(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 935 313 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
10.05.2006 Bulletin 2006/19

(51) Int Cl.:
H01R 13/627 *(2006.01)*

(21) Application number: **99101543.9**

(22) Date of filing: **29.01.1999**

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

Vorrichtung zur Ver- und Entriegelung eines an einem Mehrleiterkabel angeschlossenen Verbinders mit einer Buchse

Dispositif de verrouillage et de déverrouillage d' un connecteur raccordé à un câble à plusieurs conducteurs , par rapport à une embase

(84) Designated Contracting States:
BE CH DE DK ES FI FR GB IE IT LI NL SE

(30) Priority: **05.02.1998 FR 9801366**

(43) Date of publication of application:
11.08.1999 Bulletin 1999/32

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(56) References cited:
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Description

[0001] The present invention relates to a connector comprising 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] Such a connector is know from EP-0 547 252.

[0004] In further 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.

[0005] 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.

[0006] Thus, there is a need for users to create a connector having 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.

[0007] According to the invention, this connector is characterized in that the arms of the generally U-shaped spring 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.

[0008] The generally U-shaped spring constitutes a simple and reliable means for locking the connector to the socket.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] Other features and advantages of the invention will appear again in the description below.

[0016] In the appended drawings, given by way of nonlimiting 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] Figure 4 also shows that the generally U-shaped spring 5 goes around the board 4 and a plug 11.

[0022] 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.

[0023] 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).

[0024] 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.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] The operation of the device that has just been described will now be explained.

[0033] 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.

[0034] Moreover, the lever 9 is pushed back sideways, towards the outside of the connector, by the return spring 25.

[0035] In order to unlock the connector from the socket 8, all that is required is to press on the lever 9 in the direction of the arrow F shown in Figure 3.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] In order to remove the casing 15 from the socket 8, all that is then required is to disengage it.

[0040] 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.

[0041] In order to assemble the device which has just been described, the procedure is as follows (see Figures 7 to 13).

[0042] The contact pins 12 and the springs 12a are put into place (see Figure 7) in the plug 11.

[0043] The end of the cable 2 and the printed-circuit board 4 are put into position (see Figure 8) in the casing 15.

[0044] The support 14 is placed (see Figure 9) on the board 4 lying in the casing 15.

[0045] The U-shaped spring 5 is engaged (see Figure 10) on the support 14 and the return spring 25 is put into place.

[0046] 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.

[0047] The cover 19 is placed (see Figure 12) on the casing 15.

[0048] Next (see Figure 13), the assembly is high-frequency welded in order to weld the cover 19 to the casing 15.

[0049] 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. Connector comprising a device for locking and unlocking the connector (1) connected to a cable (2)

having several conductors (3), with respect to a socket (8), the connector (1) carries a generally U-shaped spring (5), **characterized in that** the arms (5a) of the generally U-shaped spring (5) 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. Connector according to Claim 1, **characterized in that** it comprises a printed circuit board (4) connected to said conductors (3).

3. Connector according to Claim 2, **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).

4. Connector according to Claim 3, **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).

5. Connector according to Claim 4, **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).

6. Connector according to Claim 5, **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.

7. Connector according to Claim 6, **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).

8. Connector according Claim 7, **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.

9. Connector according to Claim 8, **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).

10. Connector according to Claim 9, **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).

11. Connector according to one of Claims 9 to 10, **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) .

12. Connector according to one of Claims 4 to 11, **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).

13. Connector according to one of Claims 1 to 12, **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).

Patentansprüche

1. Verbinder mit einer Vorrichtung zum Befestigen und Lösen des Verbinders (1), der mit einem Kabel (2) verbunden ist, welches mehrere Leiter (3) aufweist, an einer Buchse (8), wobei der Verbinder (1) eine im Wesentlichen U-förmige Feder (5) trägt, **dadurch gekennzeichnet, dass** die Arme (5a) der im Wesentlichen U-förmigen Feder (5) an ihren Enden Mittel (6) aufweisen, die in komplementäre Mittel (7) eingreifen, um den Verbinder (1) mit der Buchse (8) zu verriegeln, und **dadurch**, dass der Verbinder einen Schwenkarm (9) aufweist, der ein Element (10) trägt, welches mit der Basis (5b) der im Wesentlichen U-förmigen Feder (5) zusammenwirkt, wobei dieses Element (10) in der Lage ist, sich zu bewegen, wenn der Schwenkarm (9) geschwenkt wird, zwischen ei-

