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

(11) EP 1 306 932 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.05.2003 Bulletin 2003/18

(51) Int Cl.[7]: **H01R 13/629**

(21) Application number: **02079180.2**

(22) Date of filing: **09.10.2002**

(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: **29.10.2001 GB 0125853**

(71) Applicant: **Delphi Technologies, Inc.**
Troy, MI 48007 (US)

(72) Inventors:
- **Condelli, Ubaldo**
  10153 Torino (IT)
- **Massola, Paolo**
  10051 Collogno (IT)

(74) Representative: **Denton, Michael John**
Delphi Automotive Systems,
Centre Technique Paris,
117, avenue des Nations,
B.P. 60059
95972 Roissy Charles de Gaulle Cédex (FR)

(54) Two-part electrical connector with camming system

(57) A two-part electrical connector comprising a first part (112) and a second part (114) which can be mated together in an axial direction;

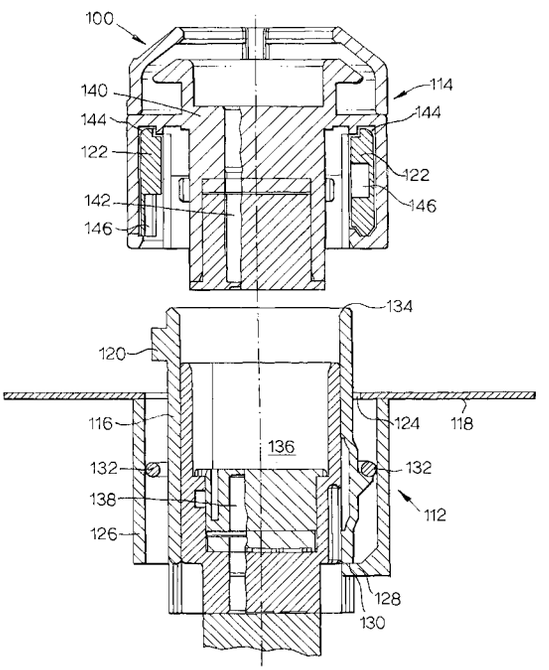
the first part including a fixed tubular housing (126) securable to a panel (118); a terminal housing (116) retained in the fixed housing and extendable in the axial direction through an aperture (124) in the panel, the terminal housing having an outer end (134) for mating with the second part, a number of outwardly directed radially extending tabs (120) positioned adjacent the outer end on opposed sides of the terminal housing; and a number of electrical terminals (138) secured in the terminal housing;

the second part including a connector housing (140); a number of electrical terminals (142) secured in the connector housing and mateable with the electrical terminals of the first part; a pair of channels (144) formed in the connector housing on opposed sides thereof extending in a direction substantially perpendicular to the axial direction; a slide member (122) positioned in each channel and slidable in the channel relative to the connector housing, each slide member having an angled groove (146) formed therein for receiving one of the tabs of the terminal housing of the first part, whereby movement of the slide members relative to the connector housing of the second part causing the second part to mate with, or unmate from, the first part;

wherein the terminal housing (116) of the first part (112) is movable in the axial direction relative to the fixed housing (126); wherein biasing means (132) biases the terminal housing into the fixed housing; and wherein, on mating, the terminal housing moves relative to the fixed housing against the biasing force of the biasing means.

The electrical connector is for use where space (height) restrictions are an issue.

Fig.3.



EP 1 306 932 A1

Description

Technical Field

[0001] The present invention relates to a two-part electrical connector.

Background of the Invention

[0002] Two-part electrical connectors in which slide members are used to mate the two parts are well known. In general, the first part is secured in a panel and has a fixed terminal housing which protrudes a predetermined height away from the panel. The terminal housing has tabs which protrude therefrom. The second part, which contains the slide members, is positioned over the first part. For mating, the slide members are pushed, and the tabs engage in angled grooves in the slide members to pull the two parts together. In certain locations, the combined height of the second part and the terminal housing of the first part away from the panel, prior to mating, can be a critical issue.

Summary of the Invention

[0003] It is an object of the present invention to provide a two-part electrical connector in which the combined height, as specified above, prior to mating is reduced compared to prior art arrangements.

