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(54) Connector and connecting structure of connectors

(57) The object of the present invention is to provide a connector capable of connecting and fixing with a connector securely without limitation of a volume of the internal space of various connectors. The connector includes a housing (21) including an internal space (23), and connecting terminals (12); (13) supported by a front wall (21 b) constituting the internal space (23) of the housing (21), a rotatable embed aiding part (32) formed in a base (31) of a left side wall (21c) substantially orthogonal to the front wall (21 b) to form the internal space (23), and slanting parts(32c), (32d) are formed in the embed aiding part (32) and protruding part from the internal space(23).

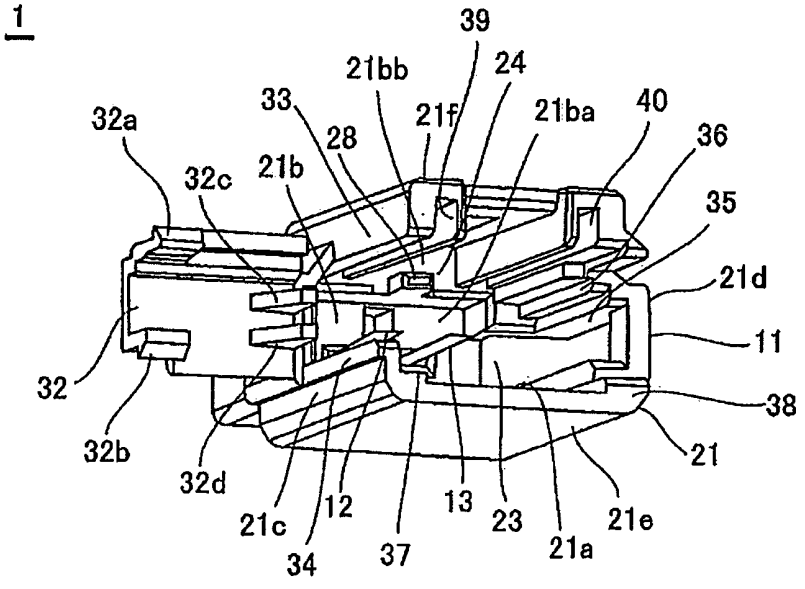

FIG. 1

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Description

Field

[0001] The present disclosure relates to a connector which can be engaged with a plurality of connectors having different shapes and sizes, and a connecting structure of connectors composed of one connector of the plurality of connectors and the connector.

Background

[0002] Connecting structure of previous connectors is described as follows. Namely, the connecting structure of the connectors is: an opening hollow portion of a connector housing is embedded with a front half portion of another connector housing, thereby the two connectors are engaged and connected. In the connecting structure of the connectors is provided a coupling lever, which is linked integrally to the outer side of the peripheral wall of the connector housing by means of a thin wall-hinge made of the same material as the connector housing, closed freely, and provided with downwardly protruding cam plates facing to the front half portion of another connector housing.

[0003] The cam plates have a cam slot, which makes the radius of rotation starting from the hinge decrease gradually from a cam starting end of a tip to a cam terminating end. Also, a cam driven pin for the cam plate is provided on the outside of another connector housing. In addition, a cam plate groove is provided in the opening hollow portion of the one connector housing, which permits the cam plate to be inserted into an inserting hole. Also, a lower half portion of the cam plate is inserted into the inserting hole by means of the holding force of the thin wall-hinge, thereby the starting end of the cam slot of the coupling lever is maintained as a stable state in which the coupling lever houses the cam driven pin in a half-closed state (for example, by reference to patent document 1).

[0004] Patent document 1 Japan Patent Utility No. H07-55827

The technical Problem to be solved in the invention

[0005] Although, in present condition, all kinds of devices have uniform specification about basic functions in consideration of interchangeability and user convenience, a plurality of specifications still co-exist in terms of specific functions. It is outstanding especially in the field of a connector used for connecting devices electrically. There is a case that connectors having a different shape and size are used by each manufacturer or in each device type. For example, as to vehicle acoustic devices installed on an automobile, there is a case that connectors electrically connecting an amplifier and a speaker system are different depending on an automobile manufacturer and an automobile type.

