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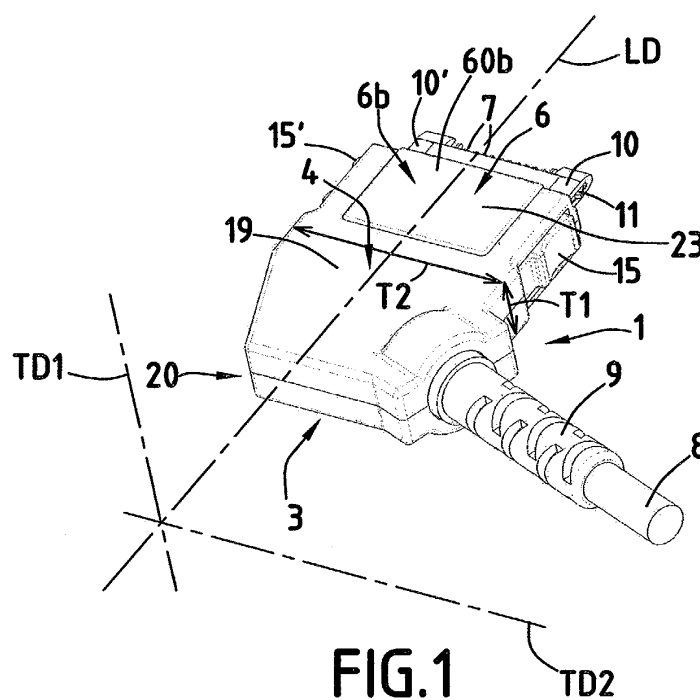
(54) **A connector with a thinner design**

(57) This connector comprising:

- a plurality of terminals (7),
- an electrically insulating body (5) bearing the terminals,
- a shield (6), and

- an outer housing (20) which comprises at least a transversal side wall (19).

An opening (23) is provided in said side wall (19), and the shield (6) comprises an embossment (60b) which is received in said opening (23).



Description

[0001] The present invention relates to a connector for connection to a complementary connector along a longitudinal connecting direction, said connector comprising:

- a plurality of terminals,
- an electrically insulating body bearing the terminals,
- a shield, and
- an outer housing which comprises at least a transversal side wall,

[0002] Such a connector is for example disclosed in EP-1 220 370. In this prior art connector, the outer housing fully surrounds the shield.

[0003] Although this connector is thin, there is a constant need for achieving thinner connectors. However, the electrically insulating body limits the possibility to reduce the thickness of such connectors.

[0004] The object of the invention is to solve this problem by providing a connector which can be thinner.

[0005] To this end, the invention relates to a connector according to claim 1.

[0006] According to particular embodiments, the invention may comprise one or several of the features recited in the dependent claims.

[0007] The invention also relates to a connection assembly according to claim 10.

[0008] The invention will be better understood upon reading of the following description, which is given solely by way of example and with reference to the appended drawings, in which:

- Figure 1 is a perspective view from below of a first embodiment of a connector according to the invention ;
- Figure 2 is an exploded view of the connector of Figure 1 ;
- Figure 3 is a perspective view of another connector which may embody the invention, and
- Figure 4 is an enlarged view of a terminal of the connector of Figure 3.

[0009] Figures 1 and 2 show a connector or plug 1, such as an input/output plug for a mobile telephone, suitable for connection to a complementary connector or receptacle 2 (only shown on figure 2) along a longitudinal connecting direction LD depicted by a dotted line.

[0010] The connector 1 comprises an outer housing 20 having, in this particular embodiment, of a lower or bottom part 3 and an upper part or cover 4. The connector further comprises an electrically insulating body 5 made of an electrically insulating thermoplastic material and is placed inside a shield 6. The shield can be made of folded metal sheets. The shield 6 is placed within the outer housing 20.

[0011] In the example of Figure 1, the shield 6 comprises a lower part 6a and an upper part 6b. The shield 6 surrounds or covers the insulating body 5.

[0012] The insulating body 5 is provided with a plurality of terminals 7 arranged in a row. The terminals 7 project forwardly from the insulating body 5 along the longitudinal direction LD.

[0013] The terminals 7 are electrically connected to respective wires (not shown) of a cable 8, whereas the shield 6 is electrically connected to a braid (not shown) of the cable 8, which braid surrounds and thus shields said wires.