[0004] A two-part electrical connector in accordance with the present invention is characterised by the features specified in Claim 1.

[0005] In the present invention, the terminal housing of the first part, on which the tabs are mounted, is spring-loaded and movable in the mating direction. When the two parts are unmated, the terminal housing is retracted, reducing the height of the terminal housing away from the panel. On mating, the terminal housing is moved against the action of the spring loading. With this arrangement, the combined height of the second part and the terminal housing of the first part away from the panel, prior to mating, is smaller the equivalent height of the prior art arrangements.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a side view of a prior art two-part electrical connector prior to mating of the two parts;
Figure 2 is a side view of a two-part electrical connector in accordance with the present invention prior to mating of the two parts;
Figure 3 is a cross-sectional view, from one end, of the two-part electrical connector of Figure 2 before the two parts are brought together for mating;
Figure 4 is a cross-sectional view of the two-part electrical connector as shown in Figure 3 prior to mating (left-side) and when mated (right-side); and
Figure 5 is a perspective view of one of the slide members of the second part of the electrical connector of Figure 2.

Description of the Preferred Embodiment

[0007] Referring to Figure 1, the prior art two-part electrical connector 10 comprises a first part 12 and a second part 14. The first part 12 includes a terminal housing 16, and is mounted on a panel 18. The terminal housing 16 is fixed and includes protruding tabs 20. The second part 14 includes slide members 22 which have angled grooves (not shown) for association with the tabs 20. In order to mate the two parts 12,14, the second part 14 is positioned over the terminal housing 16 of the first part 12, the tabs 20 enter corresponding angled grooves in the slide members 22, and the slide members are pushed. Such action mates the two parts 12, 14, and mates electrical terminals (not shown) mounted in each part. As shown in Figure 1, the second part 14 and the terminal housing 16 of the first part 12 away from the panel, prior to mating, have a combined height X.

[0008] In comparison, Figure 2 shows a two-part electrical connector 100 in accordance with the present invention. The two-part connector 100 comprises a first part 112 and a second part 114. The second part 114 is substantially unchanged from the prior art second part 14. The first part 112, however, includes a terminal housing 116 which is movable in the mating direction. The terminal housing 116 includes protruding tabs 120 which are engageable in angled grooves in the slide members 122 of the second part 114, as detailed below. The terminal housing 116 is biased inwardly in the unmated position, also as detailed below, thereby reducing the height of the terminal housing away from the panel 118. As a consequence, the combined height Y of the second part 114 and the terminal housing 116 of the first part 112 is significantly reduced compared to the prior art.

[0009] Referring to Figure 3, the first part 112 of the two-part electrical connector 100 is mounted to extend through an aperture 124 in the panel 118. The first part 112 includes a fixed tubular housing 126 which is secured to the panel 118, and which includes an inturned lip 128 at the axial end remote from the panel. The terminal housing 116 is positioned inside the fixed housing 126 and extends through the aperture 124 in the panel 118 in an axial direction (the mating direction). The terminal housing 116 has a stop edge 130 which is engageable with the inturned lip 128 of the fixed housing 126. A spring 132 positioned between the fixed housing 126 and the terminal housing 116 act on the terminal housing to bias the stop edge 130 into engagement with the inturned lip 128, when the first part 112 is not mated with the second part 114. The terminal housing 116 has four tabs 120, two on opposed sides, which project radially

outwards from the terminal housing. The tabs 120 are located adjacent the outer end 134 of the terminal housing 116. The terminal housing 116 defines a bore 136 which opens through, and axially extends from, the outer end 134 thereof. Located and secured inside the bore 136 of the terminal housing 116 are a number of electrical terminals 138.

[0010] The second part 114 of the two-part electrical connector 100 includes a connector housing 140. A number of electrical terminals 142 are located and secured in the connector housing 140 which are mateable with the electrical terminals 138 of the first part 112. A pair of channels 144 is formed in the connector housing 140 on opposed sides thereof. The channels 144 extend in a direction substantially perpendicular to the axial direction. A slide member 122 is positioned in each channel 144. The slide members 122 are slideable in the channels 144 relative to the connector housing 140. Each slide member 122 has a pair of angled grooves 146 (Figure 5) formed therein which are open at one end 148, and closed at the other end 150.

