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

(11) EP 1 100 156 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.05.2001 Bulletin 2001/20

(51) Int Cl.[7]: **H01R 13/436**

(21) Application number: **01101193.9**

(22) Date of filing: **02.06.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **04.06.1998 JP 15607598**
09.03.1999 JP 6196999

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
99109391.5 / 0 963 008

(71) Applicant: **Sumitomo Wiring Systems, Ltd.**
Yokkaichi-City, Mie, 510-8503 (JP)

(72) Inventors:
- **Ito, Osamu, Sumitomo Wiring Systems, Ltd.**
Yokkaichi-city, Mie 510-8503 (JP)
- **Ito, Mitsuru, Sumitomo Wiring Systems, Ltd.**
Yokkaichi-city, Mie 510-8503 (JP)

(74) Representative: **Müller-Boré & Partner Patentanwälte**
Grafinger Strasse 2
81671 München (DE)

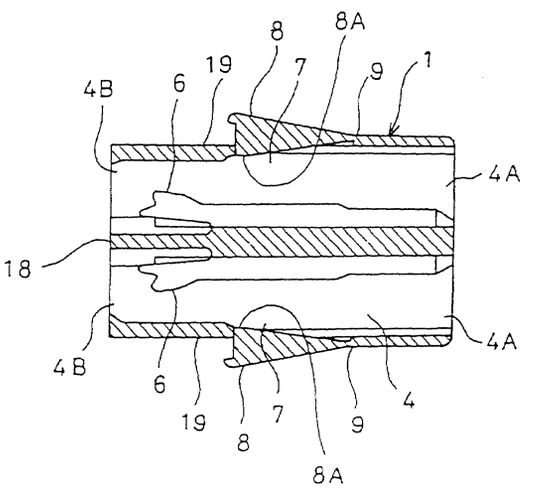
Remarks:
This application was filed on 24.01.2001 as a divisional application to the application mentioned under INID code 62.

(54) A connector and a connector assembly

(57) The invention refers to a connector, comprising:

a connector housing (1) comprising,
substantially parallel upper and lower walls (19),
at least one cavity (4) extending through said connector housing (1),
and
at least one terminal fitting (2) at least partially insertable into the at least one cavity (4) formed in the connector housing (1), said terminal fitting (2) having
a fitting projecting portion (5) provided at the leading end thereof and projecting from the front end (18) of the connector housing (1) without being surrounded.

FIG. 2



EP 1 100 156 A1

Description

[0001] The present invention relates to a cap used for male connectors and female connectors and to a connector having such a cap.

[0002] FIGS. 16 and 17 show a connector 100 disclosed in Japanese Unexamined Utility Model Publication No. 7-32868. This connector 100 is a male connector for accommodating male terminal fittings (not shown) therein and is provided at its front part with a hood 101 for surrounding tabs of the male terminal fittings. A dust preventing cap 102 is provided at a front opening of the hood 101.

[0003] As described above, the prior art male connector 100 is normally provided with the hood 101, which makes the male connector 100 larger in vertical and transverse directions. Depending upon a place where the male connector 100 is used, the male connector 100 may be forced to be smaller by omitting the hood 101. In the case of a module connector to be accommodated in a block connector, it needs not have a hood after being accommodated in a main housing if a main connector is provided with a hood.

However, in the male connector having the hood 101 omitted in order to solve the above problem, tabs of male terminal fittings are exposed from the front surface of the connector without being surrounded. Thus, the tabs may be deformed or broken if the male connector is left unconnected with a mating female connector.

[0004] In view of the above problem, an object of the present invention is to provide a hood-less (or receptacle-less) type connector capable of preventing fitting projecting portions, in particular tabs from being deformed and/or broken and to provide a cap for that purpose. Another object of the present invention is to provide a connector having a simple construction in the case that it is a module connector of a block connector.

This object is solved according to the invention by a cap according to claim 1 and by a connector according to claim 6. Preferred embodiments of the invention are subject of the dependent claims.

According to the invention, there is provided a cap (or connector cap) for a connector comprising a connector housing and terminal fittings which are at least partially inserted or insertable into cavities formed in the connector housing such that fitting projecting portions provided at the leading ends thereof substantially project from the front end surface of the connector housing without being surrounded (or hoodless or receptacleless), comprising:

a cap main body for substantially surrounding a projection space of the tabs, a cap engaging portion provided on the cap main body so as to be engageable with the connector housing, and
a detection opening formed in the front surface of the cap main body so as to permit the insertion of a detection probe.

According to a preferred embodiment of the invention, the terminal fitting is a male terminal fitting and the fitting projecting portions are tabs.

According to a preferred embodiment, there is provided a cap (male connector cap) for a male connector (hoodless or receptacleless male connector) comprising a connector housing and male terminal fittings which are inserted into cavities formed in the connector housing such that tabs provided at the leading ends thereof project from the front end surface of the connector housing without being surrounded, comprising:

a cap main body for surrounding a projection space of the tabs,
a cap engaging portion provided on the cap main body so as to be engageable with the connector housing, and
a detection opening formed in the front surface of the cap main body so as to permit the insertion of a detection probe.

Accordingly, the tabs projecting from the front end surface of the connector housing without being surrounded are protected by the cap. Accordingly, the deformation and breakage of the tabs can be prevented even if the male connector is left unconnected with its mating connector. Further, since the detection opening is formed in the front surface of the cap main body, the cap needs not be detached from the connector housing when the detection probe is brought into contact with the male terminal fittings for an electrical connection check.

[0005] Further preferably, the connector comprises at least one retainer which is mounted in a side wall portion of the connector housing such that it can be pushed from a standby position to a locking position, and locks the male terminal fittings when reaching the locking position, and the cap main body comprises a retainer protecting rib which projects in vicinity of the retainer in the standby position to prevent the retainer from (inadvertently) shifting to the locking position.

Accordingly, the retainer protecting rib projecting in vicinity of the retainer prevents the retainer from inadvertently shifting from the standby position to the locking position.

Further preferably, the connector comprises at least one retainer which is mounted in a side wall portion of the connector housing such that it can be pushed from a standby position to a locking position, and locks the (male) terminal fittings when reaching the locking position, and the cap main body comprises a retainer protecting portion for substantially covering the retainer in the standby position, thereby preventing the retainer from shifting to the locking position.

Accordingly, the retainer protecting portion covering the retainer prevents the retainer from inadvertently shifting from the standby position to the locking position.

Most preferably, the cap comprises connecting

portions interconnecting a plurality of caps being integrally or unitarily formed or produced, wherein the connecting portions preferably comprise perforations for separating adjacent caps from each other.

According to the invention, there is further provided a connector (or hoodless or receptacleless connector), comprising:

a connector housing,
terminal fittings which are at least partially inserted or insertable into cavities formed in the connector housing so that fitting projecting portions provided at the leading ends thereof project from the front end surface of the connector housing without being surrounded (or hoodless or receptacleless), and
a removable cap, in particular according to the invention, wherein the cap comprises:

a cap main body for substantially surrounding a projection space of the fitting projecting portions, and
a cap engaging portion provided on the cap main body so as to be detachably engageable with a housing side engaging portion provided on the connector housing.

According to a preferred embodiment of the invention, there is provided a male connector (hoodless or receptacleless male connector), comprising:

a connector housing,
male terminal fittings which are inserted into cavities formed in the connector housing so that tabs provided at the leading ends thereof project from the front end surface of the connector housing without being surrounded,
a cap main body for surrounding a projection space of the tabs, and
a cap engaging portion provided on the cap main body so as to be detachably engageable with a housing side engaging portion provided on the connector housing.

Accordingly, the detachably assembled cap prevents the deformation and breakage of the tabs if the male connector having no hood is left unconnected with its mating connector. Further, by providing no hood, the male connector can be made smaller by the hood.

[0006] Preferably, a plurality of male connectors form a main connector by being accommodated in a main housing, and the housing side engaging portion acts also as an engaging portion for engaging the main housing and the male connector with each other.

[0007] Accordingly, the housing side engaging portion provided on the connector housing can be engaged with both the cap and the main housing. Thus, the male connector needs not have two engaging portions and is, therefore, allowed to have a simpler construction.

Further preferably, the cap substantially covers the entire connector from its front end to its rear end.

Most preferably, the connector is a male connector, the terminal fitting is a male terminal fitting and the fitting projecting portions are tabs.

According to a further aspect of the invention, there is provided a method for forming a plurality of caps, wherein the caps are unitarily or integrally formed, preferably by vacuum-forming, wherein the caps are interconnected along connecting portions being preferably provided with perforations, wherein a necessary number of caps is separated along the connecting portions, preferably along the perforations thereof.