[0006] Here, when a speaker system only has a connector corresponding to a specific automobile manufacturer or a specific automobile type, selection of the speaker system by a user is limited. On the other hand, different connectors equipped for the speaker system corresponding to each automobile manufacturer or each automobile type, will result in the increasing cost of the speaker system. Thus, there is a need for a compatible connector which can be engaged with a plurality of connectors having different shapes and sizes, and a connecting structure of connectors composed of the compatible connector and the plurality of connectors.

[0007] However, in a connecting structure of the said known connectors, in the case that one connector is electrically connected to another connector by inserting the one connector housing into the internal space of the another connector housing, when a volume of the internal space of the another connector housing is larger than a volume of the internal space of the one connector housing, there is a gap formed between the one connector housing and the another connector housing. Thus, the one connector housing is loose in the internal space of the another connector housing, and there is a problem that it is difficult to securely fix the another connector housing within the internal space of the one connector housing. As a result, there is a problem that a malfunction and a breakdown in the electric device using the structure of the connectors will be generated because of the deficient electrical connection of the cable with two connectors.

[0008] The probability of the problem occurring is high, because a gap between the one connector and the another connector generates easily for compatible connectors capable of connecting a plurality of connectors having different shapes and sizes. Meanwhile, if the gap is decreased, the compatibility of the connector is lost.

Summary

[0009] In view of the problem the invention is completed. It is an object of the invention to provide a connector and a connecting structure of connectors which can solve the problem.

[0010] In order to solve the problem, the connector of the present invention comprising: a housing including an internal space, and a connecting terminal supported by the housing; a first wall constituting the internal space of the housing and supporting the connecting terminal; a second wall substantially orthogonal to the first wall to form the internal space having an embed aiding part, the embed aiding part is free to rotate around the second wall and has a projection-shaped part protruding toward the internal space.

[0011] Also, the connecting structure of connectors according to the present invention comprising: the first connector and the second connector of the connector of Claim 1, wherein the second connector is arranged in the internal space of the first connector, and the second connector is fixed in the first connector.

[0012] Also, the connecting structure of connectors of

the present invention comprising a first connector and a second connector, a portion of the second connector is arranged in the first connector, the first connector including: a housing having an internal space in which the portion of the second connector is arranged; and a connecting terminal supported by the housing for connecting the second connector to the outside electrically; a wall of the housing which faces the second connector having a thick wall and a thin wall which is thinner than the thick wall, wherein the second connector has a protrusion part toward the wall of the housing, which passes through the thin wall, thereby the second connector is fixed in the first connector.

Brief Description of the Drawings

[0013] Figure 1 is a perspective view explaining the configuration of the connector 1 of the embodiment 1 according to the invention.

[0014] Figure 2 is a perspective view explaining the configuration of the connector 1 as shown in Figure 1 when viewed from a slightly left angle to the front.

[0015] Figure 3 is a perspective view explaining the configuration of the connector 1 as shown in Figure 1 when viewed from a slightly right angle to the front.

[0016] Figure 4 is a perspective view explaining the configuration of the connector 1 as shown in Figure 1 when viewed from a slightly upper side to the back.

[0017] Figure 5 is a left side view explaining the configuration of the connector 1 as shown in Figure 1.

[0018] Figure 6 is a perspective view explaining the state that an embed aiding part is mounted on the upper flange and the lower flange in the connector 1 as shown in Figure 1.

[0019] Figure 7 is a perspective view explaining the configuration of one example of the small connector when viewed from the upper right angle to the front.

[0020] Figure 8 is a perspective view explaining the configuration of the connector as shown in Figure 7 when viewed from the upper left angle to the front.