ner Stellung, in der dieses Element (10) inaktiv ist bezüglich der Basis (5b) der Feder (5) und die Arme (5a) der Feder an der Buchse (8) verriegelt sind, und einer Position, in der dieses Element (10) eine Kraft auf die Basis (5b) der Feder (5) ausübt, um die Arme (5a) der Feder von der Buchse (8) zu entriegeln.

2. Verbinder nach Anspruch 1, **dadurch gekennzeichnet, dass** er eine gedruckte Schaltungsplatine (4) aufweist, die mit dem Leiter (3) verbunden ist.

3. Verbinder nach Anspruch 2, **dadurch gekennzeichnet, dass** die gedruckte Schaltungsplatine (4), welche mit dem Kabel (2) verbunden ist, gegen einen Stekker (11) gepresst ist, der aus Isoliermaterial gefertigt ist und mehrere Kontaktstifte (12) aufweist, die mit den Leitern (3) des Kabels über die gedruckte Schaltung der Platine (4) verbunden sind, wobei diese Kontaktstifte (12) von dem Stecker (11) abstehen und eine elektrische Verbindung mit Buchsenkontakten (13) der Buchse (8) herstellen, wenn letztere am Verbinder (1) verriegelt ist, wobei die im Wesentlichen U-förmige Feder (5) sich um die Platine (4) und den Stecker (1) herumerstreckt.

4. Verbinder nach Anspruch 3, **dadurch gekennzeichnet, dass** ein Träger (14) zwischen der gedruckten Schaltungsplatine (4) und der Basis (5b) der U-förmigen Feder (5) angeordnet ist.

5. Verbinder nach Anspruch 4, **dadurch gekennzeichnet, dass** der Stecker (11), die gedruckte Schaltungsplatine (4) und die U-förmige Feder (5) in einem Gehäuse (15) untergebracht sind, und das Ende des Kabels (2) ein Endstück (16) aufweist, mit einem vorstehenden Teil (17) der in einer Öffnung (18) des Gehäuses (15) gehalten ist.

6. Verbinder nach Anspruch 5, **dadurch gekennzeichnet, dass** das Gehäuse (15) durch einen Dekkel (19) verschlossen ist, der die Basis (5b) der U-förmigen Feder (5) und den Träger (14) bedeckt, wobei dieser Dekkel (19) eine Aushöhlung (20) aufweist, die komplementär zu derjenigen Ausnehmung in dem Gehäuse (15) ist, um den vorstehenden Teil (17) des Endstücks (16) des Kabels (2) festzuhalten.

7. Verbinder nach Anspruch 6, **dadurch gekennzeichnet, dass** der Schwenkarm (9) an einem seiner Enden ein Schwenkgelenk (21) aufweist, welches in komplementären Nuten (22, 23) in dem Dekkel (19) gehaltert ist, wobei die Achsen des Schwenkgelenks (21) im Wesentlichen parallel zu den Kontaktstiften (12) des Steckers (11) verläuft.

8. Verbinder nach Anspruch 7, **dadurch gekennzeichnet, dass** das Element (10), welches mit der Basis (5b) der U-förmigen Feder (5) zusammenwirkt, zwischen dem Schwenkgelenk (21) und dessen Ende gegenüber dieser Schwenkachse liegt.

9. Verbinder nach Anspruch 8, **dadurch gekennzeichnet, dass** das Element (10) eine Nocke (24) aufweist, die zwischen der Basis (5b) der im Wesentlichen U-förmigen Feder (5) und dem Träger (14) angeordnet ist.

10. Verbinder nach Anspruch 9, **dadurch gekennzeichnet, dass** die Basis (5b) der U-förmigen Feder (5) in Form eines Zweiflachs geformt ist, dessen Scheitelpunkt gegenüber dem Träger (14) liegt, wobei die Nocke (24) des Elements (10), welches von dem Schwenkarm (9) getragen wird, eingefügt ist zwischen einem geneigten Teil des Zweiflachs und einer gradlinigen Fläche des Trägers (14).