These and other objects, features and advantages of the present invention will become more apparent upon a reading of the following detailed description and accompanying drawings in which:

FIG. 1 is a side view of a connector housing according to a first embodiment,
FIG. 2 is a side view in section of the connector housing,
FIG. 3 is a perspective view of a cap,
FIG. 4 is a side view of the connector housing assembled with the cap when retainers are in their standby positions,
FIG. 5 is a side view in section of the connector housing assembled with the cap and having male terminal fittings mounted therein when the retainers in their standby positions,
FIG. 6 is a front view of the connector housing assembled with the cap and having the male terminal fittings mounted therein,
FIG. 7 is a plan view of the connector housing assembled with the cap and having the male terminal fittings mounted therein,
FIG. 8 is a side view in section of the male connector when the retainers are pushed to their locking positions,
FIG. 9 is a side view in section of the male connector when the cap is detached therefrom,
FIG. 10 is a side view in section of a main housing,
FIG. 11 is a side view in section of a main connector when the male connector is accommodated in the main housing,
FIG. 12 is a plan view of the main connector,
FIG. 13 is a perspective view of an assembly of caps according to a second embodiment,
FIG. 14 is a perspective view of the male connector before the cap is assembled with the connector housing with the retainers in their standby positions,
FIG. 15 is a side view in section of the connector housing assembled with the cap and having the male terminal fittings mounted therein,
FIG. 16 is a perspective view of a prior art connector, and
FIG. 17 is a perspective view of the prior art connector when a dust preventing cap is assembled.

<First Embodiment>

[0008] Next, a first embodiment of the invention is described in detail with reference to FIGS. 1 to 12.

[0009] FIG. 1 is a side view of a connector housing 1 of a male connector 17. The male connector 17 is a so-called module connector. As described later, a main housing 20 capable of accommodating a plurality of male connectors 17 is provided, and a main connector 21 is assembled by mounting the male connectors 17 in the main housing 20.

[0010] The male connector 17 is provided with a connector housing 1 and male terminal fittings 2 substantially accommodated or accommodatable in the connector housing 1. A tab 5 connectable with a mating female terminal fitting (not shown) extends at a front part of each male terminal fitting 2 (see particularly FIG. 5).

[0011] The connector housing 1 is so made e.g. of a synthetic resin as to have a substantially parallelepipedic shape and is connectable with a mating female connector housing (not shown) while substantially accommodating the male terminal fittings 2 therein. In the connector housing 1 are provided cavities 4 for at least partially accommodating the male terminal fittings 2 (see FIG. 2). The cavities 4 penetrate the connector housing 1 along forward and backward directions, and openings left at the rear side of the connector housing 1 serve as terminal insertion openings 4A through which the male terminal fittings 2 are inserted or insertable. Further, openings left at the front side of the connector housing 1 serve as tab insertion openings 4B through which the tabs 5 of the male terminal fittings 2 are inserted. A front end surface 18 of the connector housing 1 is substantially in alignment with the positions of the tab insertion openings 4B. Thus, when the male terminal fittings 2 are mounted in the connector housing 1, the tabs 5 are exposed from the front end surface 18 of the connector housing 1 substantially without being surrounded. Further, a locking portion 6, which is elastically deformable in a lateral direction, e.g. upward and downward, projects from a part of a wall surface defining each cavity 4 so as to be engageable with the male terminal fitting 2.

[0012] At the lateral or left and right side walls of the connector housing 1, a pair of housing side engaging portions 10 project preferably backward (as seen in a mating direction MD (FIG. 7) of the male connector 17 with the cap 3). The housing side engaging portions 10 are elastically deformable inward and are engageable with cap side engaging portions 11 provided in the cap 3 to be described later.

[0013] In the middle of upper and lower walls 19 of the connector housing 1 are formed retainer mounting openings 7 which communicate with the cavities 4. A retainer 8 is mounted in each retainer mounting opening 7. The retainers 8 are integrally or unitarily formed with the connector housing 1 via hinges 9, and are rotatable or pivotable about the hinges 9. Further, a terminal engaging portion 8A projects from a surface of each retainer 8, which surface faces inward of the connector housing 1. The retainer 8 has two insertion positions where its depth of insertion into the retainer mount openings 7 differs. One insertion position where the retainer 8 is lightly inserted is a standby position where the insertion of the male terminal fittings 2 into the cavities 4 is permitted. Another insertion position where the retainer 8 is pushed deeper than in the standby position is a locking position. The outer surfaces of the retainers 8 are substantially in flush with the outer wall surfaces of the connector housing 1 when the retainers 8 reach their locking positions, whereas they project from the outer wall surfaces of the connector housing 1 when the retainers 8 are in the standby positions.

[0014] FIG. 3 shows the cap 3. This cap 3 is integrally or unitarily made e.g. of a synthetic resin and is provided with a hollow cap main body 12 from its front part to its middle part and the cap side engaging portion 11 which is provided behind the cap main body 12 to engage the cap 3 with the connector housing 1.

[0015] The cap main body 12 has substantially the same outer dimensions as the connector housing 1 and is longer than the length of the tabs projecting from the front end surface 18 of the connector housing 1. When the cap 3 is mounted on the connector housing 1, the cap main body 12 substantially surrounds a projection space where the tabs 5 project. Further, a detection opening 13 is open in the front end surface of the cap main body 12. With the cap 3 and the connector housing 1 assembled with each other, the detection opening 13 permits the insertion of a detection probe 14 for an electrical conduction check when the male terminal fittings 2 are mounted in the cavities 4. A pair of grips 15 project from the left and right side wall surfaces of the cap main body 12. The cap 3 and the connector housing 1 can be smoothly assembled and detached by manoeuvring the grips 15.

[0016] The cap side engaging portion 11 is formed at a rear end of the cap main body 12 and is comprised of a substantially tubular portion 11A for substantially covering a front end portion of the connector housing 1 and elastic pieces 11 B extending backward from the left and right side walls of the tubular portion 11A. The tubular portion 11A is formed slightly larger than the cap main body 12, and the connector housing 1 is insertable thereinto. The elastic pieces 11B are elastically deformable sideways. At the leading end of each elastic piece 11 B, a claw 11C projects inward. The connector housing 1 and the cap 3 are substantially engaged by the engagement of the claws 11C and the housing side engaging portions 10 of the connector housing 1.

[0017] Retainer protecting ribs 16 project at rear end portions of the tubular portion 11A covering the upper and lower parts of the connector housing 1. The vertical projecting length of the retainer protecting ribs 16 is so set as to be equal to or slightly longer than the projecting length of the retainers 8 in the standby position from the

connector housing 1 when the cap 3 is mounted on the connector 1 (see FIG. 5).

[0018] Next, how the thus constructed male connector 17 and cap 3 are assembled and detached is described.

The retainers 8 of the connector housing 1 are rotated or pivoted about the hinges 9 to the respective standby positions in the retainer mounting openings 7.

[0019] Next, the cap 3 is mounted on the front portion of the connector housing 1. When the front portion of the connector housing 1 is fitted into the tubular portion 11A of the cap 3, the elastic pieces 11B are slightly elastically deformed outward and the claws 11C are engaged with the housing side engaging portions 10 after moving over them (It should be noted that the engagement of the claws 11C and the housing side engaging portions 10 is shown in FIG. 7). In this state, the cap side engaging portion 11 and the housing side engaging portions 10 are engaged to hold the connector housing 1 and the cap 3 locked. Further, at this time, the retainer protecting ribs 16 of the cap 3 project in vicinity of or adjacent to the retainers 8. This prevents the retainers 8 from inadvertently shifting from the standby positions to the locking positions.

[0020] Subsequently, the male terminal fittings 2 are inserted into the cavities 4 of the connector housing 1. When the male terminal fittings 2 are pushed to their proper insertion positions, the locking portions 6 engage the male terminal fittings 2, thereby partly locking the male terminal fittings 2 in the cavities 4 (see FIG. 5). At this time, the tabs 5 projecting from the front end surface 18 of the connector housing 1 without being surrounded are substantially protected by the cap 3. Accordingly, the deformation and breakage of the tabs 5 can be prevented even when the male connector 17 is left unconnected with a mating connector.

[0021] Subsequently, when the retainers 8 are pushed from the standby positions to the locking positions, the terminal engaging portions 8A of the retainers 8 engage the male terminal fittings 2, thereby fully locking the male terminal fittings 2 in the cavities 4 (see FIG. 8). In this state, the detection probe 14 can be substantially inserted through the detection opening 13 formed in the front surface of the cap main body 12 when an electrical conduction check for the male terminal fittings 2 is performed. Thus, the electrical conduction check can be efficiently performed without making it necessary to detach the cap 3 from the male connector 17.

If the male connector 17 having no hood or receptacle (hood-less or receptacle-less connector) is left unconnected with its mating connector, the deformation and breakage of the tabs 5 are prevented by the cap 3 detachably assembled. Further, by omitting the hood, the male connector 17 can be made smaller by the hood.

[0022] If necessary, the male connector 17 can be assembled into the main housing 20 after the cap 3 is detached therefrom (see FIG. 9).

Next, the assembling of the male connectors 17 into the main housing 20 is described with reference to FIGS. 10 to 12.

The main housing 20 is integrally made e.g. of a synthetic resin and can accommodate a plurality of male connectors 17 therein. As shown in FIGS. 10-12, a plurality of connector accommodating chambers 22 in which the male connectors 17 are mountable are provided in the main housing 20. The connector accommodating chambers 22 penetrate the main housing 20 along forward and backward directions (a connecting direction of the main connector 21 with an unillustrated mating connector is assumed to be a forward direction). A hood or receptacle 23 capable of at least partially accommodating the mating connector is formed at a front part of the main housing 20. When the male connectors 17 are mounted in the main housing 20, the hood 23 substantially surrounds the tabs 5.

