



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 326 310 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

09.07.2003 Bulletin 2003/28

(51) Int Cl.7: **H01R 27/00, H01R 13/642**

(21) Application number: **02257504.7**

(22) Date of filing: **29.10.2002**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: **27.12.2001 JP 2001396888**

(71) Applicants:

- **Pioneer Corporation**
Meguro-ku, Tokyo (JP)
- **Tohoku Pioneer Corporation**
Tendo-shi, Yamagata-ken (JP)

(72) Inventors:

- **Hayasaka, Shinichi,**
c/o Tohoku Pioneer Corporation
Tendo-shi, Yamagata-ken (JP)
- **Kobayashi, Hiroyuki**
c/o Tohoku Pioneer Corporation
Tendo-shi, Yamagata-ken (JP)

(74) Representative: **Haley, Stephen**

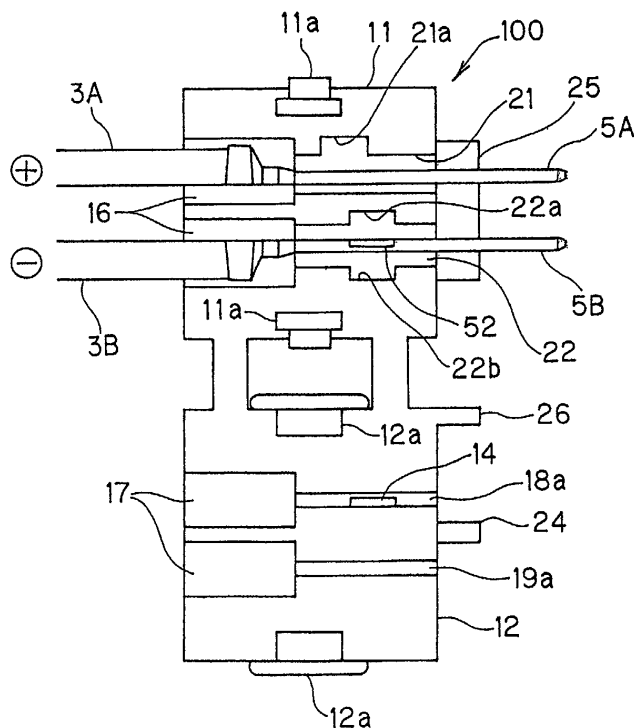
Gill Jennings & Every,
Broadgate House,
7 Eldon Street
London EC2M 7LH (GB)

(54) **Electric connector**

(57) An electric connector, which is connectable to a counter-connector, comprises a main body (1); and terminals (5A, 5B) disposed in the main body (1). The

main body (1) has, for each of the terminals (5A, 5B), a plurality of mounting portions for supporting the terminal (5A or 5B). The terminal (5A or 5B) is placed in any one of the plurality of mounting portions.

FIG. 2



EP 1 326 310 A1

Description

[0001] The present invention relates an electric connector, which is connectable to any one of a plurality of counter-connectors having different configurations from each other.

[0002] Some different standards may be applied to a certain kind of apparatus, with the result that there may be used different kinds of connectors that have been manufactured by different manufacturers in accordance with the different standards. For instance, connection terminals for car audio systems are different from each other, depending upon the type of a car in a region. It may be necessary to attach a specific connector, which is exclusively used for a certain type of a car, when selling a speaker system, for example.

[0003] However, it is troublesome for a user to select, when buying a speaker system, a product provided with suitable connectors for the type of a car. A cost of the product also increases.

[0004] An object of the present invention is therefore to provide an electric connector, which is commonly connectable to any one of a plurality of counter-connectors, which have different configurations from each other.

[0005] In order to attain the aforementioned object, an electric connector according to the first aspect of the present invention, which is connectable to a counter-connector, comprises:

a main body; and
terminals disposed in said main body,

characterized in that

said main body has, for each of said terminals, a plurality of mounting portions for supporting the terminal, and said terminal being placed in any one of said plurality of mounting portions.