[0021] Figure 9 is a perspective view explaining the state that the connector as shown in Figure 7 is fitted in the connector as shown in Figure 1.

[0022] Figure 10 is a perspective view explaining the state that the connector as shown in Figure 7 is fitted in the connector as shown in Figure 1 when viewed from an angle different from the angle in Figure 9.

[0023] Figure 11 is a section view explaining the state that the connector as shown in Figure 7 is embedded in the connector as shown in Figure 1.

[0024] Figure 12 is a perspective view explaining the configuration of one example of the large connector when viewed from the upper right angle to the front.

[0025] Figure 13 is a perspective view explaining the configuration of the connector as shown in Figure 12 when viewed from the upper left angle to the front.

[0026] Figure 14 is a section view explaining the state that the connector as shown in Figure 12 is embedded in the connector as shown in Figure 1.

[0027] Figure 15 is a perspective view explaining the state that the connector as shown in Figure 12 is embedded in the connector as shown in Figure 1 when viewed from an angle different from the angle in Figure 14.

[0028] Figure 16 is a perspective view explaining the configuration of another example of the small connector when viewed from the upper right angle to the front.

[0029] Figure 17 is a perspective view explaining the configuration of the connector as shown in Figure 16 when viewed from the upper left angle to the front.

[0030] Figure 18 is a perspective view explaining the state that the connector as shown in Figure 16 is embedded in the connector as shown in Figure 1.

[0031] Figure 19 is a perspective view explaining the state that the connector as shown in Figure 16 is embedded in the connector as shown in Figure 1 when viewed from an angle different from the angle in Figure 18.

[0032] Figure 20 is a side view explaining the state that the connector as shown in Figure 16 is embedded in the connector as shown in Figure 1.

[0033] Figure 21 is a front view explaining the state that the connector as shown in Figure 16 is embedded in the connector as shown in Figure 1.

[0034] Figure 22 is a section view explaining the state that the connector as shown in Figure 16 is embedded in the connector as shown in Figure 1.

[0035] Figure 23 is a front view explaining the configuration of the connector of the embodiment 2 according to the invention.

[0036] Figure 24 is a plan view explaining the configuration of the connector of the embodiment 3 according to the invention.

[0037] Figure 25 is a section view explaining the state that another example of the large connector is embedded in the connector as shown in Figure 24.

[0038] Figure 26 is a section view explaining the state that another example of the large connector is embedded in the connector as shown in Figure 24 after a portion of the thin wall of the connector as shown in Figure 24 is cut out.

[0039] Figure 27 is a perspective view explaining the configuration of the connector of the embodiment 4 according to the invention.

[0040] Figure 28 is a perspective view explaining the configuration of the connector as shown in Figure 27 when viewed from a slightly left angle to the front.

[0041] Figure 29 is a perspective view explaining the configuration of the connector as shown in Figure 27 when viewed from a slightly right angle to the front.

[0042] Figure 30 is a perspective view explaining the configuration of the connector as shown in Figure 27 when viewed from a slightly upper backside.

[0043] Figure 31 is a perspective view explaining the state that the connector as shown in Figure 7 is embedded in the connector as shown in Figure 27.

[0044] Figure 32 is a perspective view explaining the state that the connector as shown in Figure 7 is embed-

ded in the connector as shown in Figure 27 when viewed from an angle different from the angle in Figure 31.

[0045] Figure 33 is a section view explaining the state that the connector as shown in Figure 12 is embedded in the connector as shown in Figure 27.

[0046] Figure 34 is a perspective view explaining the state that the connector as shown in Figure 12 is embedded in the connector as shown in Figure 27 when viewed from an angle different from the angle in Figure 33.

[0047] Figure 35 is a front view explaining the configuration of the connector of the embodiment 5 according to the invention.

[0048] Figure 36 is a plan view explaining the configuration of the connector of the embodiment 6 according to the invention.

[0049] Figure 37 is a section view explaining the state that another example of the large connector is embedded in the connector as shown in Figure 36.