11. Verbinder nach einem der Ansprüche 9 oder 10, **dadurch gekennzeichnet, dass** eine Rückholfeder (25) zwischen dem Träger (14) und einem Teil des Schwenkarms (9) angeordnet ist, der zwischen der Schwenkachse (21) und dem Element (10) liegt, welches die Nocke (24) aufweist.

12. Verbinder nach einem der Ansprüche 4 bis 11, **dadurch gekennzeichnet, dass** der Träger (14) an seinen beiden gegenüberliegenden Enden eine abgerundete Fläche (26) aufweist zum Tragen und zur Führung der gegenüberliegenden Enden der Basis (5b) der U-förmigen Feder (5).

13. Verbinder nach einem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** die Enden der Arme (5a) der U-förmigen Feder (5) Rastnasen (6) aufweisen, welche nach außen zeigen und in Öffnungen (7) eingreifen, die in Lappen (27) ausgeführt sind, die am Sockel (8) befestigt sind.

Revendications

1. Connecteur comprenant un dispositif pour le verrouillage et le déverrouillage du connecteur (1) raccordé à un câble (2) à plusieurs conducteurs (3), par rapport à une embase (8), le connecteur (1) portant un ressort (5) de forme générale en U **caractérisé en ce que** les branches (5a) du ressort (5) de forme générale en U présentent, à leurs extrémités, des moyens (6) coopérant avec des moyens complémentaires (7) pour verrouiller le connecteur (1) à l'embase (8), **en ce que** le connecteur comporte un levier pivotant (9) portant un organe (10) coopérant avec la base (5b) du ressort (5) de forme générale en U, cet organe (10) étant mobile lors du pivotement du levier (9) entre une position dans laquelle ledit organe (10) est inactif par rapport à la base (5b) dudit ressort (5) et les branches (5a) du ressort sont ver-

rouillées à l'embase (8) et une position dans laquelle ledit organe (10) exerce un effort sur la base (5b) dudit ressort (5) pour déverrouiller les branches (5a) de celui-ci par rapport à l'embase (8).

2. Connecteur (1) selon la revendication 1, **caractérisé en ce qu'**il comprend une carte (4) à circuit imprimé reliée aux dits conducteurs (3).

3. Connecteur (1) selon la revendication 2, **caractérisé en ce que** la carte (4) à circuit imprimé reliée au câble (2) est appliquée sur une fiche (11) en matière isolante renfermant plusieurs broches de contact (12) reliées aux conducteurs (3) du câble par l'intermédiaire du circuit imprimé de ladite carte (4), ces broches de contact (12) faisant saillie de ladite fiche (11) et établissant des liaisons électriques avec des contacts femelles (13) de ladite embase (8) lorsque celle-ci est verrouillée au connecteur (1), ledit ressort (5) de forme générale en U entourant la carte (4) et la fiche (11).

4. Connecteur (1) selon la revendication 3, **caractérisé en ce qu'**un support (14) est placé entre la carte (4) à circuit imprimé et la base (5b) dudit ressort en U (5).

5. Connecteur (1) selon la revendication 4, **caractérisé en ce que** la fiche (11), la carte (4) à circuit imprimé et le ressort (5) en U sont logés dans un boîtier (15), l'extrémité du câble (2) comportant un embout (16) présentant une partie en saillie (17) retenue dans une cavité (18) du boîtier (15).

6. Connecteur (1) selon la revendication 5, **caractérisé en ce que** le boîtier (15) est fermé par un couvercle (19) qui recouvre la base (5b) du ressort (5) en U, et ledit support (14), ce couvercle (19) comportant une cavité complémentaire (20) de celle prévue dans le boîtier (15) pour retenir la partie en saillie (17) de l'embout (16) du câble (2).

7. Connecteur (1) selon la revendication 6, **caractérisé en ce que** le levier (9) comporte à l'une de ses extrémités un pivot (21) monté dans des évidements complémentaires (22, 23) ménagés dans le couvercle (19) et le boîtier (15), l'axe du pivot (21) étant sensiblement parallèle aux broches de contact (12) de la fiche (11).