[0023] On one of the inner wall surfaces defining each connector accommodating chamber 22 which faces the housing side engaging portions 10 of the male connector 17 are provided connector engaging portions 24. These connector engaging portions 24 are engageable with the housing side engaging portions 10 and hold the male connector 17 so as not to come out of the main housing 20.

Each male connector 17 is mounted in the main housing 21 as follows. First, the male connector 17 is inserted into the corresponding connector accommodating chamber 22 from front. When the engaging portions 10, 24 are brought into contact with each other, the housing side engaging portions 10 are elastically deformed inward. When the male connector 17 is further pushed into the connector accommodating chamber 22, the housing side engaging portions 10 restore their original shapes after moving over the connector engaging portions 24, with the result that the engaging portions 10, 24 are substantially engaged with each other (see FIGS. 11 and 12). In this way, the assembling of the main connector 21 is completed.

As described above, in this embodiment, the housing side engaging portions 10 provided on the male connector housing 17 are engageable with the engaging portions 11, 24 of the cap 3 and the main housing 20. Thus, the male connector 17 needs not have two kinds of engaging portions and, therefore, is allowed to have a simpler construction.

<Second Embodiment>

[0024] Next, a second embodiment of the invention is described with reference to FIGS. 13 to 15. The second embodiment differs from the first embodiment only in the shape of a cap 30. Accordingly, no description is given on the same or similar construction as the first embodiment by identifying it by the same or similar reference numerals.

[0025] FIG. 13 shows a plurality of caps 30 which are formed while being interconnected with each other.

Such an assembly of the caps 30 is formed by, e.g. vacuum forming. Perforations 31 are formed in connecting portions of the respective caps 30. Depending on a necessary number of the caps 30, the caps 30 can be cut off along the perforations 31.

[0026] Each cap 30 is comprised of a cap main body 32 for substantially surrounding a projection space of the tabs 5 at a front side of the male connector 17 and a retainer protecting portion 33 provided at a rear part of the cap main body 32.

[0027] The inner configuration of the cap main body 32 is slightly larger than the outer configuration of the outer diameter of the connector housing 1, so that the cap 30 can be so assembled as to cover the outer wall surfaces of the connector housing 1. Further, contact portions 34 project from inner wall surfaces of the cap main body 32. The front end of the connector housing 1 is positioned in the cap 30 by the front end surface 18 of the connector housing 1 coming into contact with the contact portions 34 (see FIG. 15). A length between the contact portions 34 and the front end of the cap main body 32 is substantially longer than a projecting length of the tabs 5 from the front end surface 18 of the connector housing 1. Further, the front end surface of the cap main body 32 is formed with a detection opening 35 for permitting the insertion of the detection probe 14.

[0028] The retainer protecting portion 33 has upper, lower, left and right walls and substantially covers the retainers 8 in the assembled state of the cap 30. The position of the retainer protecting portion 33 is before the retainers 8 in their standby positions when the cap 30 is assembled with the male connector 17. The left and right side wall surfaces of the retainer protecting portion 33 extend along the left and right surfaces of the cap main body 32, whereas the upper and lower wall surfaces thereof are located above and below the cap main body 32. A distance between the upper and lower inner wall surfaces of the retainer protecting portion 33 and the upper and lower outer wall surfaces of the cap main body 32 is slightly longer than a projecting distance of the retainers 8 in their standby positions. Further, the rear end of the retainer protecting portion 33 is located slightly behind the rear end position of the male connector 17 when the cap 30 is assembled with the male connector 17 (see FIG. 15).

Though unillustrated, claws or connector engaging portions project on the inner wall surfaces of the retainer protecting portion 33 in positions corresponding to the housing side engaging portions 10 of the connector housing 1, and are adapted to engage the connector housing 1 and the cap 30 with each other.

[0029] The same action and effects as the first embodiment can be obtained by the second embodiment constructed as above.

[0030] Further, in this embodiment, the retainers 8 in the standby positions are prevented from shifting to the locking positions by being covered by the retainer protecting portions 33 when the cap 30 is assembled with the connector housing 1. Thus, as compared with the retainer protecting ribs 16 of the first embodiment, the retainer shift preventing function is further improved.

[0031] In addition, since the cap 30 substantially covers the entire male connector 17 from its front end to its rear end, it has a function of protecting the entire male connector 17.

[0032] Further, a plurality of caps 30 are integrally formed and interconnected via the perforations 31. Thus, a necessary number of caps 30 can be cut off to be used. Furthermore, since a batch of caps 30 are integrally formed, a production cost is lower as compared to a case where the caps 30 are individually formed.

[0033] The present invention is not limited to the foregoing embodiments. For example, the following embodiments are also embraced by the scope of the present invention as defined in the claims.

(1) Although the male connectors of the foregoing embodiments are module connectors, the present invention is also applicable to usual male connectors.

(2) According to the invention, the retainer protecting rib or the retainer protecting portion may not be provided on the cap.

LIST OF REFERENCE NUMERALS

[0034]

1	Connector Housing
2	(Male) Terminal Fitting
3, 30	Cap (Cap for Male Connector)
4	Cavity
5	Tab (Fitting Projecting Portions)
8	Retainer
10	Housing Side Engaging Portion
11	Cap Side Engaging Portion
12, 32	Cap Main Body
13, 35	Detection Opening
14	Detection Probe
16	Retainer Protecting Rib
17	(Male) Connector
20	Main Housing
21	Main Connector
33	Retainer Protecting Portion

Claims

1. A connector, comprising:

a connector housing (1) comprising,
substantially parallel upper and lower walls (19),
at least one cavity (4) extending through said connector housing (1), and
at least one terminal fitting (2) at least partially

insertable into the at least one cavity (4) formed in the connector housing (1), said terminal fitting (2) having a fitting projecting portion (5) provided at the leading end thereof and projecting from the front end (18) of the connector housing (1) without being surrounded.

2. A connector according to claim 1, wherein the connector housing (1) comprises at least one locking portion (6) projecting into the cavity (4) and said terminal fitting (2) has a locking aperture for locking engagement by the locking portion (6) when the terminal fitting (2) is inserted into the cavity (4).

3. A connector according to claim 1, wherein the connector housing (1) has an intermediate wall disposed between said upper and lower walls (19), at least one said cavity (4) is disposed between said intermediate wall and said upper wall (19) and at least one said cavity is disposed between said intermediate wall and said lower wall (19), and said locking portions (6) project from said intermediate wall into each of the respective cavities (4) and said terminal fitting (2) has a locking aperture for locking engagement by the locking portion (6) when the terminal fitting (2) is inserted into the cavity (4).

4. A connector according to one of claims 2 or 3, wherein said locking projections (6) project forwardly into said cavity (4).

5. A connector according to one of the preceding claims, wherein the connector housing (1) has at least one retainer (8) formed on at least a selected one of the upper and lower walls (19), said retainer being selectively deflectable from a first position where said retainer (8) is adjacent to the cavity (4) and a second position where said retainer (8) projects into the respective cavity (4) and the terminal has a locking surface disposed for engagement by the retainer (8) when the terminal fitting (2) is inserted into the cavity and the retainer (8) is moved into the second position.

6. The connector according to claim 5, wherein a rear end of each said retainer (8) is hingedly joined to the connector housing (1) at a location in proximity to the rear end of the connector housing, each said retainer (8) projecting from the rear end of the retainer (8) toward the front end (18) of the connector housing (1).

7. A connector according to one or more of the preceding claims, wherein the connector is a male connector (21; 17), the terminal fitting (2) is a male terminal fitting (2) and the fitting projecting portions (5) are tabs (5).

8. The connector according to one or more of the preceding claims, wherein the connector housing (1) further includes opposed substantially parallel sidewalls extending between the upper and lower walls (19) of the connector housing (1), side engaging portions (10) projecting resiliently outwardly from the sidewalls of the connector housing (1) for releasably engaging said connector housing (1) with another structure.

9. The connector according to claim 8, wherein said side engaging portions (10) project rearwardly from the sidewalls of the connector housing (1).

10. A connector assembly, comprising:

a main housing (20) having a plurality of connector accommodating chambers (22), each said connector accommodating chamber (22) having at least two connector engaging portions projecting into the respective connector accommodating chamber;
a plurality of connectors according to claim 8 or 9, wherein the outer walls (19) of the connector housing (1) define a cross-section configured for insertion of said connector housings (1) into the respective connector accommodating chambers (22), and whereby the engaging portions (10) on the outer walls (19) of the connector housings (1) engage the engaging portions (24) of the connector accommodating chambers (22) in the main housing (20) for locking the respective connector housings (1) in the main housing (20).