[0050] Figure 38 is a section view explaining the state that another example of the large connector is embedded in the connector as shown in Figure 36.

[0051] Figure 39 is a plan view explaining the configuration of the connector of the embodiment 6 according to the invention.

Description of reference numerals

[0052]

1	connector
11	housing
12	connecting terminal
12a	latch protrusion
13	connecting terminal
13a	latch projection
21	main body
21a	opening
21b	front wall
21ba	rectangular wall
21bb	enclosing wall
21c	left side wall
21d	right side wall
21e	bottom plate part
21f	top plate part
22	terminal supporting portion
22a	terminal receiving chamber
22b	terminal receiving chamber
22c	opening
22d	opening
23	internal space
24	upper projection
25	left projection
26	lower projection
27	right projection
28	contacting part
31	base
31a	connecting part
32	embed aiding part
32a	latch claw
32b	latch claw
32c	slanting part
32d	slanting part
33	upper flange
34	lower flange
35	opening
36	step part
37	step part
38	step part
39	guide groove
39a	step part
40	guide groove
41	opening
51	connector
52	housing
53	connecting terminal
54	connecting terminal
61	main body
61a	terminal receiving chamber
61b	terminal receiving chamber
61c	tip
62	protrusion for latch
62a	latch projection
62b	operating part
62c	tip
71	connector
72	housing
73	connecting terminal
74	connecting terminal
81	main body
81a	terminal receiving chamber
81b	terminal receiving chamber
82	rectangular protruding part
82a	entering portion for contacting part
82aa	opening
82b	latch projection
82c	operating part
83	protruding bar
83a	step part
84	protruding bar
91	connector
92	elastic member
101	connector
102	main body
103	top plate
103a	thick wall
103b	thin wall
105	opening
111	connector
112	protrusion for latch
112a	latch protrusion
121	connector
122	housing
123	connecting terminal
124	connecting terminal
131	main body
131a	terminal receiving chamber

131b terminal receiving chamber
131c tip
132 protrusion for latch
132a latch protrusion
132b operating part

Detailed Description

[0053] The best embodiment of the invention will be described by reference to the accompanying drawings.

[0054] Embodiment 1

[0055] Figure 1 is a perspective view explaining the configuration of a connector 1 of the embodiment 1 according to the invention, Figure 2 is a perspective view explaining the configuration of connector 1 as shown in Figure 1 when viewed from a slightly left angle to the front, Figure 3 is a perspective view explaining the configuration of connector 1 as shown in Figure 1 when viewed from a slightly right angle to the front. Also, Figure 4 is a perspective view explaining the configuration of connector 1 as shown in Figure 1 when viewed from a slightly upper side to the back, Figure 5 is a left side view explaining the configuration of connector 1 as shown in Figure 1.

[0056] The connector 1 of the embodiment 1 is adapted to electrically connect a vehicle acoustic device, such as an amplifier with a connector having a different shape and size depending on each automobile manufacturer and each automobile type, to a speaker system. The connector 1 corresponds to "the first connector" of Claim 9, and connectors with the different shape and size correspond to "the second connector" of Claim 9.

[0057] The connector 1 includes a housing 11 and two connecting terminals 12, 13 of substantially thin sheet shape. Housing 11 is made from a synthetic resin such as ABS resin, polypropylene or polystyrene, nylon 66, polybutylene terephthalate (PBT), and is formed by such means as injection molding and extrusion molding. On the other hand, the connecting terminals 12 and 13 are made of substrate such as brass, nickel and the like, with a surface of the substrate plated by tin alloy and the like, and have conductivity. The bases of the connecting terminals 12 and 13 are not shown, with lead wires riveted and connected to the terminals of the speaker system respectively.