[0006] According to the first aspect of the present invention, the terminal can be placed in any one of the mounting portions so as to make the mounting position of the terminal changeable. It is therefore possible to connect the electric connector of the present invention to any one of a plurality of counter-connectors having different configurations from each other.

[0007] In the second aspect of the present invention, each of said terminals may be a male-terminal.

[0008] In the third aspect of the present invention, there may be adopted optional features that said male-terminal comprises a flat plate-shaped terminal having a rectangular cross section; and said plurality of mounting portions for each of said terminals comprise a first mounting portion and a second mounting portion, each of said first and second mounting portions including a groove having a cross section matching with said rectangular cross section of said flat plate-shaped terminal, a long side portion of said groove of said first mounting

portion intersecting a long side portion of said groove of said second mounting portion at right angles. According to the third aspect of the present invention, it is possible to place horizontally or vertically the flat plate-shaped terminal on the main body.

[0009] In the fourth aspect of the present invention, there may be adopted an optional feature that said main body comprises a first block and a second block connected to said first block so as to be openable and closable, each of said terminals being selectively and detachably placed in any one of said plurality of mounting portions so as to make mounting positions of said terminals changeable, when said second block is placed in an opened position, and each of said terminals is held stationarily in any one of said plurality of mounting portions, when said second block is placed in a closed position. According to the fourth aspect of the present invention, it is possible to change easily the mounting position of the terminal by opening the second block.

[0010] In the fifth aspect of the present invention, there may be adopted an optional feature that said main body includes a means for preventing said electric connector from being connected to said counter-connector in an improper positional relationship of said electric connector relative to said counter-connector. According to the fifth aspect of the present invention, it is possible to prevent the electric connector from being connected to the counter-connector in the improper positional relationship of the former relative to the latter.

FIG. 1 is a side view illustrating an electric connector of the embodiment of the present invention, which serves as the first type of gender changer;

FIG. 2 is a plan view illustrating the electric connector as shown in FIG. 1, in which the second block is kept in the opened position;

FIG. 3 is a side view illustrating the electric connector of the embodiment of the present invention, which serves as the second type of gender changer; FIG. 4 is a plan view illustrating the electric connector as shown in FIG. 3, in which the second block is kept in the opened position;

FIG. 5 is a plan view illustrating terminals of the electric connector of the present invention;

FIGS. 6(a), 6(b) and 6(c) are side views of counter-connectors, respectively, any one of which can be connected to the electric connector of the present invention; and

FIGS. 7(a), 7(b) and 7(c) are perspective views of the counter-connectors as shown in FIGS. 6(a), 6(b) and 6(c), respectively.

[0011] Now, an electric connector of an embodiment of the present invention will be described in detail below with reference to FIGS. 1 to 7(c). In the embodiment of the present invention, the electric connector of the present invention is used for connection of a car audio system.

[0012] FIG. 1 is a side view illustrating the electric connector of the embodiment of the present invention, which serves as the first type of gender changer; FIG. 2 is a plan view illustrating the electric connector as shown in FIG. 1, in which the second block is kept in the opened position; FIG. 3 is a side view illustrating the electric connector of the embodiment of the present invention, which serves as the second type of gender changer; FIG. 4 is a plan view illustrating the electric connector as shown in FIG. 3, in which the second block is kept in the opened position; FIG. 5 is a plan view illustrating terminals of the electric connector of the present invention; FIGS. 6(a), 6(b) and 6(c) are side views of counter-connectors, respectively, any one of which can be connected to the electric connector of the present invention; and FIGS. 7(a), 7(b) and 7(c) are perspective views of the counter-connectors as shown in FIGS. 6(a), 6(b) and 6(c), respectively.

[0013] The electric connector 100, which serves as the gender changer, includes a main body, i.e., a housing 1 formed of synthetic resin and a pair of terminals 5A, 5B, as shown in FIGS. 1 to 4. Each of the terminals 5A, 5B is a flat plate-shaped terminal having a rectangular cross-section. The terminals 5A and 5B are connected to lead wires 3A and 3B, respectively, through a swaging connection. The lead wires 3A and 3B are connected to positive and negative terminals of a loudspeaker (not shown).