FIG. 1

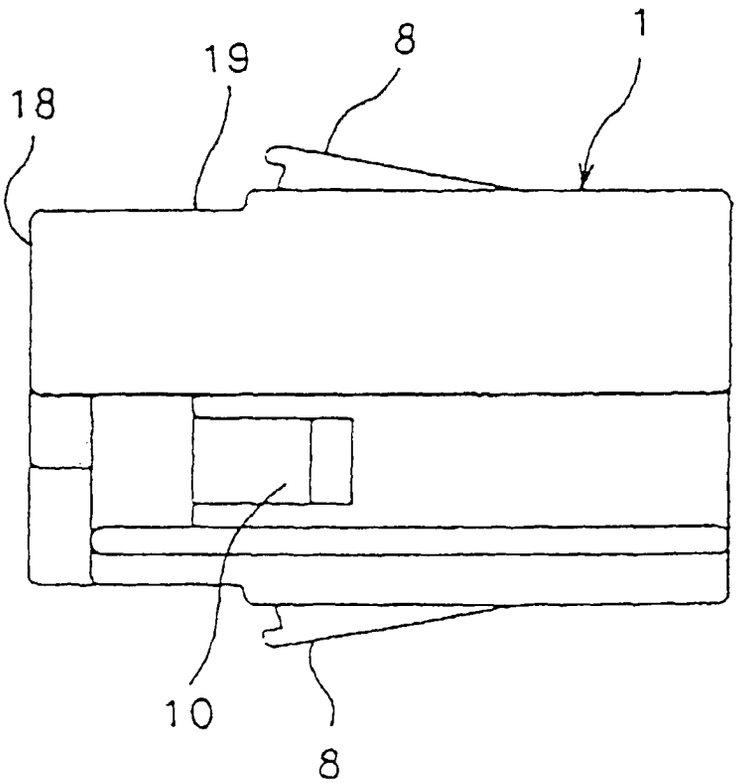
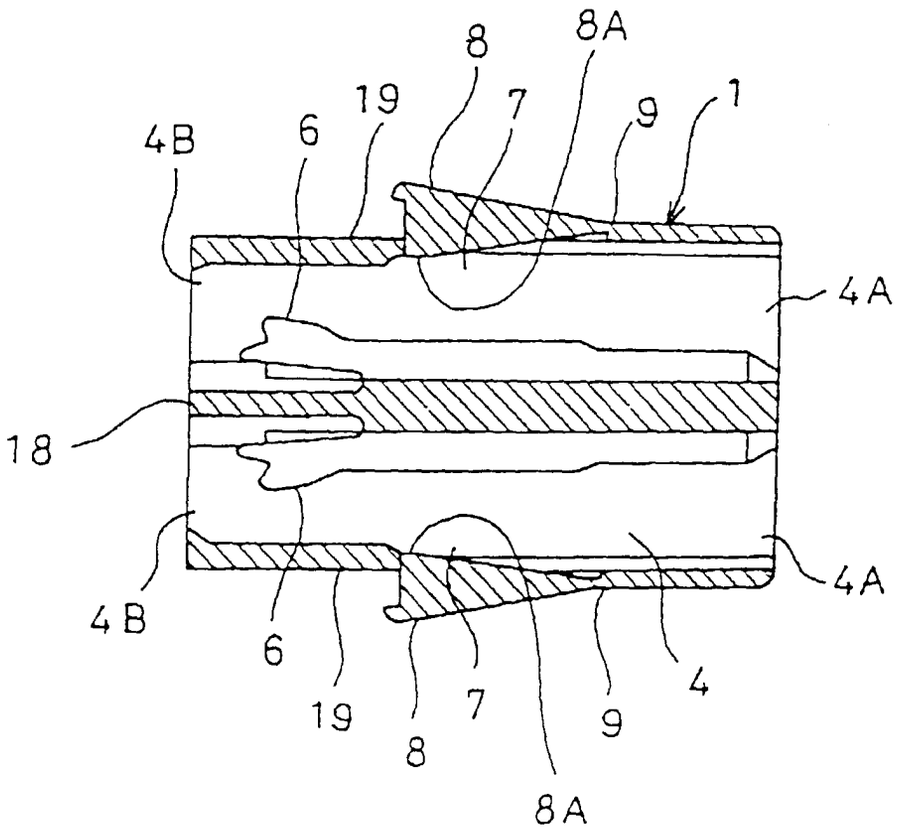