[0058] The housing 11 is an integrated structure of a main body 21 and a terminal supporting portion 22. The second connector is inserted into and connected to the main body 21. The terminal supporting portion 22 houses and supports the bases of the connecting terminals 12 and 13 (not shown in Figures). An opening 21 a is formed in a front of the main body 21, regarded the front of the main body 21 as the side in which the second connector is inserted. The main body 21 has a front wall 21b, a left side wall 21c, a right side wall 21d, a bottom plate part 21e, and a top plate part 21f formed integrally. The portion enclosed by the front wall 21b, the left side wall 21c, the right side wall 21d, the bottom plate part 21e and the top plate part 21f forms an internal space 23. The second connector is inserted into the internal space 23.

[0059] The front wall 21b constitutes the boundary of the terminal supporting portion 22 therewith, and a portion of the connecting terminals 12, 13 projects from the surface of the front wall 21b. The front wall 21b is composed of a rectangular wall 21ba and an enclosing wall 21bb. The reason is as follows. First, in the second connector inserted into the connector 1, it is supposed that the front end of the second connector with a shape having small width (the right-and-left length) and large length in the depth direction is inserted into the enclosing wall 21bb, thereby is in contact with the rectangular wall 21ba. Second, in the second connector inserted into the connector 1, it is supposed that the front end of the second connector with a shape having large width (the right-and-left length) and small length in the depth direction contact with the enclosing wall 21bb.

[0060] The rectangular wall 21ba is substantially rectangular, and a portion of the connecting terminals 12, 13 projects from the surface of the rectangular wall 21ba respectively. The enclosing wall 21bb, compared with the rectangular wall 21ba, projects further towards the front, thereby the enclosing wall 21bb, except a portion thereof opposite to the right side wall 21d, almost entirely encloses a circumference of the rectangular wall 21ba. The enclosing wall 21bb has an upper projection part 24 connected to the top plate part 21f, a left projection part 25 connected to the left side wall 21c, a lower projection part 26 connected to the bottom plate part 21e, and a right projection part 27 connected to the right side wall 21d.

[0061] Wherein, a contacting part 28 is integrated with the upper projection part 24 at substantially central position of the upper projection part 24 which faces the rectangular wall 21ba. In the second connector (omitted), the contacting part 28 limits the entering of the second connector by contacting the tip constituting a portion of the second connector (for example, the tip 62c of connector 51 shown in Figure 7 and Figure 8). Herein, due to the entering of the second connector limited by the contacting part 28, parts in the second connector, even if capable of moving towards the depth of the internal space 23, can be securely fixed in the internal space 23.

[0062] The left side wall 21c has a base 31 and an embed aiding part 32. The base 31 and the embed aiding part 32 are formed integrally. The base 31 extends from the portion connecting to the left projection part 25 towards the opening 21 a for a distance slightly shorter than the substantially half of the distance from the portion connecting with the left projection part 25 to the opening 21 a. At the substantially central tip of the base 31, the embed aiding part 32 is connected by means of the connecting part 31 a, while rotating around the connecting part 31 a as the base point. On the other hand, on the upper end and the lower end of the base 31 are connected the upper rim 33 and the lower rim 34, and extend up to the opening 21 a. The embed aiding part 32 is provided

to assist securely fixing the portion of the second connector having a small size in the left-right direction (hereinafter referred to as "the small connector") in the internal space 23 without limitation of the volume of the internal space 23 by being equipped at the upper rim 33 and the lower rim 34.

[0063] Latch claws 32a and 32b are formed on the top end and lower end of the embed aiding part 32. When the embed aiding part 32 rotates for example towards the front side of Figure 1 and Figure 2 (hereinafter referred to as the connecting direction), the latch claw 32a contacts with the upper rim 33 and the lower rim 34 respectively. Further, when the embed aiding part 32 rotates towards the connecting direction, the latch claws 32a and 32b engage the upper rim 33 and the lower rim 34 respectively after the latch claw 32a and 32b enter the internal space 23, and the rotation of the embed aiding part 32 inside of the Figure (hereinafter referred to as the releasing direction) is latched. Figure 6 is a perspective view explaining the state that the embed aiding part 32 is connected to the upper rim 33 and the lower rim 34 in the connector 1 as shown in Figure 1. Thus, the internal space 23 is secured by the latch claws 32a and 32b connecting the upper rim 33 and the lower rim 34 respectively, and the small connector is housed and securely fixed in the internal space 23.