[0011] At the start of mating of the first part 112 with the second part 114, each tab 120 on the terminal housing 116 passes through the open end 148 of a respective angled groove 146 to enter the groove, as shown on the left-hand side of Figure 4. The slide members 122 are then pushed (slid) relative to the connector housing 140. The movement of the slide members 122 draws the tabs 120 along their respective grooves 146 until the tabs reach the closed end 150, at which point the first and second parts 112, 114 are fully mated, as shown on the right-hand side of Figure 4.

[0012] Because the terminal housing 116 is axially movable relative to the fixed housing 126, the movement of the tabs 120 along the grooves 146 during mating draws the terminal housing 116 out of the fixed housing against the bias of the spring 132, also as shown on the right-hand side of Figure 4, to bring the outer end 134 of the terminal housing into the connector housing 140. For unmating of the first and second parts 112, 114, the slide members 122 are moved in the opposite direction to push the tabs towards the open ends 148 of the grooves 146. During this action, the terminal housing 116 retracts under the bias of the spring 132 until the stop edge 130 engages the inturned lip 128.

[0013] The present invention therefor provides a two-part electrical connector 100 which is usable where height restrictions may be an issue.

Claims

1. A two-part electrical connector comprising a first part (112) and a second part (114) which can be mated together in an axial direction;

the first part including a fixed tubular housing (126) securable to a panel (118); a terminal housing (116) retained in the fixed housing and extendable in the axial direction through an aperture (124) in the panel, the terminal housing having an outer end (134) for mating with the second part, a number of outwardly directed radially extending tabs (120) positioned adjacent the outer end on opposed sides of the terminal housing; and a number of electrical terminals (138) secured in the terminal housing;

the second part including a connector housing (140); a number of electrical terminals (142) secured in the connector housing and mateable with the electrical terminals of the first part; a pair of channels (144) formed in the connector housing on opposed sides thereof extending in a direction substantially perpendicular to the axial direction; a slide member (122) positioned in each channel and slidable in the channel relative to the connector housing, each slide member having an angled groove (146) formed therein for receiving one of the tabs of the terminal housing of the first part, whereby movement of the slide members relative to the connector housing of the second part causing the second part to mate with, or unmate from, the first part;

characterised in that

the terminal housing (116) of the first part (112) is movable in the axial direction relative to the fixed housing (126);

by biasing means (132) biasing the terminal housing into the fixed housing;

and **in that**, on mating, the terminal housing moves relative to the fixed housing against the biasing force of the biasing means.

2. A two-part electrical connector as claimed in Claim 1, wherein the biasing means comprises a spring (132).

3. A two-part electrical connector as claimed in Claim 2, wherein the spring (132) is located between the fixed housing (126) and the terminal housing (116) of the first part (112).

4. A two-part electrical connector as claimed in any one of Claims 1 to 3, wherein the fixed housing (126) has an inturned lip (128), and wherein the terminal housing (116) has a stop edge (130) engaging the lip when the first and second parts are unmated.

5. A two-part electrical connector as claimed in any one of Claims 1 to 4, wherein the terminal housing (116) has an axially extending bore (136) opening through the outer end (134) thereof, the electrical terminals (138) of the first part (112) being located inside the bore.

Fig.2.