FIG. 2



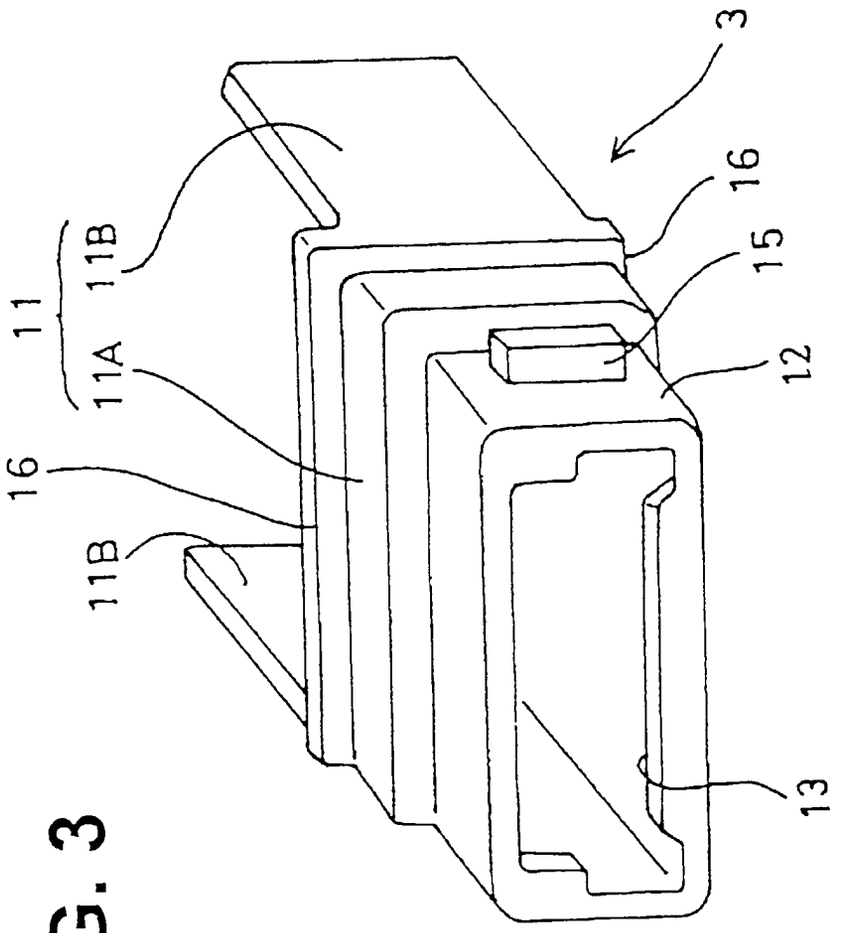


FIG. 3

FIG. 4

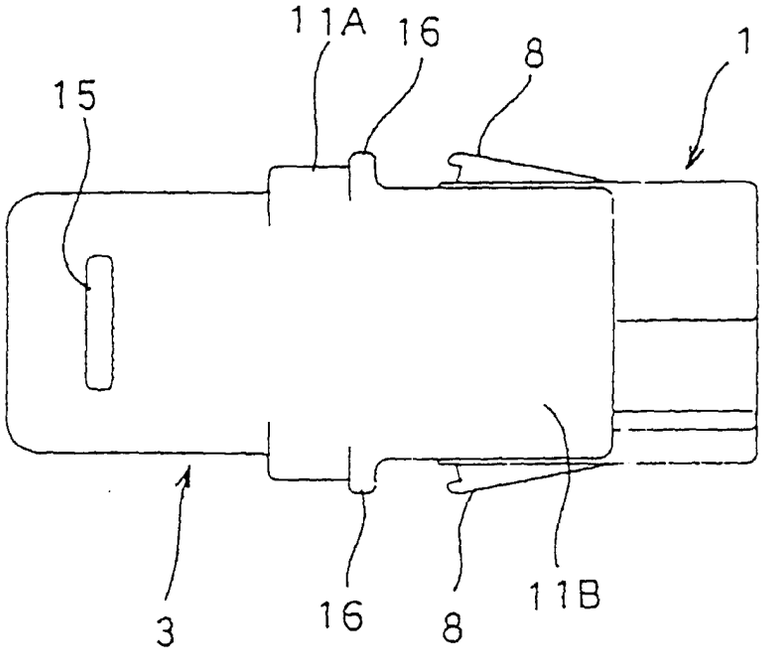


FIG. 5

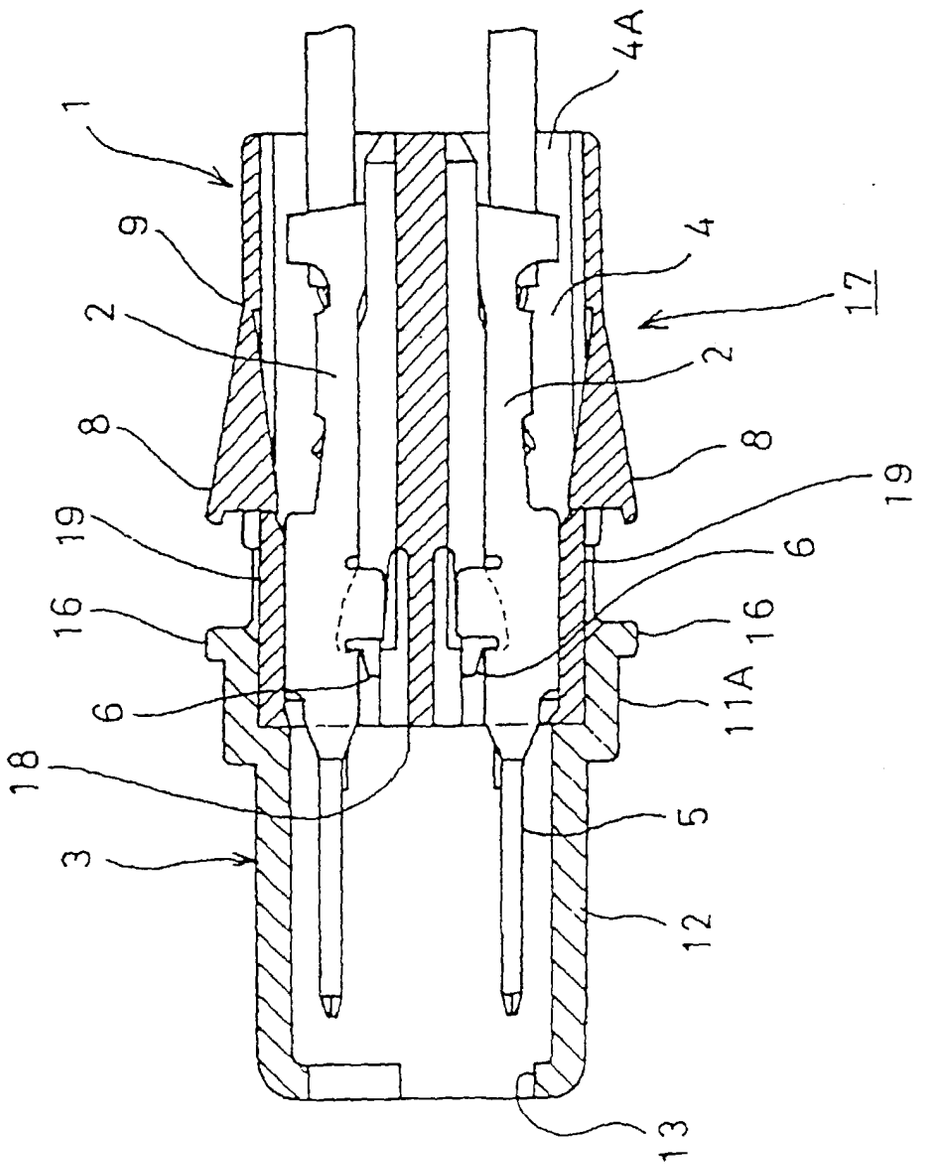


FIG. 6

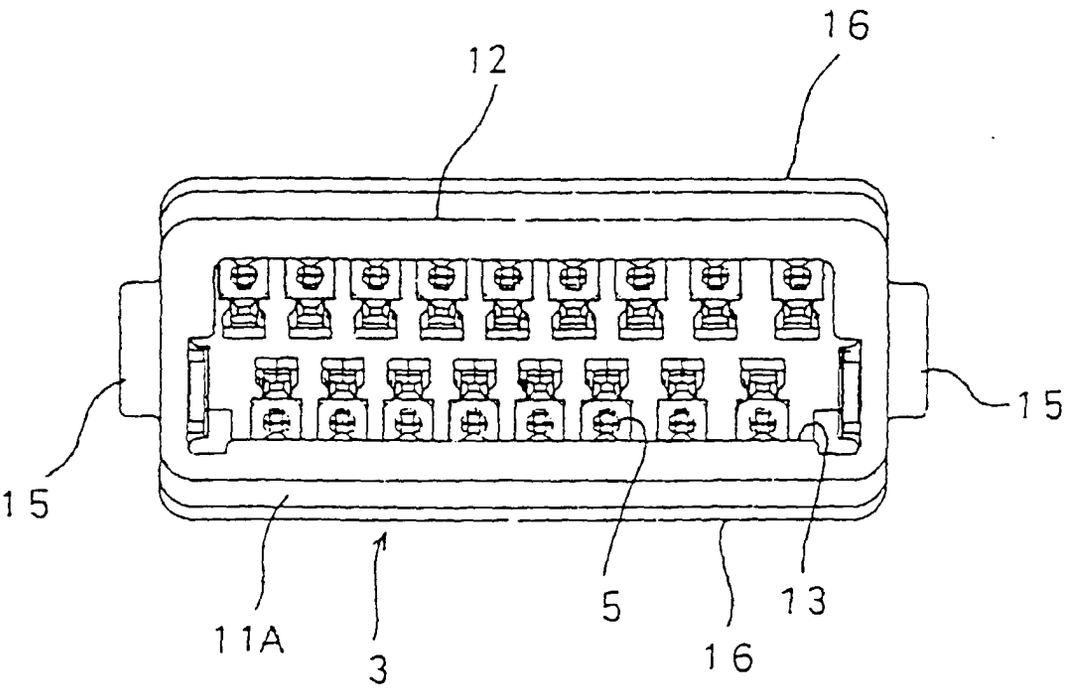


FIG. 7

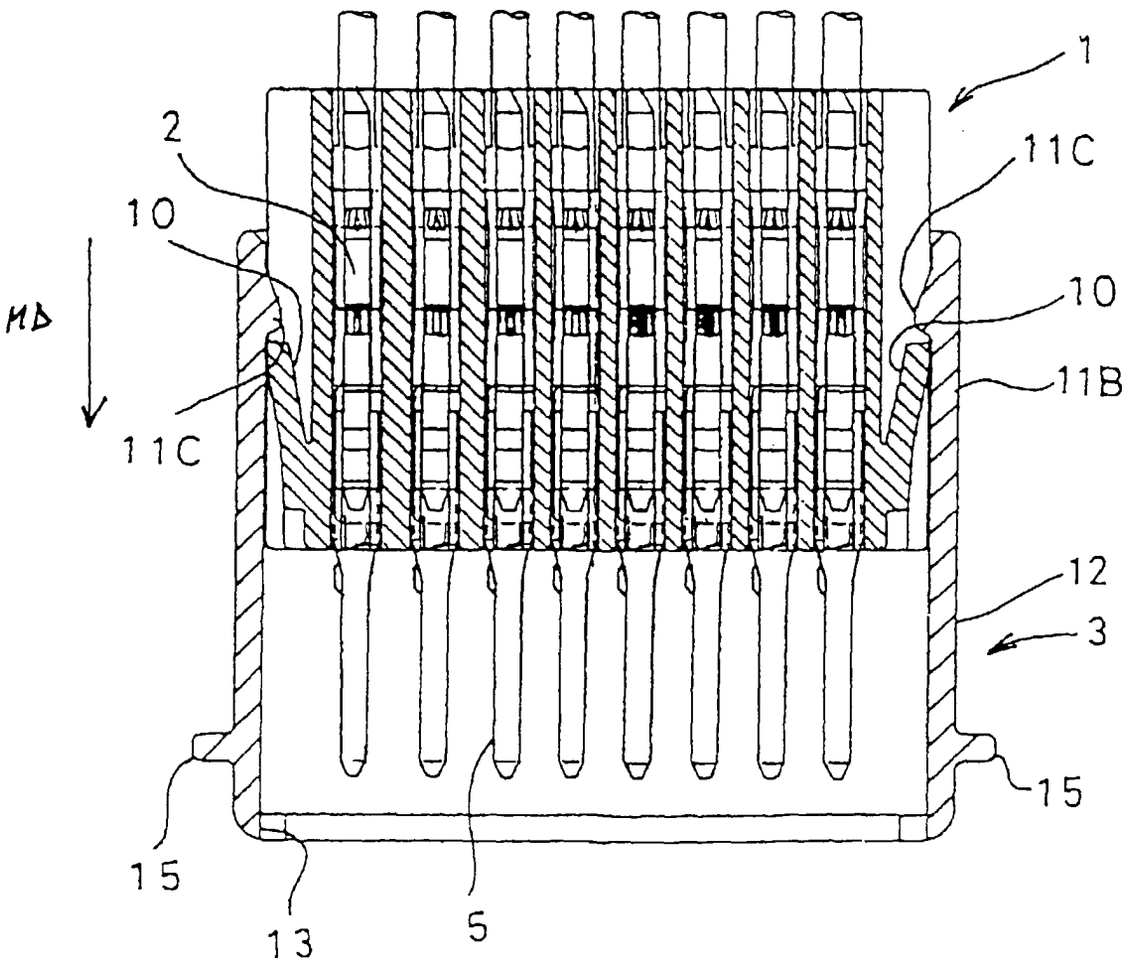


FIG. 8

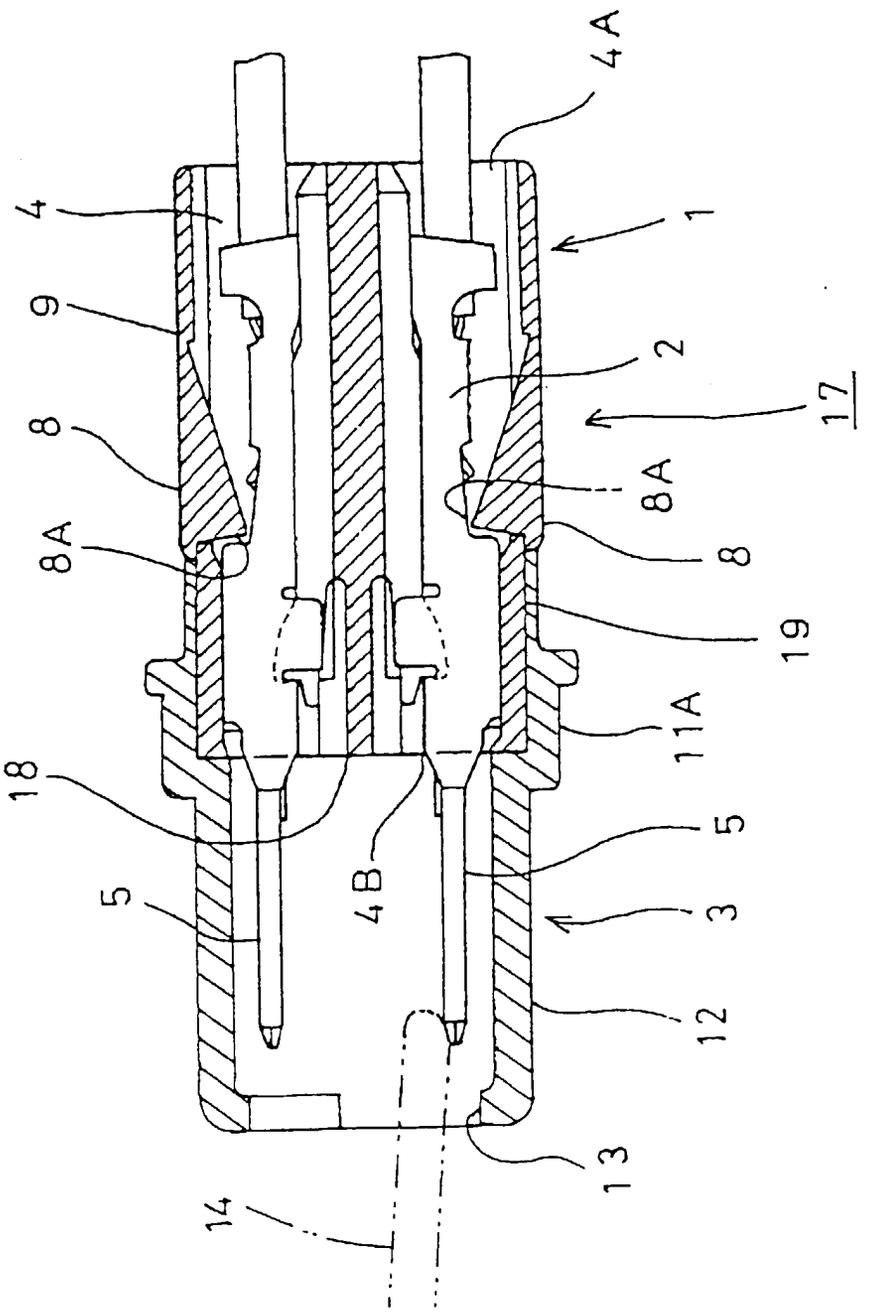


FIG. 9

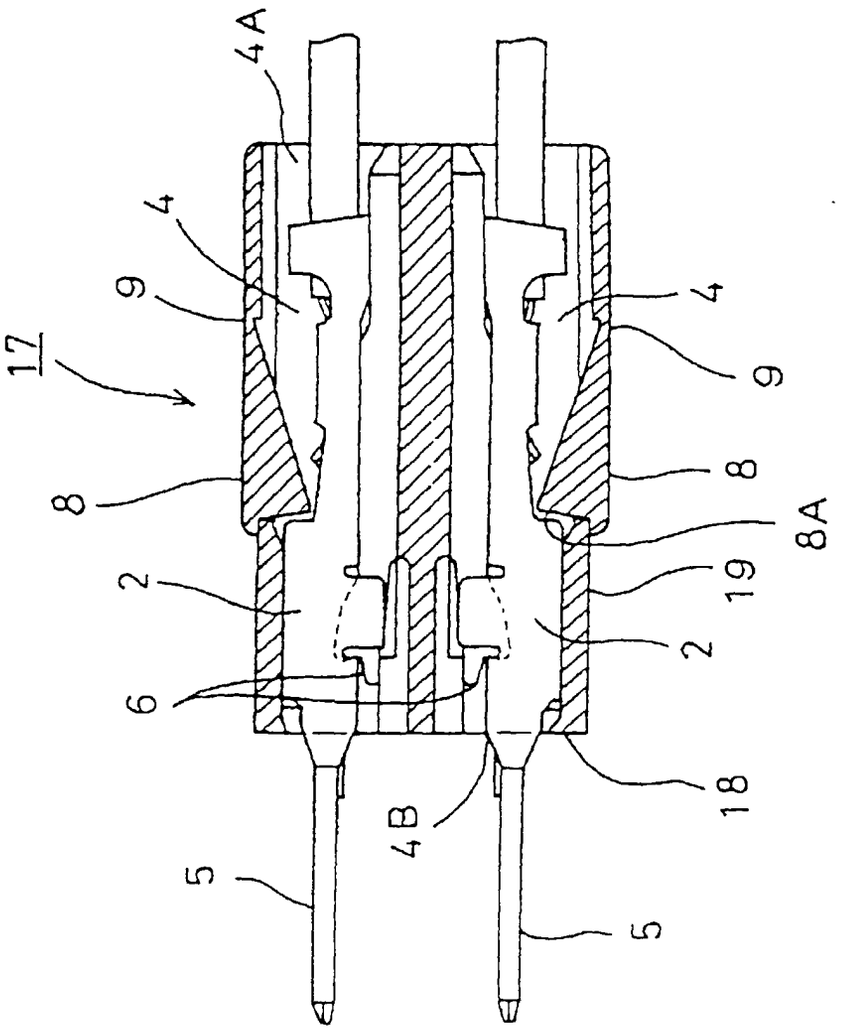


FIG. 10

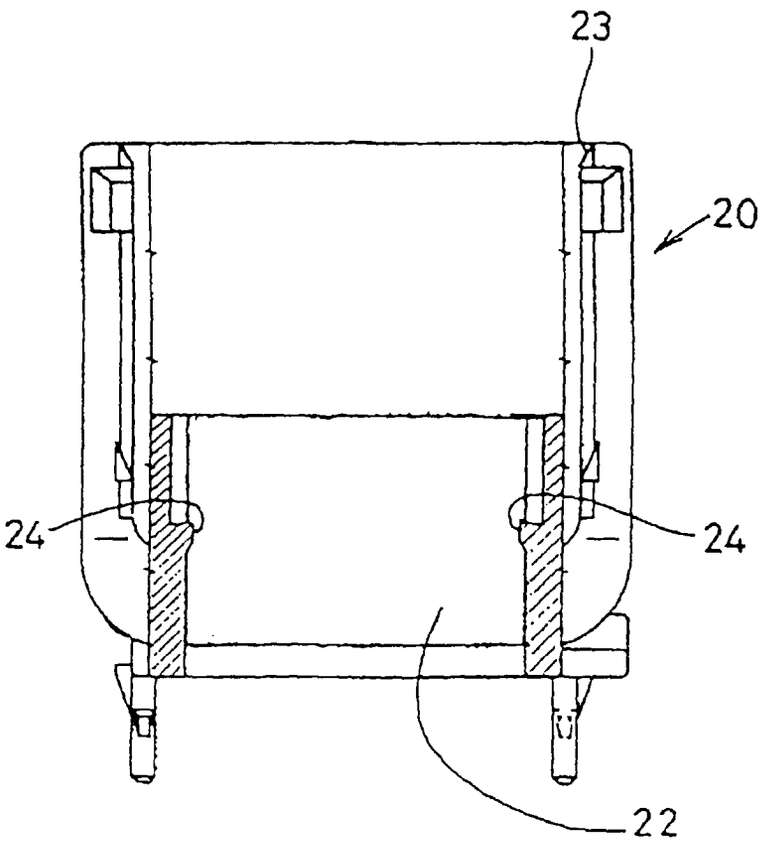


FIG. 11

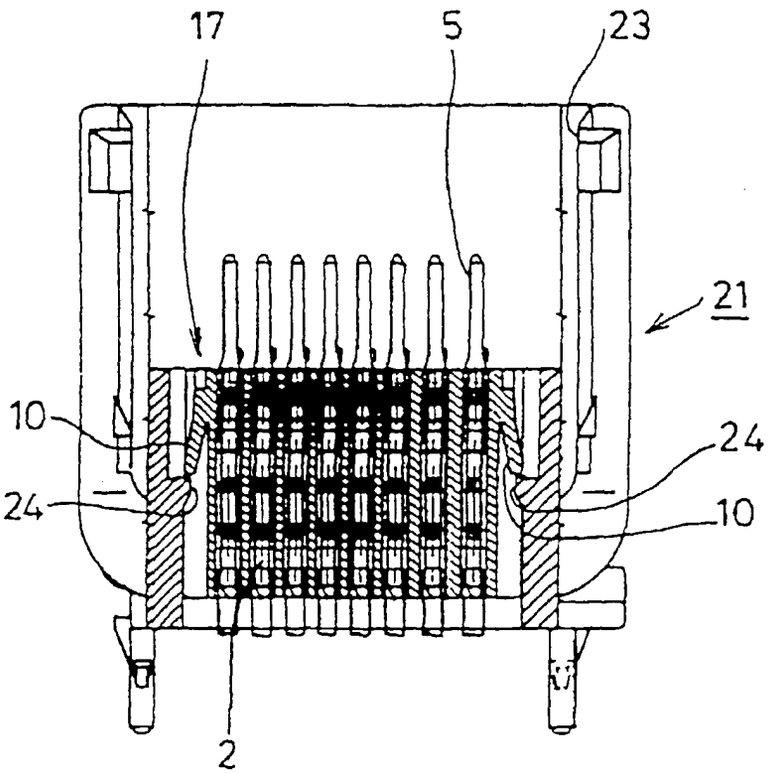


FIG. 12

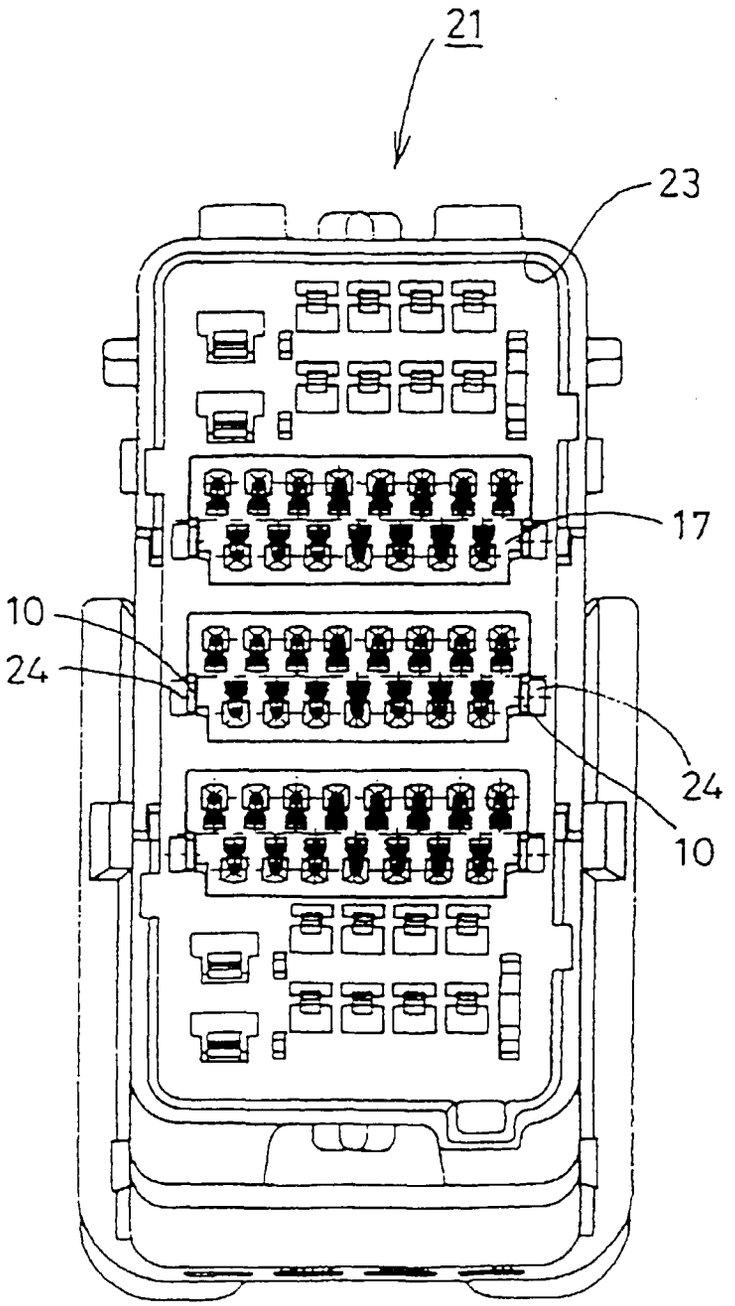


FIG. 13

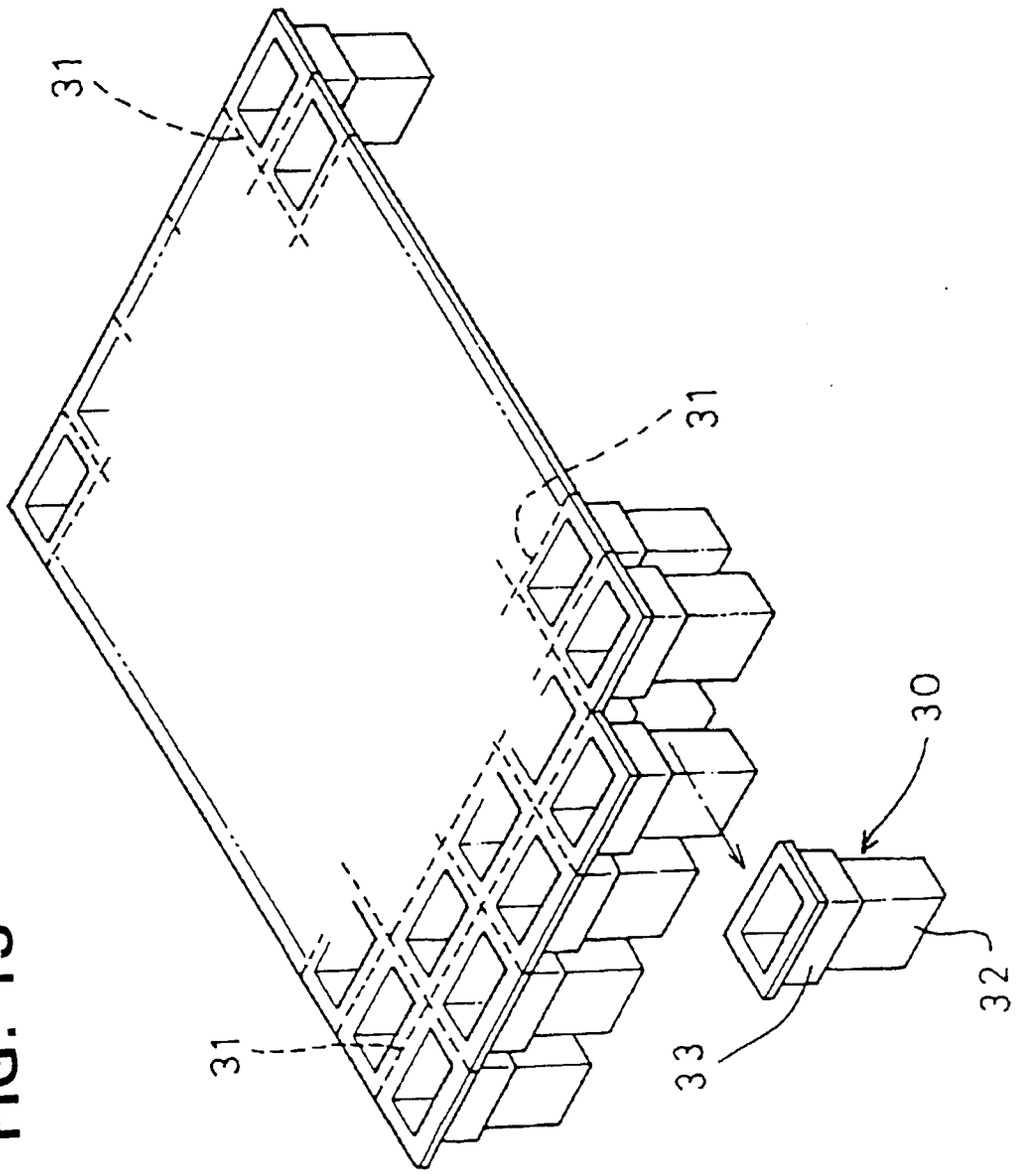


FIG. 14

