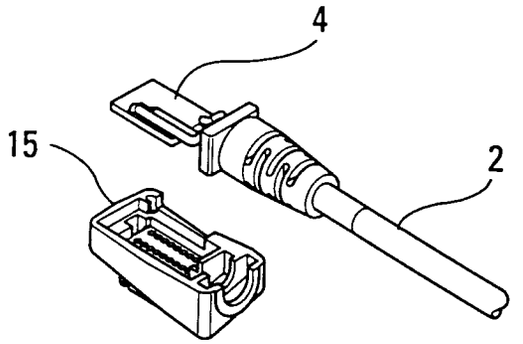

Fig. 8

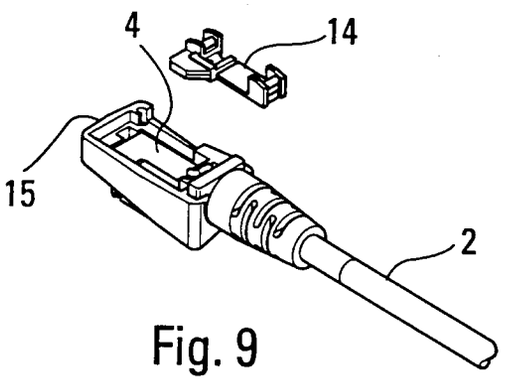

Fig. 9

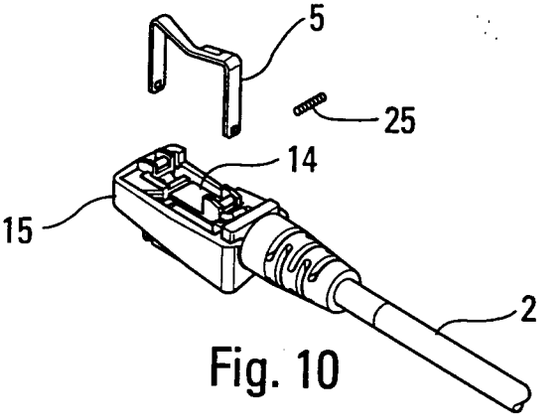

Fig. 10

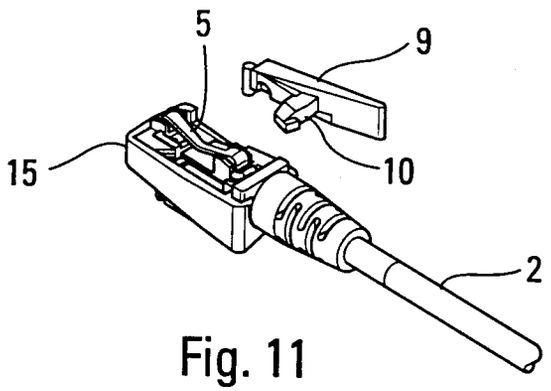

Fig. 11

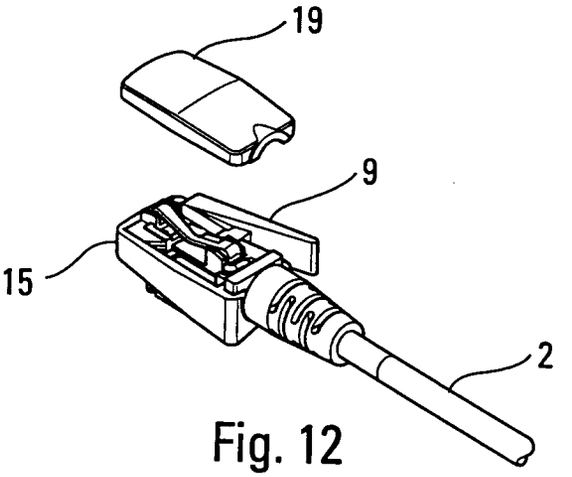

Fig. 12

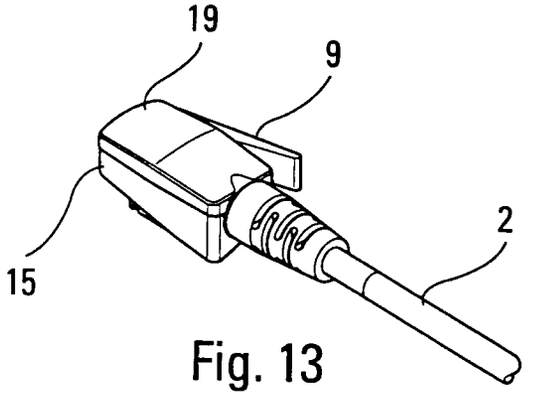

Fig. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 1543

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.6)
A	EP 0 547 252 A (MOLEX) 23 June 1993 * column 3, line 28 - line 37 * * column 4, line 1 - line 29; figures 5-9 * ---	1,11	H01R13/627
A	EP 0 318 719 A (GROTE & HARTMANN) 7 June 1989 * column 2, paragraph 31 - column 3, paragraph 44; figure 1 * -----	1,12	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	20 May 1999	Alexatos, G

CATEGORY OF CITED DOCUMENTS

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20-05-1999

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