[0014] The housing 1 is composed of two blocks, i.e., the first block 11 and the second block 12, which is connected to the first block 11 so as to be openable and closable. The first block 11 is provided on its opposite sides with a pair of engaging projections 11a, 11a. The second block 12 is provided on its corresponding opposite sides with a pair of engaging recesses 12a, 12a. Engagement of the engaging projections 11a, 11a with the engaging recesses 12a, 12a keeps the second block 12 in the closed position. In such a closed position, the terminals 5A, 5B are held stationarily between the first block 11 and the second block 12.

[0015] In the embodiment of the present invention, each of the terminals 5A, 5B can be held not only in the first position in which the long side of the cross section of each of the terminals 5A, 5B extend along the vertical direction as shown in FIG. 1, but also in the second position in which the long side thereof extend along the horizontal direction as shown in FIG. 3.

[0016] FIG. 1 illustrates the first position in which the terminals 5A, 5B are held in the housing 1 so that the long side of the cross section of the terminal 5A faces the long side of the cross section of the terminal 5B. FIG. 2 illustrates the second block 12 is kept in the opened position. The housing 1 has, for each of the terminals 5A, 5B, the first and second mounting portions. Each of the first and second mounting portions includes a groove having a cross section matching with the rectangular cross section of the flat plate-shaped terminal 5A or 5B. The long side portion of the groove 21 or 22 of

the first mounting portion intersects the long side portion of the groove 18a and 18b, or 19a and 19b of the second mounting portion at right angles.

[0017] More specifically, the first mounting portion into which the terminal 5B is to be fitted, is composed of an upper half vertically extending groove 18a formed in the second block 12 and a lower half vertically extending groove 18b formed in the first block 11, as is clear from FIG. 3. The first mounting portion into which the terminal 5A is to be fitted, is also composed of an upper half vertically extending groove 19a formed in the second block 12 and a lower half vertically extending groove 19b formed in the first block 11, as is clear from the same figure.

[0018] The second mounting portion in which the terminal 5B is to be fitted, is composed of a horizontally extending groove 22 formed in the first block 11, as is clear from FIG. 1. The second mounting portion in which the terminal 5A is to be fitted, is also composed of a horizontally extending groove 21 formed in the first block 11, as is clear from the same figure.

[0019] As shown in FIG. 5, the terminal 5A has a single projection 51 and the terminal 5B has a pair of opposite projections 52, 53. The horizontally extending groove 21 of the first block 11 has a recess 21a (see FIG. 2) into which the above-mentioned projection 51 of the terminal 5A can be fitted as shown in FIG. 4. The horizontally extending groove 22 of the first block 11 has a pair of opposite recesses 22a, 22b (see FIG. 2) into which the above-mentioned opposite projections 52, 53 of the terminal 5B can be fitted as shown in FIG. 4. In addition, the lower half vertically extending groove 19b of the first block 11 has a recess (not shown) into which the above-mentioned projection 51 of the terminal 5A can be fitted. The upper half vertically extending groove 18a of the second block 12 has a recess 14 (see FIG. 2) into which the above-mentioned projection 52 of the terminal 5B can be fitted, and the lower half vertically extending groove 18b of the first block 11 has a recess (not shown) into which the above-mentioned projection 53 of the terminal 5B can be fitted. Such a structure makes it possible to fit the terminals 5A, 5B in their predetermined positions, respectively, thus preventing the terminals 5A, 5B from being wrongly mounted on the housing 1.

[0020] In addition, the first block 11 has recesses 16, 16, which communicate with both of the horizontally extending groove 21 and the lower half vertically extending groove 19b, and both of the horizontally extending groove 22 and the lower half vertically extending groove 18b, respectively, as shown in FIG. 2. The second block 12 also has corresponding recesses 17, 17, which communicate with the upper half vertically extending grooves 18a and 19a, respectively, as shown in FIG. 2. The recesses 16 and 16 of the first block 11 receive the lead wires 3A and 3B, in cooperation with the recesses 17 and 17 of the second block 12.