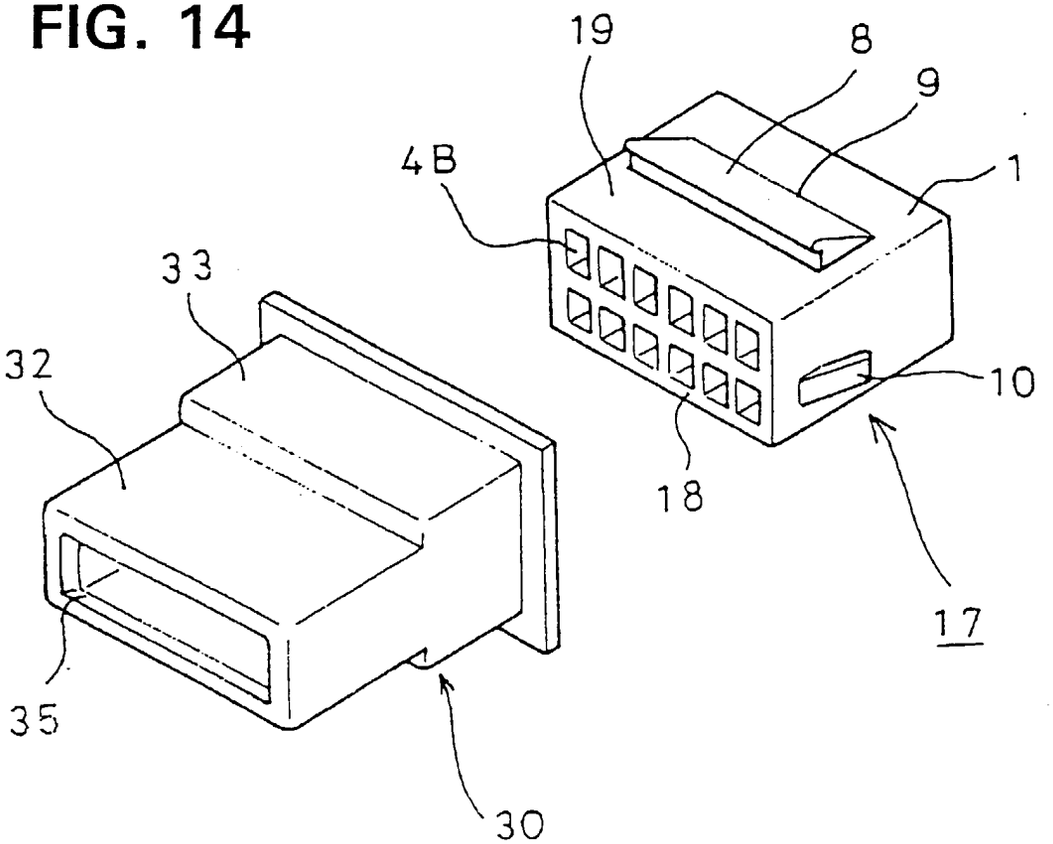


FIG. 15

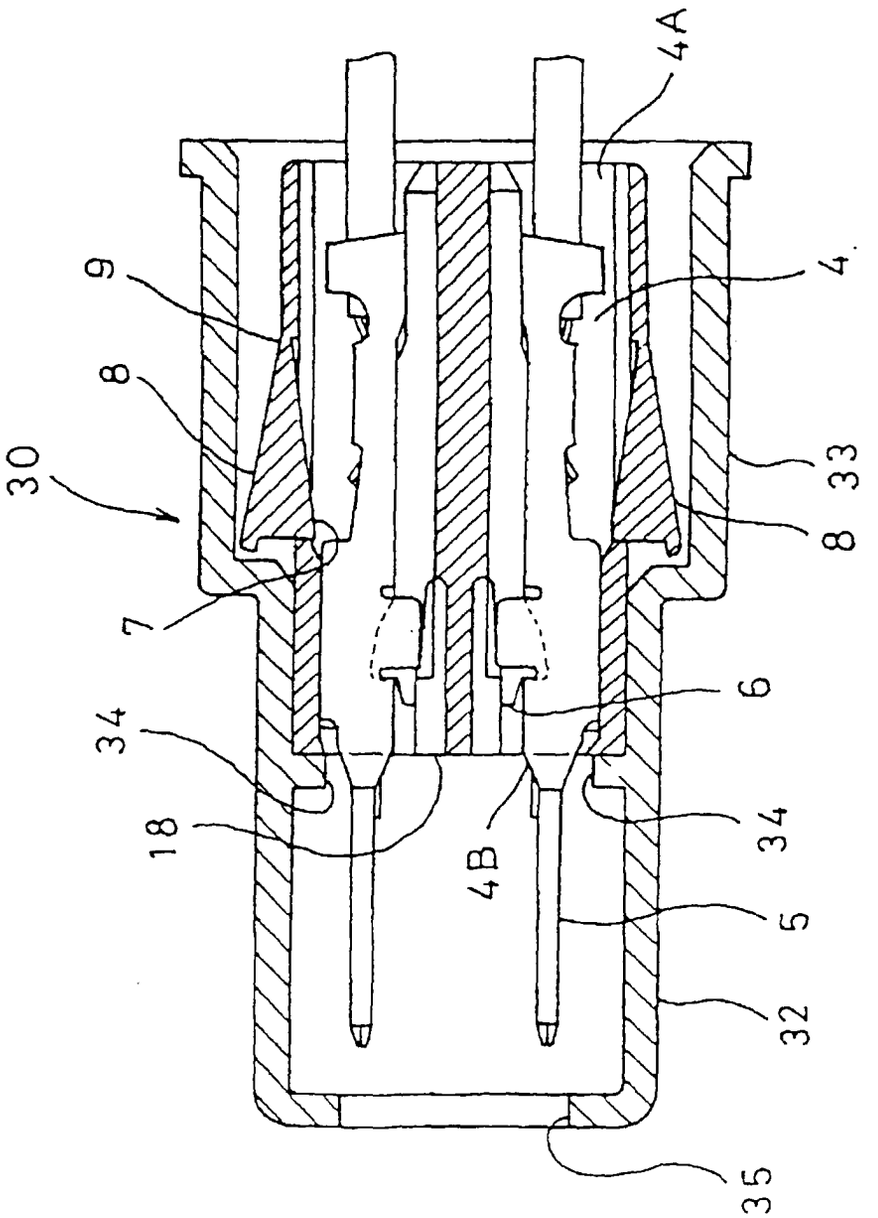


FIG. 16
PRIOR ART

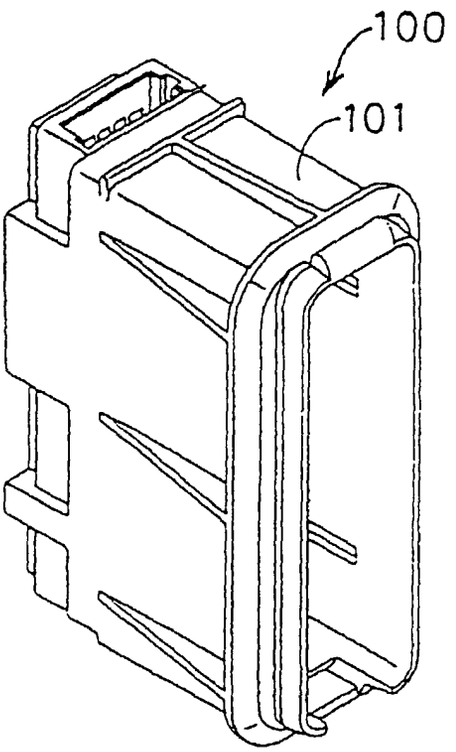
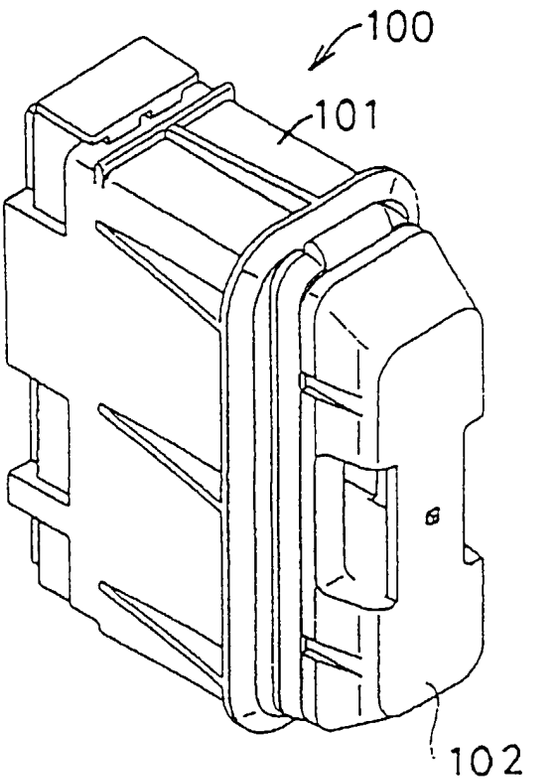


FIG. 17
PRIOR ART



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 10 1193

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 Y	US 5 651 704 A (FUKUSHIMA) 30 September 1997 (1997-09-30) * column 3, line 30 - column 5, line 12 *	1-7,10 8,9	H01R13/436
X	EP 0 670 500 A (SUMITOMO WIRING SYSTEMS) 6 September 1995 (1995-09-06) * column 5, line 20 - column 9, line 34 *	1-7,10	