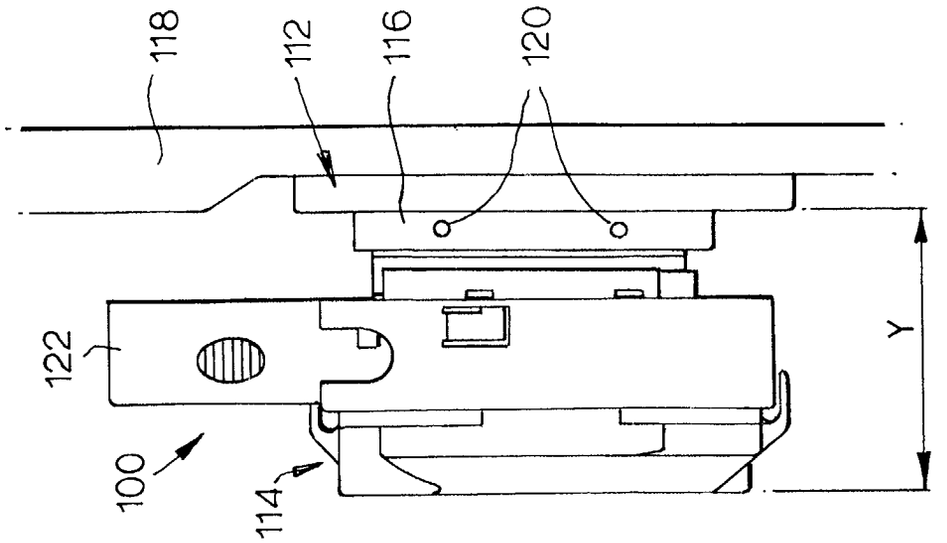


Fig.1. PRIOR ART.

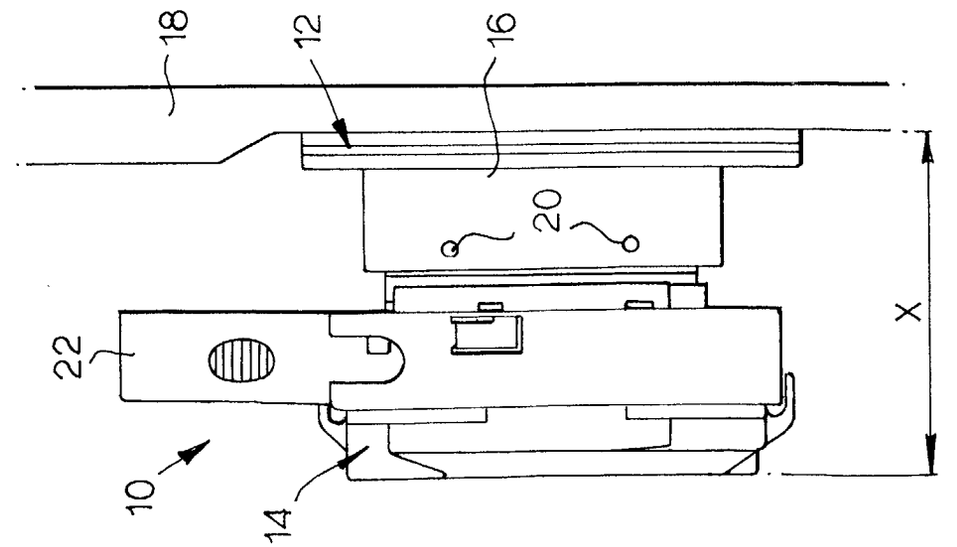


Fig.3.