[0014] A strain relieving element 9 (overmoulded bushing) is provided in the rear of the outer housing so as to avoid excessive forces on the (solder) connection between the terminals 7 and the wires when the cable 8 is being bent. The strain relieve 9 is angled and offset with respect to the longitudinal direction LD.

[0015] The insulating body 5 is provided with two substantially parallel pegs 10, 10', for aligning and polarizing the connector 1 with respect to connector 2. Peg 10, 10' includes a latch 11, 11', respectively, for establishing a secure mechanical connection between the connector 1 and the complementary connector 2.

[0016] Buttons 15, 15' provided on the bottom 3 to control the latches 11, 11' to release the mechanical connection between the connector 1 and the connector 2.

[0017] For further details on the connector 1 and the complementary connector 2, one may refer to EP-1 220 370.

[0018] The outer housing 20 has a general planar shape with a thickness T1 along a first transversal direction TD 1 lower than its thickness T2 along a second transversal direction TD2. Directions TD1 and TD2 are perpendicular to the longitudinal direction LD and are perpendicular one with another.

[0019] Thus, the outer housing 20 exhibits two major opposing side walls 17 and 19 facing outwardly along the first transversal direction TD1.

[0020] These side walls 17 and 19 are therefore substantially parallel to a plane defined by the second transversal direction TD2 and the longitudinal direction LD.

[0021] Cutouts defining through openings 21 and 23 are provided in the side walls 17 and 19. These transversal openings 21 and 23 communicate with a front opening 25 of the outer housing 20 through which the terminals 7 and the insulating body 5 protrudes forwardly in the longitudinal direction LD.

[0022] An embossment 60a, respectively 60b, is provided in each shield part 6a, respectively 6b. The embossments 60a and 60b define recesses receiving the electrically insulating body 5 so that the body 5 is at least partially covered by the embossments 60a and 60b.

[0023] The embossments 60a and 60b are received respectively in the transversal openings 21 and 23 so that the outer surfaces of the embossments 60a and 60b are transversally exposed and are flush with the outer surfaces of the side walls 17 and 19.

[0024] Thus, the thickness T1 of the connector 1

along the first transversal direction TD1 is reduced by the amount of the thicknesses of the side walls 17 and 19, for example by 2 mm.

[0025] According to other embodiments which are not shown on the appended drawings, an opening can be provided in only one of the side walls 17 and 19 to receive an embossment provided in either one of the shield parts 6a and 6b.

[0026] It should also be noted that the shield 6 is not necessarily flush with the outer surface(s) of the side wall(s) through which it extends.

[0027] Figures 3 and 4 illustrate another feature which can also provide for a lower thickness T1 of a connector 1.

[0028] Figures 3 and 4 show a connector 1 having the same general design as the connector 1 of Figures 1 and 2, but for the absence of an exposed shield 6, such as the exposed shield 6 of Figures 1 and 2.

[0029] Specifically, such a shield 6 may be absent in the connector 1 of figures 3 and 4.

[0030] Figures 3 and 4, only two terminals 7 have been shown, for clarity. However, the connector 1 may of course comprise more than two terminals 7.

[0031] As illustrated by Figure 4, each terminal 7 of the connector 1 extends along the longitudinal direction LD and comprises a contacting end portion 31 and a spring portion 33. The portion 31 protrudes out of the insulating body 5 and the portion 33 is embedded in the insulating body 5.

[0032] For each terminal 7, the spring portion 33 is carried by the insulating body 5 and provides for an electrical connection of the contacting end portion 31 to the wires of the cable 8.

[0033] The conventional purpose of the contacting end portions 31 is to be placed in contact with contact elements of the connector 2 to establish an electrical connection when connectors 1 and 2 are in abutment.

[0034] The springs portions 33 allows the contacting portions 31 to move transversally with respect to the insulating body 5, thereby reducing potential damages of the contact elements of connector 2 during connection to the connector 1.

[0035] In the disclosed embodiment, the spring portions 33 have a serpentine shape. This serpentine extends in a plane defined by the longitudinal direction LD and the second transversal direction TD2.

[0036] Therefore, the terminals 7 have a greater width W2 along the second transversal direction TD2 and a smaller width W1 along the first transversal direction TD1.

[0037] Due to this particular orientation of the terminals 7, which is perpendicular to the prior art orientation, the thickness T1 of the connector 1 along the first transversal direction TD1 can be diminished.

[0038] Consequently, the number of terminals 7 placed side by side along the direction TD2 is reduced with respect to a conventional connector.