[0064] In the released state that the embed aiding part 32 is not connected to the upper rim 33 and the lower rim 34, an angle between the embed aiding part 32 and the base 31 is about 80-about 120 degrees. Since the embed aiding part 32 is formed in a certain angle against the base 31, the embed aiding part 32 is sure to connect the upper rim 33 and the lower rim 34 by the restoring force of the embed aiding part 32 towards the releasing direction. Also, when the embed aiding part 32 is bent in the side of the base 31, the stress applied to the connecting part 31 a between the base 31 and the embed aiding part 32 is alleviated by pre-shaping the embed aiding part 32 as described above and the embed aiding part 32 is refrained from breaking off. Besides, the thickness of the connecting part 31 a is formed thinner than the thickness of the base 31. As discussed below, when the embed aiding part 32 is not needed, the embed aiding part 32 can be easily cut off using a cutter and so on because the thickness of the connecting part 31 a is formed thinner than the thickness of the base 31.

[0065] A connecting portion of the base 31 is formed inside the embed aiding part 32, that is to say, two slanting parts 32c and 32d are formed in the vicinity of the connecting part 31 a. In the state that the embed aiding part 32 is connected to the upper rim 33 and the lower rim 34, when the small connector is embedded in the first connector, the slanting parts 32c and 32d guide the small connector to hold the small connector in the internal space 23 or press the small connector to the right side wall 21d in order that the small connector is securely housed in the internal space 23. Also, in the state that the embed aiding part 32 is connected to the upper rim 33 and the lower rim 34, these slanting parts 32c and 32d are disposed in positions nearer to the opening 21 a, compared to the connecting terminals 12 and 13, in the internal space 23. Thus, the connection of connecting terminal constituting the small connector with the connecting terminals 12, 13 is not obstructed, while the small connector is housed in the internal space 23.

[0066] The right side wall 21d extends from the portion connected to the right projection part 27 towards the opening 21 a for about two thirds of the distance from the portion connected to the right projection part 27 to the opening 21a. A substantially rectangular opening 35 is formed in the substantial centre of the right side wall 21d. The opening 35 is configured such that the sides of a portion of the second connector having large size in the right-and-left direction (hereinafter referred to as "the large connector") can be securely embedded. The back end of the opening 35 reaches between the two right projection parts 27, the front end thereof reaches close to the front end of the right side wall 21d. Besides, the step part 36 with three steps is formed on a top end inside the right side wall 21d. When a portion of the large connector is inserted into the internal space 23, the step part 36 guides the partial side of the large connector.

[0067] The step parts 37, 38 are formed on the two ends of the bottom plate part 21e, and when a portion of the large connector is inserted into the internal space 23, these step parts guide a portion of the two low ends of the large connector. On the other hand, the guide grooves 39, 40 are formed on the two ends of the top plate 21f, and when a portion of the large connector is inserted into the internal space 23, these guide grooves 39, 40 guide protruding bars formed on the two top ends of the portion of the large connector (by reference to the connector 71 shown in Figure 12 and Figure 13, for example, as indicated by reference numerals 83 and 84). The guide groove 39 is formed for about two thirds of the distance from the portion connected to the upper projection part 24 of the top plate part 21f to the opening 21a, namely, the groove is shallow at the position same as the tip of the right side wall 21d, and is deep from the position to the opening 21a. Thus, when a portion of the large connector is inserted into the internal space 23, step parts of the protruding bars formed on the two top ends of the portion of the large connector (by reference to the step part 83a of the protruding bar 83 of the connector 71 shown in Figure 12, for example) are in contact with the step part 39a formed at the boundary of the shallow portion and the deep portion of the guide groove 39. A substantially rectangular opening 41 is formed substantially in the centre of the top plate part 21f. A latch protrusion formed on the second connector (by reference to latch protrusion 62a of the connector 51 shown in Figure 7 and Figure 8, for example) is inserted into and latched in the opening 41.