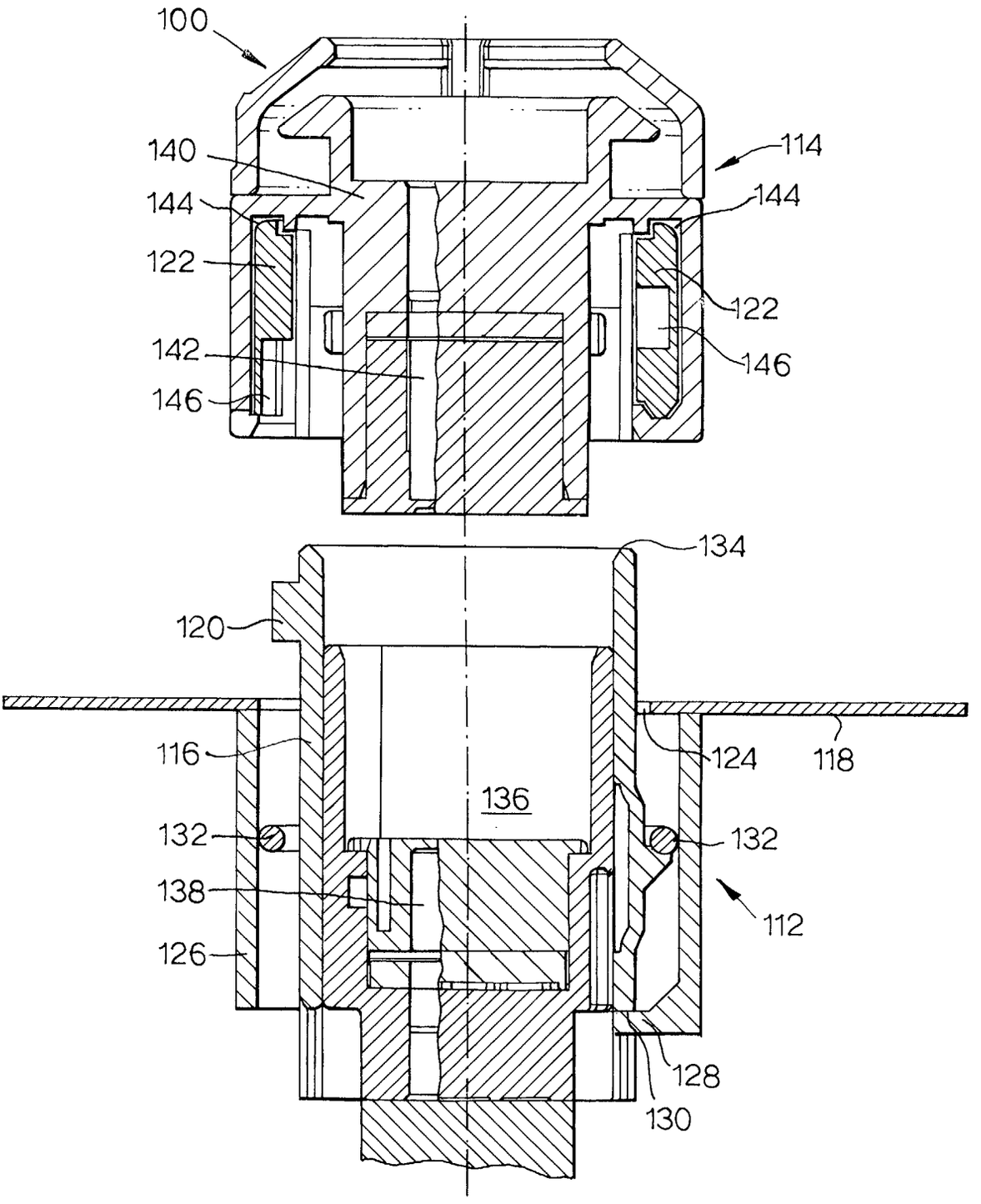

100
140
144
122
142
146
114
144
122
146
134
120
116
124
118
136
132
132
138
112
126
128
130

Fig.4.