[0039] According to other embodiments, the terminals

7 may be inclined, with respect to the plane defined by the longitudinal direction LD and the transversal direction TD2, by an angle comprised between 0 and 45°.

[0040] In order to achieve a thin connector 1, this orientation of the terminals 7 may be used alone, as shown on Figures 3 and 4, or in combination with the feature illustrated by Figures 1 and 2 and relating to the opening (s) in the outer housing receiving the shield 6.

Claims

1. A connector (1) for connection to a complementary connector (2) along a longitudinal connecting direction (LD), said connector (1) comprising:

- a plurality of terminals (7),
- an electrically insulating body (5) bearing the terminals,
- a shield (6), and
- an outer housing (20) which comprises at least a transversal side wall (17, 19),

characterized in that an opening (21, 23) is provided in said side wall (17, 19), and the shield (6) comprises an embossment (60a, 60b) which is received in said opening (21, 23).

2. The connector according to claim 1, wherein an outer surface of said embossment (60a, 60b) is substantially flush with the outer surface of said side wall (17, 19).

3. The connector according to claim 1 or 2, wherein the outer housing (3, 4) comprises two opposing transversal side walls (17, 19) and openings (21, 23) are provided in each of the transversal side walls (17, 19) to receive respective embossments (60a, 60b) of the shield (6).

4. The connector according to claim 3, wherein outer surfaces of said embossments (60a, 60b) are substantially flush with the respective outer surfaces of the opposing side walls (21, 23).

5. The connector according to any of the preceding claims, wherein the outer housing (20) has a substantially planar shape with a thickness (T1) along a first transversal direction (TD1) lower than a thickness (T2) along a second transversal direction (TD2), and wherein said transversal side wall (17, 19) faces outwardly along said first transversal direction (TD1).

6. The connector according to claim 5, wherein the terminals (7) extend along the longitudinal connecting direction (LD) and have a smaller width (W1) along the first transversal direction (TD1) and a greater

width (W2) along the second transversal direction (TD2).