[0021] Further, the second block 12 has projections

24 and 26, which project in parallel to the projecting direction of the terminals 5A, 5B. The first block 11 has a projection 25, which projects in parallel to the above-mentioned projections 24 and 26. The projections 24, 25 and 26 serve as the means for preventing the electric connector 100 from being connected to the first to third counter-connectors 200, 300 and 400 as shown in FIGS. 7(a) to 7(c) in an improper positional relationship of the electric connector 100 relative thereto, respectively. The function of the projections 24, 25 and 26 will be described later.

[0022] In the first position as shown in FIG. 1, the terminals 5A and 5B are held in their respective first mounting portions, i.e., the upper and lower half vertically extending grooves 19a, 19b, and the upper and lower half vertically extending grooves 18a, 18b, respectively, so that the long side of the cross section of the terminal 5A faces the long side of the cross section of the terminal 5B. In the above-mentioned first position, the projection 51 of the terminal 5A is fitted into the above-described recess (not shown) of the first block 11, on the one hand, and the projections 52, 53 of the terminal 5B are fitted into the recess 14 of the second block 12 and the above-described recess (not shown) of the first block 11, respectively, on the other hand.

[0023] FIG. 3 illustrates the second position in which the terminals 5A, 5B are held in the housing 1 so that the short side of the cross section of the terminal 5A faces the short side of the cross section of the terminal 5B. FIG. 3 illustrates the second block 12 is kept in the opened position. In the above-mentioned second position, the projection 51 of the terminal 5A is fitted into the above-described recess 21a of the first block 11, on the one hand, and the projections 52, 53 of the terminal 5B are fitted into the recesses 22a, 22b of the first block 11, on the other hand.

[0024] The electric connector 100 of the above-described embodiment of the present invention can be connected to any one of counter-connectors 200, 300 and 400 as shown in FIGS. 7(a) to 7(c), respectively. Each of the first to third counter-connectors 200, 300 and 400 is provided with connection terminals (not shown), to which lead wires 7, 7 are connected, as shown in FIGS. 7(a) to 7(c). The lead wire 7, 7 are connected to an output unit of an amplifier of an audio system, which is to be mounted on a car. When the electric connector 100 of the present invention is connected to any one of the first to third counter-connectors 200, 300 and 400, the terminals 5A, 5B of the electric connector 100 come into contact with the connection terminals of any one of the first to third counter-connectors 200, 300 and 400 so that output terminals of the above-mentioned amplifier are connected to the terminals of the loudspeaker.

[0025] The electric connector 100 of the present invention, in which the terminals 5A, 5B are held in the first position so that the long side of the cross section of the terminal 5A faces the long side of the cross section

of the terminal 5B as shown in FIGS. 1 and 2, can be connected to the first counter-connector 200 as shown in FIGS. 6(a) and 7(a). FIG. 6(a) is a side view of the first counter-connector 200, which is placed in the normal position relative to the electric connector 100 of the present invention as shown in FIG. 1. The electric connector 100 of the present invention can be connected to the first counter-connector 200 in such a proper positional relationship of the former relative to the latter. However, in the improper positional relationship thereof, for example in case where the first counter-connector 200 is turned by 180 degree from the state as shown in FIG. 6(a), the projection 24 (see FIGS. 1 to 4) formed on the housing 1 comes into contact with the end surface of the first counter-connector 200, thus disabling the electric connector 100 of the present invention from being connected to the first counter-connector 200. It is therefore possible to prevent reliably the electric connector 100 from wrongly connected to the first counter-connector 200 in the improper positional relationship (i.e., preventing the positive and negative terminals of the electric connector 100 from being wrongly connected to the negative and positive terminals of the first counter-connector 200, respectively).