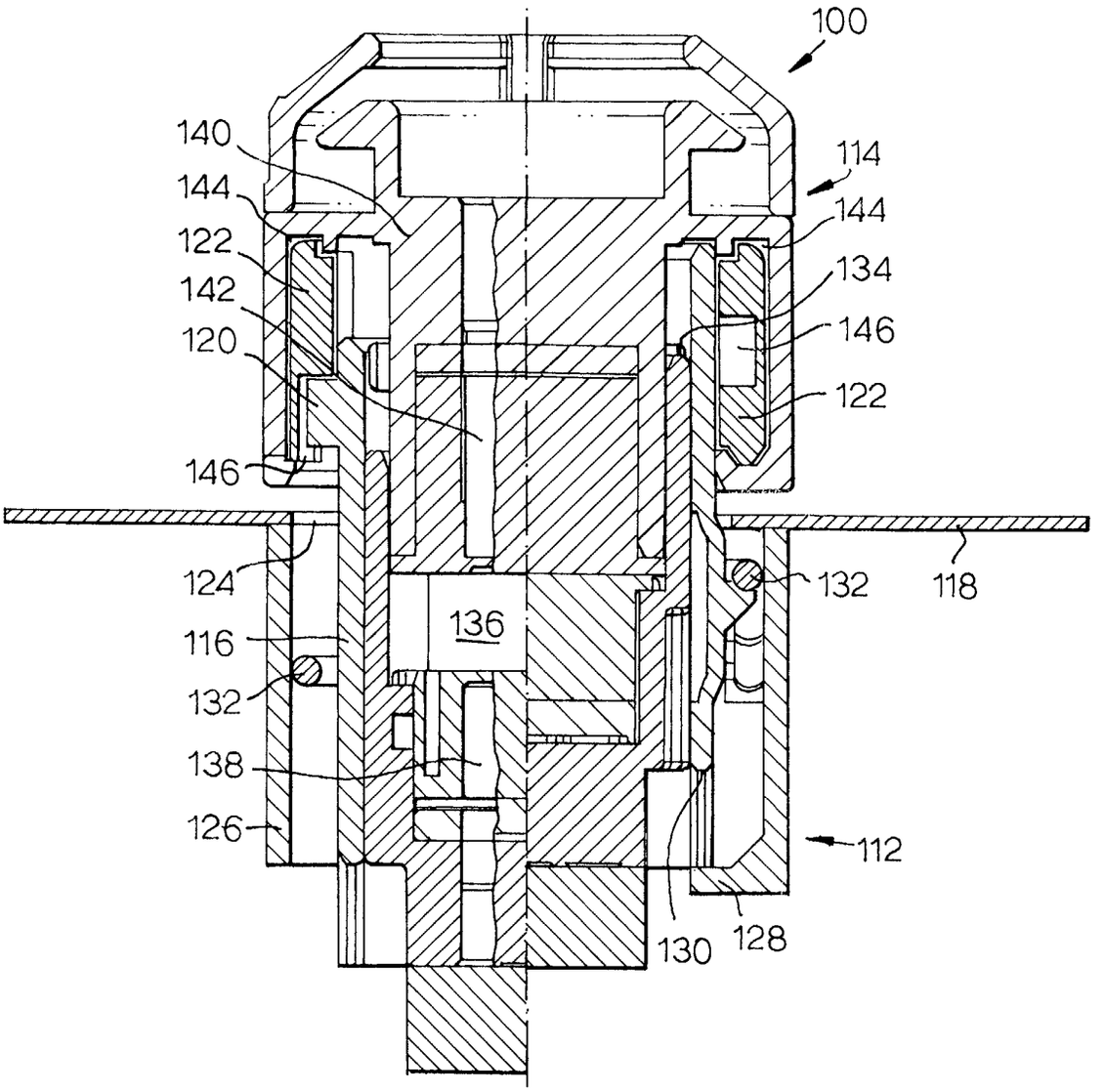
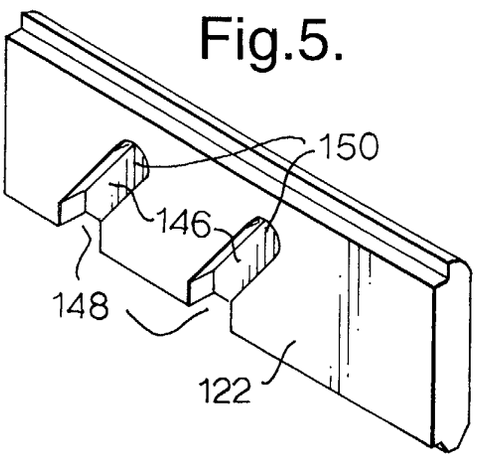

100
140
144
122
142
120
146
124
116
132
138
126
136
114
144
134
146
122
132
118
112
130
128

Fig.5.


150
146
148
122

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 9180

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	US 5 928 011 A (BAKKER JOHN HENRY ET AL) 27 July 1999 (1999-07-27) * column 3, line 1 - column 3, line 18; figure 5 *	1	H01R13/629
A	US 5 584 715 A (EHRENFELS ALFRED L) 17 December 1996 (1996-12-17) * column 6, line 61 - column 7, line 7 * * column 16, line 27 - column 16, line 41; figures 4,9 *	1	
A	US 5 957 707 A (KODAMA SHINJI) 28 September 1999 (1999-09-28) * column 3, line 20 - column 3, line 46 * * column 4, line 59 - column 4, line 65; figures 5,6 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	24 January 2003	Segerberg, T

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 07 9180

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.

24-01-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5928011 A	27-07-1999	NONE	
US 5584715 A	17-12-1996	CA 2146505 A1	29-10-1995
		US 5758414 A	02-06-1998
US 5957707 A	28-09-1999	JP 3117126 B2	11-12-2000
		JP 10074562 A	17-03-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82