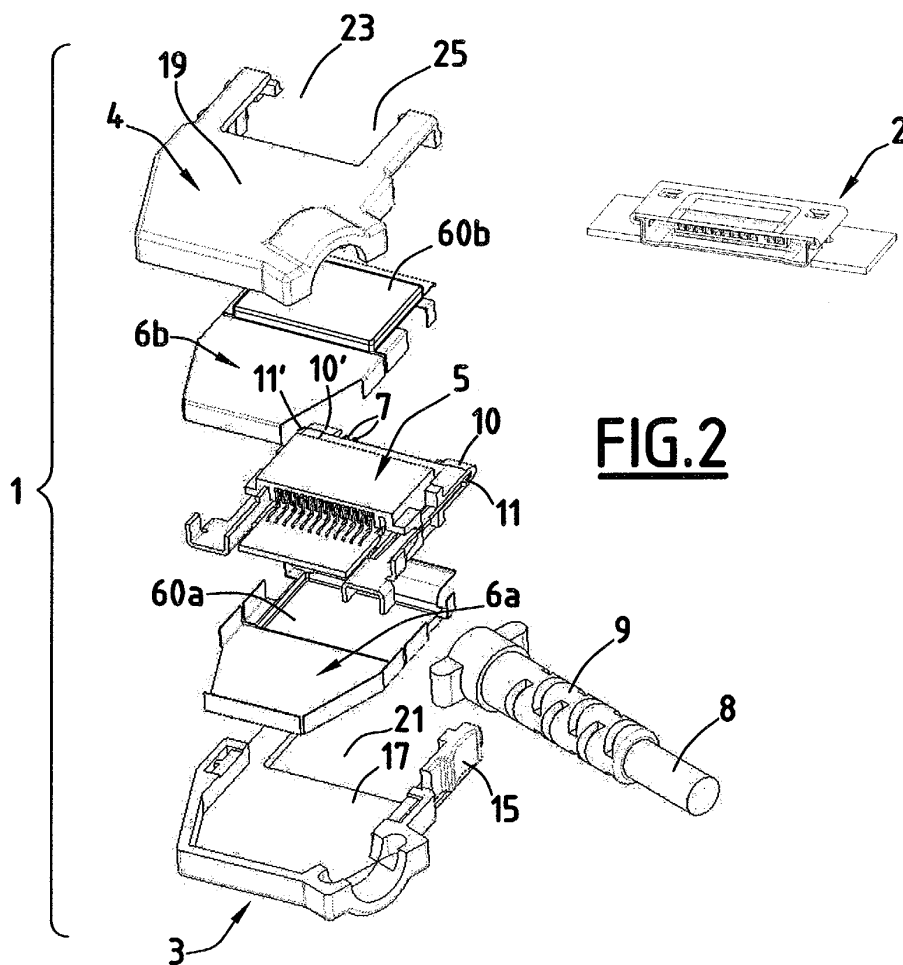
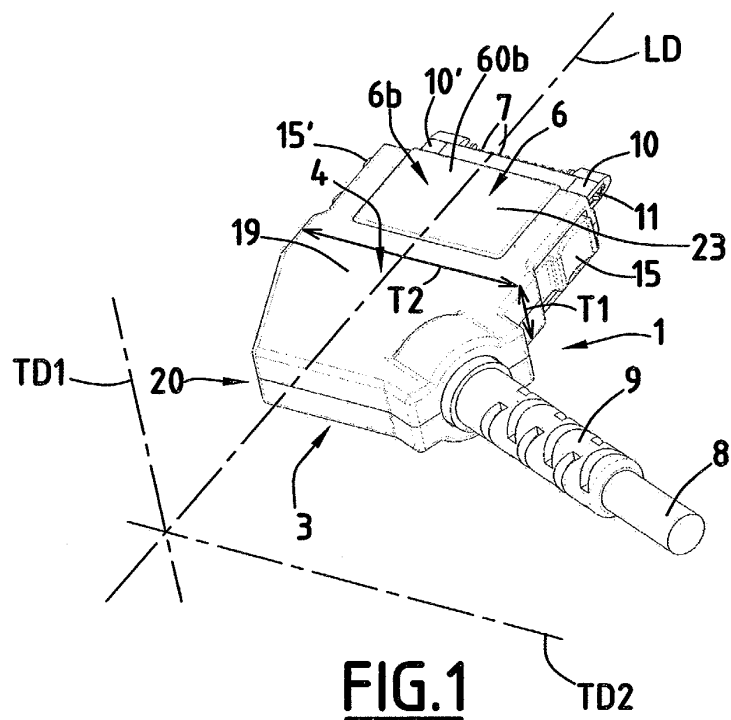
7. The connector according to claim 6, wherein the terminals (7) comprise spring portions (33) substantially extending in a plane defined by the longitudinal connecting direction (LD) and the second transversal direction (TD2). 5
8. The connector according to claim 7, wherein the spring portion (33) has substantially a serpentine shape. 10
9. A connector according to any one of claims 6-8, wherein the terminals (7) are placed side by side in a row along the second transversal direction (TD2). 15
10. A connection assembly comprising a cable (8) and a connector (1) according to any of the preceding claims. 20

Amended claims in accordance with Rule 86(2) EPC.

7. longitudinal connecting direction (LD) and the second transversal direction (TD2). 25
8. The connector according to claim 7, wherein the spring portion (33) has substantially a serpentine shape. 30
9. A connector according to any one of claims 6-8, wherein the terminals (7) are placed side by side in a row along the second transversal direction (TD2). 35
10. A connector according to any one of claims 1-9, wherein the embossment (60a, 60b) defines a recess receiving the electrically insulating body (5) so that said body is at least partially covered by the embossment (60a, 60b). 40
11. A connection assembly comprising a cable (8) and a connector (1) according to any of the preceding claims. 45