[0026] The electric connector 100 of the present invention, in which the terminals 5A, 5B are held in the first position so that the short side of the cross section of the terminal 5A faces the short side of the cross section of the terminal 5B as shown in FIGS. 3 and 4, can be connected to any one of the second counter-connector 300 as shown in FIGS. 6(b) and 7(b) and the third counter-connector 400 as shown in FIGS. 6(c) and 7(c). FIG. 6(b) is a side view of the second counter-connector 200, which is placed in the normal position relative to the electric connector 100 of the present invention as shown in FIG. 1. The electric connector 100 of the present invention can be connected to the second counter-connector 300 in such a proper positional relationship of the former relative to the latter. FIG. 6(c) is a side view of the third counter-connector 400, which is placed in the normal position relative to the electric connector 100 of the present invention as shown in FIG. 1. The electric connector 100 of the present invention can also be connected to the third counter-connector 400 in such a proper positional relationship of the former relative to the latter.

[0027] However, in the improper positional relationship, for example in case where the second counter-connector 300 is turned by 180 degree from the state as shown in FIG. 6(b), the projection 25 (see FIGS. 1 to 4) formed on the housing 1 comes into contact with the end surface of the second counter-connector 300, thus disabling the electric connector 100 of the present invention from being connected to the second counter-connector 300. It is therefore possible to prevent reliably the electric connector 100 from wrongly connected to the second counter-connector 300 in the improper positional relationship (i.e., preventing the positive and

negative terminals of the electric connector 100 from being wrongly connected to the negative and positive terminals of the second counter-connector 300, respectively).

[0028] In the improper positional relationship, for example in case where the third counter-connector 400 is turned by 180 degree from the state as shown in FIG. 6 (c), the projection 26 (see FIGS. 1 to 4) formed on the housing 1 comes into contact with the end surface of the third counter-connector 400, thus disabling the electric connector 100 of the present invention from being connected to the third counter-connector 400. It is therefore possible to prevent reliably the electric connector 100 from wrongly connected to the third counter-connector 400 in the improper positional relationship (i.e., preventing the positive and negative terminals of the electric connector 100 from being wrongly connected to the negative and positive terminals of the third counter-connector 400, respectively).

[0029] According to the electric connector of the embodiment of the present invention, the electric connector 100 can be connected to any one of the first to third counter-connectors 200, 300 and 400, thus coping with a problem of compatibility with many counter-connectors, which are different from each other in accordance with types of a car. There is no need to provide many kinds of connectors corresponding to counter-connectors used in accordance with the types of a car. It is therefore possible for a user to apply the speaker system to any one of many types of a car, utilizing the electric connector of the present invention, which is connectable to any one of the counter-connectors that are used exclusively for many types of a car.

[0030] The housing 1 of the electric connector 100 rejects insertion of any one of the first to third counter-connectors 200, 300 and 400 therein in the improper positional relationship of the electric connector 100 relative to any one of these counter-connectors. It is therefore possible to prevent the electric connector 100 from being wrongly connected to any one of the first to third counter-connectors 200, 300 and 400.

[0031] In the above-described embodiment of the present invention, the present invention is applied to the male connector with the male-terminals, which is connectable to any one of the female connectors, i.e., the first to third counter-connectors 200, 300 and 400. The present invention may be applied to a female connector, which is connectable to any one of male connectors.

Claims

1. An electric connector, which is connectable to a counter-connector, comprising:

a main body (1); and
terminals (5A, 5B) disposed in said main body (1),

characterized in that

said main body (1) has, for each of said terminals (5A, 5B), a plurality of mounting portions for supporting the terminal (5A or 5B), and said terminal (5A or 5B) being placed in any one of said plurality of mounting portions.

2. The electric connector as claimed in Claim 1, **characterized in that:**

each of said terminals (5A, 5B) is a male-terminal.