8. Connecteur (1) selon la revendication 7, **caractérisé en ce que** l'organe (10) coopérant avec la base (5b) du ressort (5) en U est situé entre le pivot (21) et son extrémité opposée à ce pivot.

9. Connecteur (1) selon la revendication 8, **caractérisé en ce que** ledit organe (10) comporte une came (24) engagée entre la base (5b) du ressort (5) sensiblement en U et le support (14).

10. Connecteur (1) selon la revendication 9, **caractérisé en ce que** la base (5b) du ressort (5) en U est conformée en dièdre dont le sommet est dirigé vers le support (14), ladite came (24) de l'organe (10) porté par le levier (9) étant insérée entre une partie inclinée du dièdre et une face rectiligne du support (14).

11. Connecteur (1) selon l'une des revendications 9 ou 10, **caractérisé en ce qu'**un ressort de rappel (25) est placé entre le support (14) et une partie du levier (9) située entre le pivot (2.1) et l'organe (10) comportant la came (24).

12. Connecteur (1) selon l'une des revendications 4 à 11, **caractérisé en ce que** le support (14) comporte à ses deux extrémités opposées une surface arrondie (26) d'appui et de guidage des extrémités opposées de la base (5b) du ressort (5) en U.

13. Connecteur (1) selon l'une des revendications 1 à 12, **caractérisé en ce que** les extrémités des branches (5a) du ressort en U (5) comportent des becs d'accrochage (6) dirigés vers l'extérieur et engagés dans des ouvertures (7) ménagées dans des pattes (27) solidaires de l'embase (8).

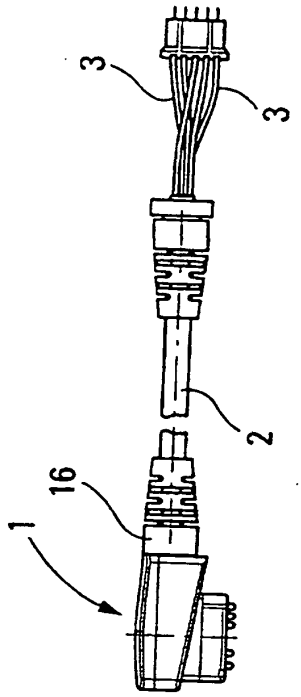
3
3
2
16
1

Fig. 1

3
3
3
2
9
10
24
21
20
19
22
5
25
5a
6
26
5b
4
16
17
18
12
12
12
23
14
26
5a
6
1
15