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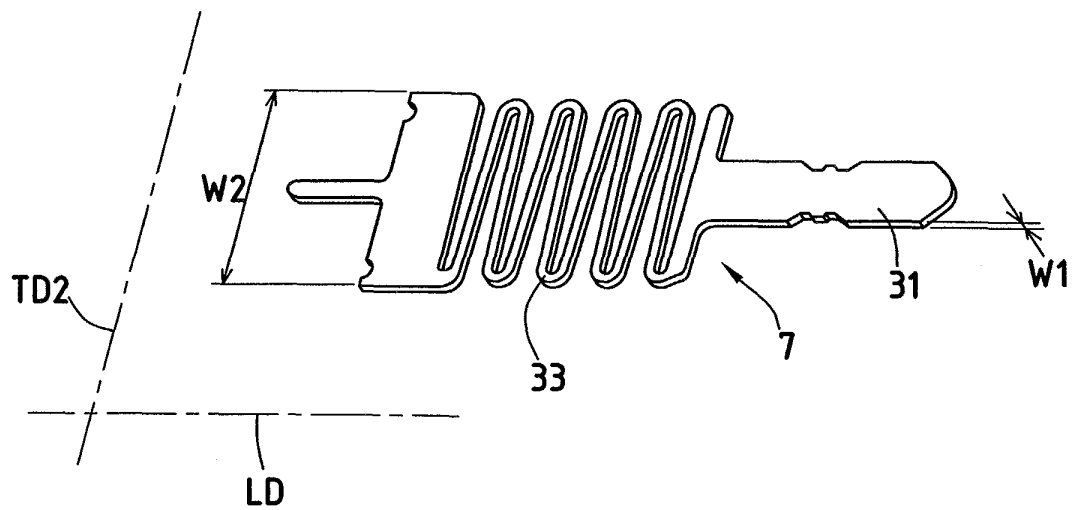
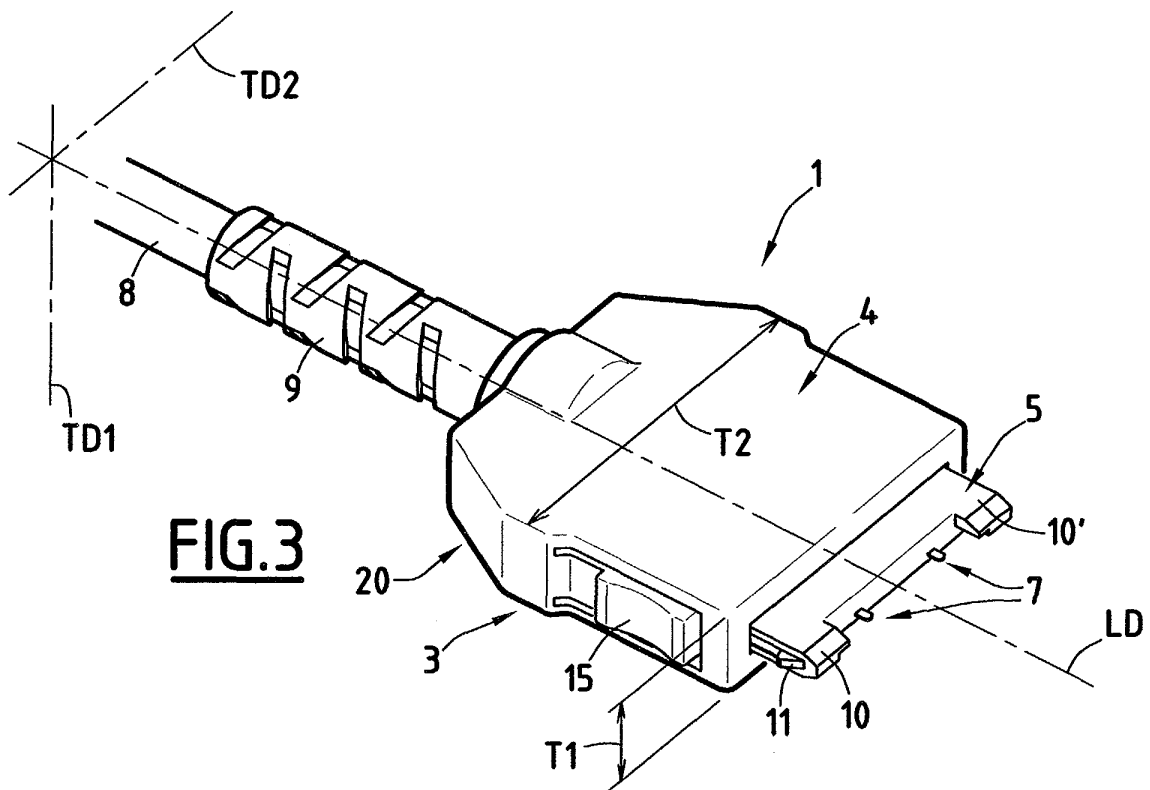


FIG.4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 29 0401

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)
A	EP 0 473 063 A (LABINAL COMPONENTS & SYSTEMS) 4 March 1992 (1992-03-04) * column 4, line 15 - column 6, line 12; figures 1,10 *	1-5,10	H01R13/658 H01R13/24
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Berlin		23 July 2004	Stirn, J-P
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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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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