3. The electric connector as claimed in Claim 2, **characterized in that:**

said male-terminal comprises a flat plate-shaped terminal having a rectangular cross section; and

said plurality of mounting portions for each of said terminals (5A, 5B) comprise a first mounting portion and a second mounting portion, each of said first and second mounting portions including a groove having a cross section matching with said rectangular cross section of said flat plate-shaped terminal, a long side portion of said groove (21, 22) of said first mounting portion intersecting a long side portion of said groove (18a and 18b, 19a and 19b) of said second mounting portion at right angles.

4. The electric connector as claimed in any one of Claims 1 to 3, **characterized in that:**

said main body (1) comprises a first block (11) and a second block (12) connected to said first block (11) so as to be openable and closable, each of said terminals (5A, 5B) being selectively and detachably placed in any one of said plurality of mounting portions so as to make mounting positions of said terminals (5A, 5B) changeable, when said second block (12) is placed in an opened position, and each of said terminals (5A, 5B) is held stationarily in any one of said plurality of mounting portions, when said second block (12) is placed in a closed position.

5. The electric connector as claimed in any one of Claims 1 to 4, **characterized in that:**

said main body (1) includes a means (24, 25, 26) for preventing said electric connector from being connected to said counter-connector in an improper positional relationship of said electric connector relative to said counter-connector.