Fig. 2

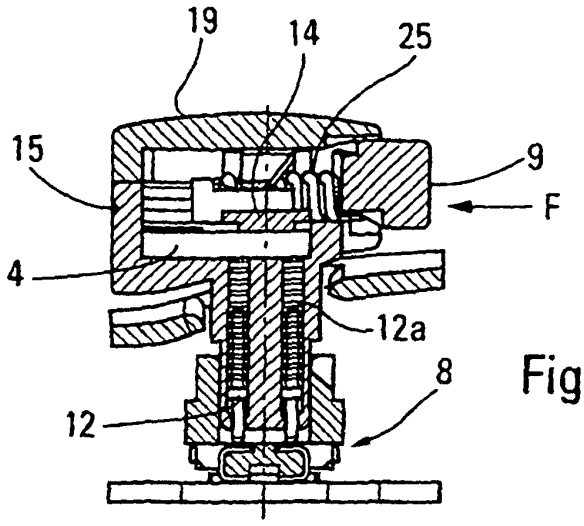

Fig. 3

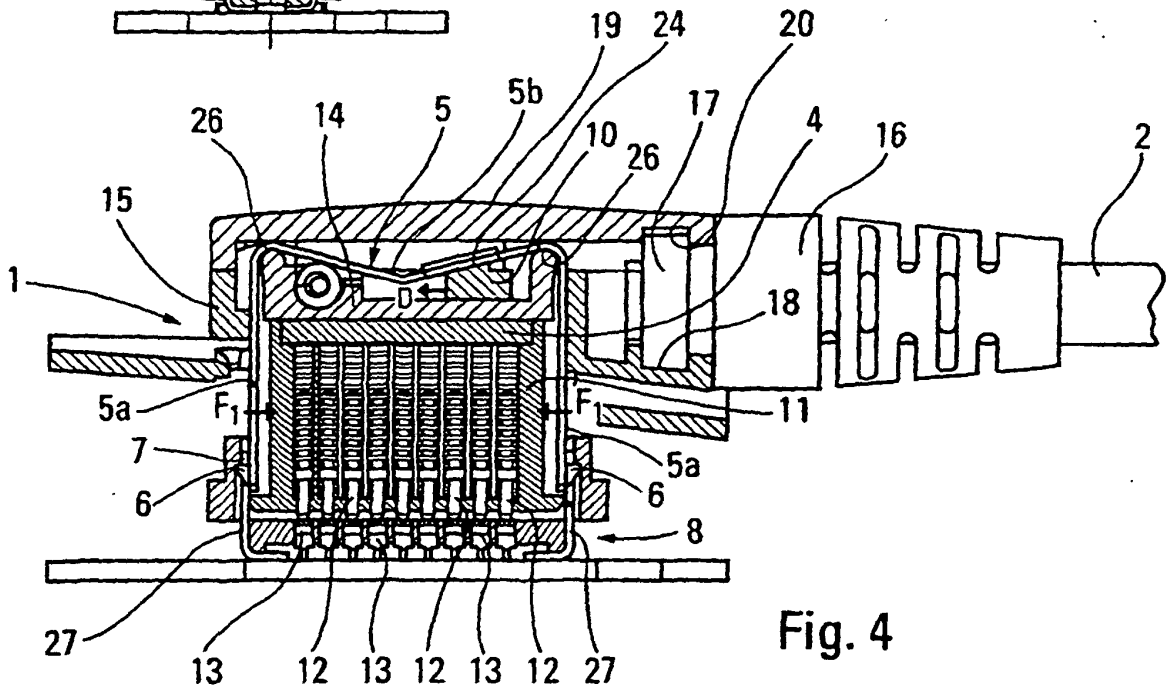

Fig. 4

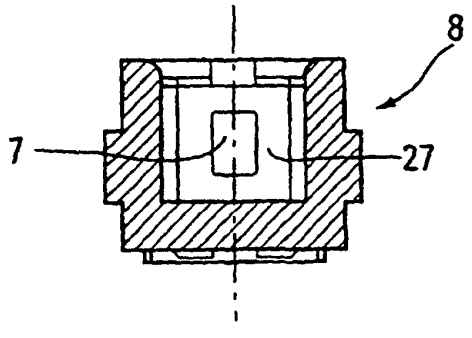

Fig. 5

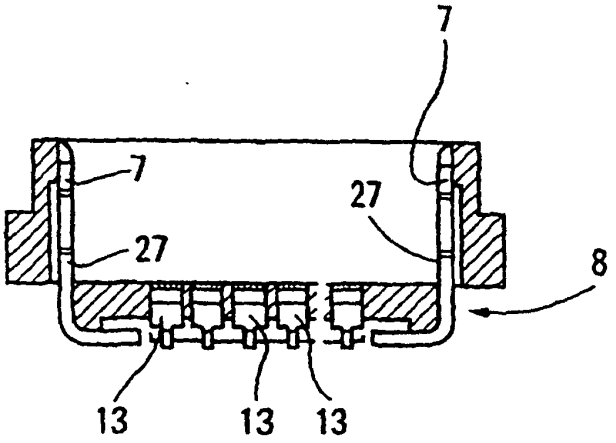

Fig. 6

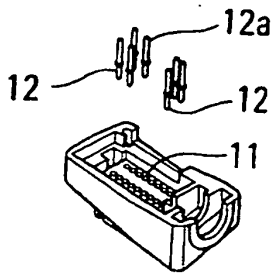

Fig. 7

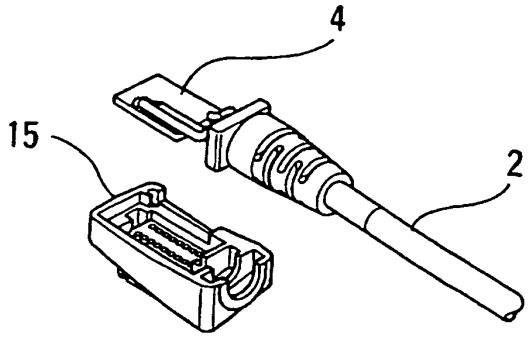