X	US 5 730 627 A (OKABE TOSHIAKI) 24 March 1998 (1998-03-24) * column 2, line 58 - column 5, line 34; figure 5 *	1-6,10	
X	US 3 990 759 A (CROWE TERENCE ALFRED) 9 November 1976 (1976-11-09) * column 2, line 25 - column 4, line 9; figures 1,6 *	1-6,10	
Y	EP 0 164 835 A (LUCAS IND PLC) 18 December 1985 (1985-12-18) * page 6, line 30 - page 7, line 16 *	8,9	

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
THE HAGUE	8 March 2001	Bertin, M

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 01 10 1193

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.

08-03-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5651704 A	29-07-1997	JP 2852497 B	03-02-1999
		JP 8264223 A	11-10-1996
		CN 1140917 A	22-01-1997
		KR 156959 Y	15-09-1999
EP 0670500 A	06-09-1995	JP 7245141 A	19-09-1995
		JP 7312255 A	28-11-1995
		DE 69517217 D	06-07-2000
		DE 69517217 T	22-02-2001
		US 5620346 A	15-04-1997
US 5730627 A	24-03-1998	JP 9007676 A	10-01-1997
US 3990759 A	09-11-1976	ZA 7403170 A	27-08-1975
		AU 8122975 A	18-11-1976
		GB 1504173 A	15-03-1978
EP 0164835 A	18-12-1985	DE 3567775 D	23-02-1989

EPO FORM P0459

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