FIG. 1

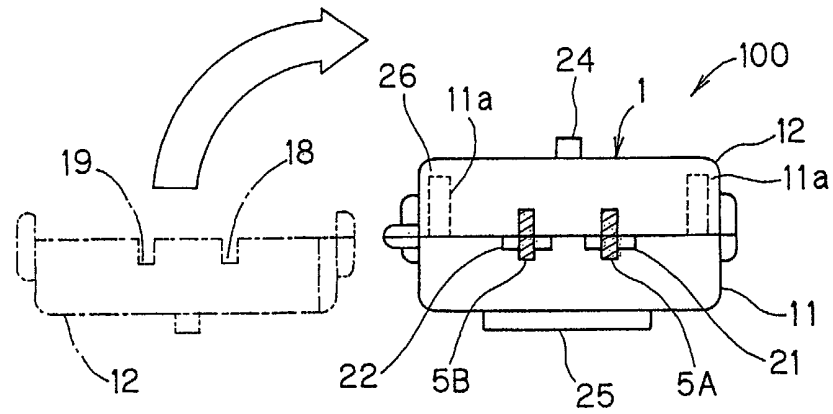


FIG. 2

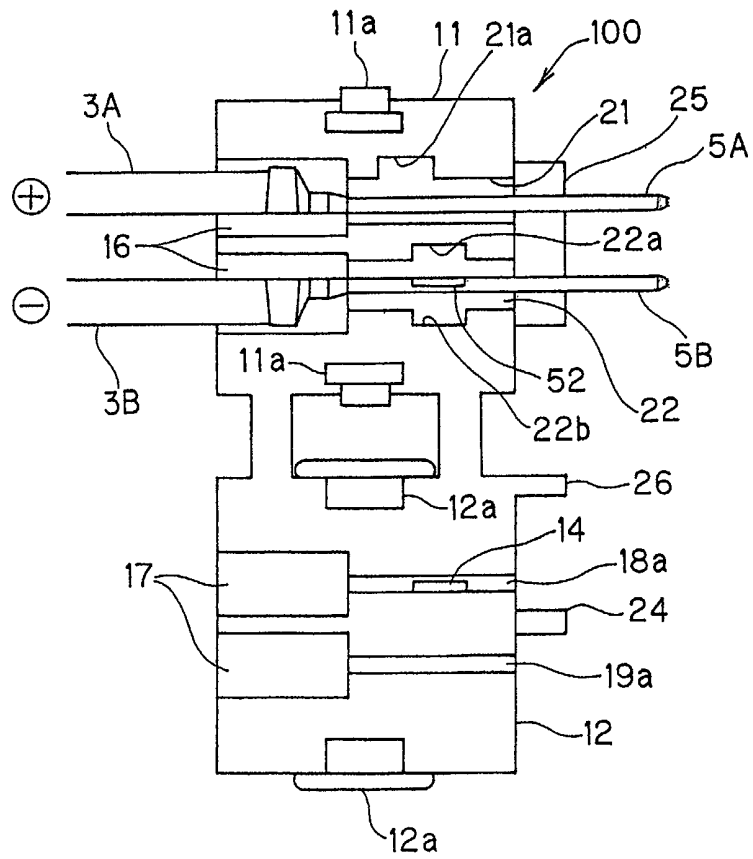


FIG. 3

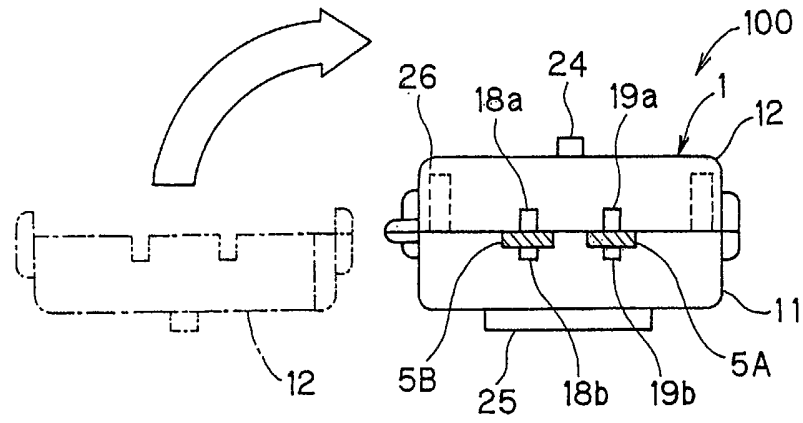


FIG. 4

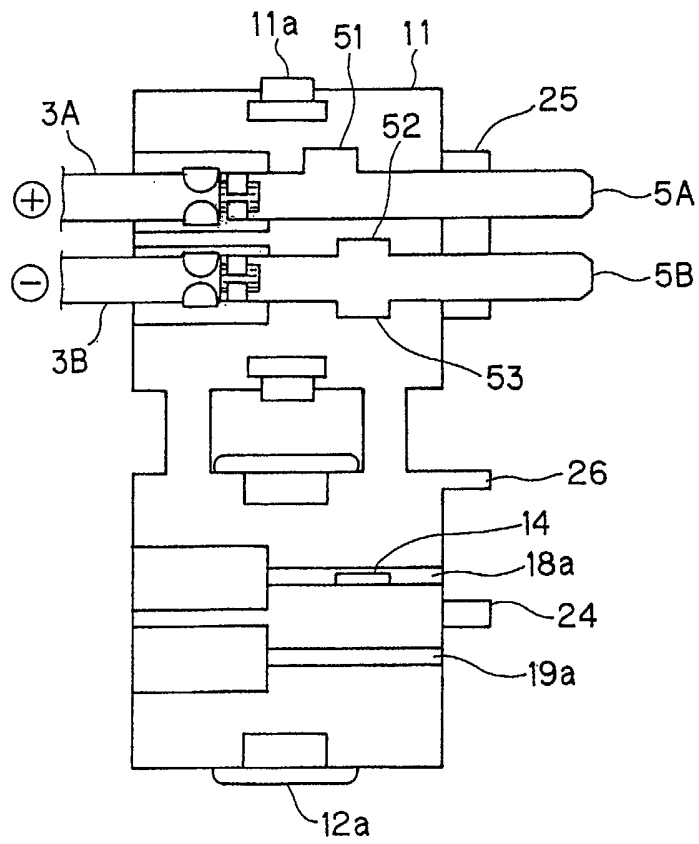


FIG. 5

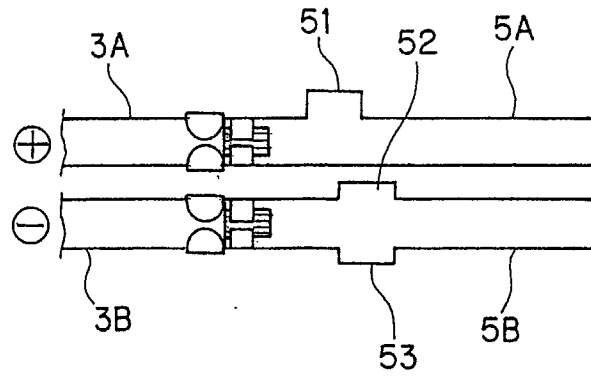


FIG. 6 (b)