Fig. 8

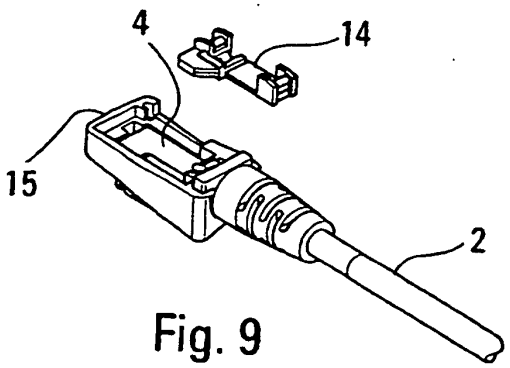

Fig. 9

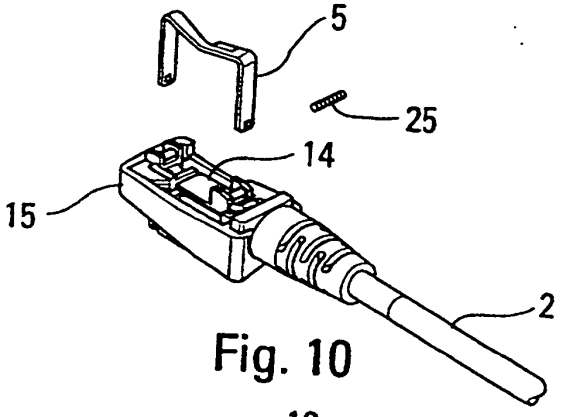

Fig. 10

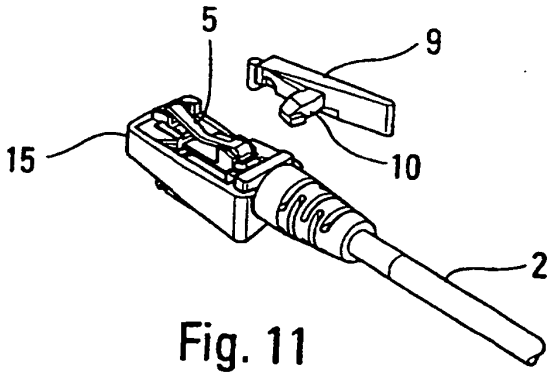

Fig. 11

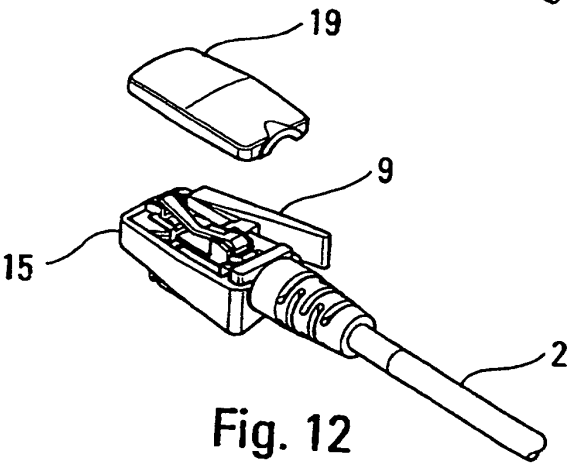

Fig. 12

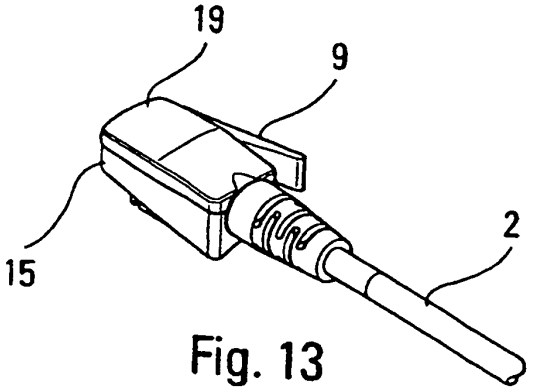

Fig. 13