FIG. 6 (a)

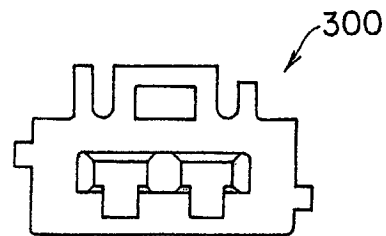
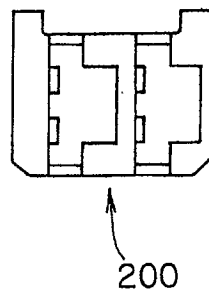


FIG. 6 (c)

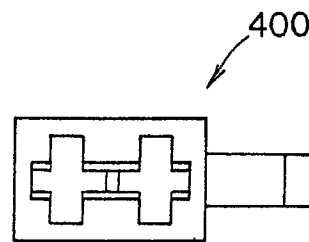


FIG. 7(a)

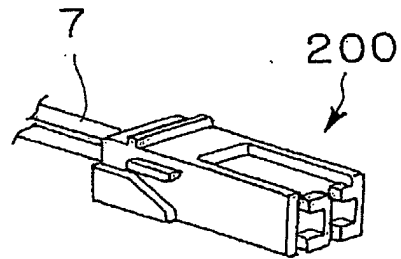


FIG. 7(b)

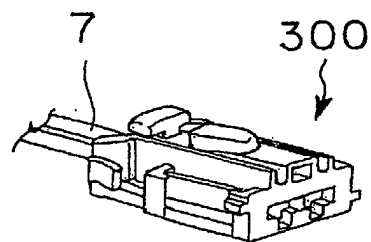
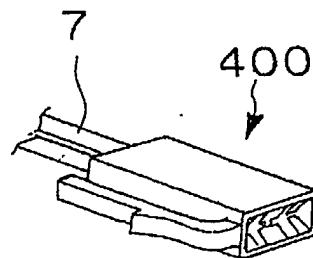


FIG. 7(c)





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 7504

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)
X	US 2 930 019 A (HARVEY HUBBELL) 22 March 1960 (1960-03-22)	1,2,5	H01R27/00 H01R13/642
Y	* column 2, line 36 - column 2, line 47 * * column 5, line 3 - column 7, line 4; figures 1,8,9,15-18,20-25 *	3,4	
X	DE 66 10 688 U (GEBR. BERKER, ALBRECHT JUNG) 7 August 1975 (1975-08-07)	1,2	
A	* page 4, line 1 - page 4, line 18; figures 1-6 *	3,4	
X	US 2 097 257 A (SCHANK ARTHUR W) 26 October 1937 (1937-10-26)	1,2	
	* page 1, column 1, line 1 - page 1, column 1, line 15; figures 1,3-5 *		
Y	US 5 938 459 A (CHEN LI S S ET AL) 17 August 1999 (1999-08-17)	3	
	* column 1, line 20 - column 1, line 43; figures 1-4E *		
Y	US 6 126 462 A (LAM SIU LING) 3 October 2000 (2000-10-03)	4	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R
	* column 2, line 64 - column 3, line 6 * * column 3, line 18 - column 3, line 57 * * column 4, line 28 - column 4, line 31; figures 1-10B,16A-16C *		
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 31 March 2003	Examiner Ledoux, S
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			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 25 7504

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-03-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2930019	A	22-03-1960	NONE	
DE 6610688	U	07-08-1975	NONE	
US 2097257	A	26-10-1937	NONE	
US 5938459	A	17-08-1999	NONE	
US 6126462	A	03-10-2000	DE 29909076 U1	29-07-1999