[0068] Referring to Fig. 4, the terminal supporting portion 22 has a terminal housing chamber 22a into which the connecting terminal 12 connected with a wire (not

shown) is inserted, and a terminal housing chamber 22b into which the connecting terminal 13 connected with a wire (not shown) is inserted. Substantially rectangular openings 22c and 22d are formed in the substantial centre of the top plates of the terminal housing chamber 22a and the terminal housing chamber 22b respectively. Latch protrusions 12a and 13a formed on the connecting terminals 12 and 13 are inserted into and latched in the openings 22c and 22d respectively.

[0069] Then, the structure of the second connector is illuminated by reference to the accompanying drawings. Figure 7 is a perspective view explaining the configuration of one example of the small connector, namely connector 51, when viewed from the upper right angle to the front. Figure 8 is a perspective view explaining the configuration of the connector 51 as shown in Figure 7 when viewed from the upper left angle to the front. The housing 52 is made from synthetic resin such as ABS resin, polypropylene or polystyrene, nylon 66, polybutylene terephthalate (PBT), and is formed by such means of injection molding and extrusion molding.

[0070] The housing 52 includes a main body 61 and a protrusion for a latch 62. The main body 61 and the protrusion for the latch 62 are formed integrally. The main body 61 has a terminal housing chamber 61 a into which the connecting terminal 53 connected with a wire (not shown) is inserted, and a terminal housing chamber 61 b into which the connecting terminal 54 connected with a wire (not shown) is inserted. The protrusion for the latch 62 is formed integrally on the tip 61 c of the main body 61 and in the substantial centre thereof. The protrusion for the latch 62 extends on the tip 61 c of the main body 61 vertically from the substantial centre to the upside, and then extends rearward substantially parallel to the connector axis of the main body 61 (longitudinal axis: the inserting direction of the connector 1). That is to say, the protrusion for the latch 62 is formed to bend due to elastic deformation. The length of the protrusion for the latch 62 is three fourths of the length of the main body 61.

[0071] A latch protrusion 62a is formed on the protrusion for the latch 62 and in the substantial centre thereof. In the protrusion for the latch 62 as shown in the Figure 9 and Figure 10, when the connector 51 is embedded in the connector 1, the latch protrusion 62a formed on the protrusion for latch 62 is inserted into the opening 41 formed on the substantial centre of the top plate part 21f provided on the main body 21 constituting the housing 11 of the connector 1, by the restoring force of the protrusion for the latch 62, to refrain the connector 51 from pulling out. At this time, as shown in Figure 11, the tip 62c of the protrusion for the latch 62 contacts the contacting part 28 formed on the upper projection part 24 provided on the main body 21 constituting the housing 11 of the connector 1, to refrain the connector 51 from entering. Thus, due to the entering of the second connector limited by the contacting part 28, the connector 51, even if capable of moving towards the depth of the internal space 23, can be securely fixed in the internal space 23. Besides, by embedding the connector 51 with the connector 1, the connecting terminal 12 of the connector 1 and the connecting terminal 53 of the connector 51 connect to each other, and the connecting terminal 13 of the connector 1 and the connecting terminal 54 of the connector 51 connect to each other.

[0072] Also, when the connector 51 is detached, the operating part 62b formed on the protrusion for latch 62 is pressed and the protrusion for the latch 62 is bent, and thus the latch protrusion 62a is disengaged from the opening 41. If in the case of maintaining the above mentioned state the connector 51 is pulled towards the back of the connector 51 (in the direction towards the end side of the protrusion for the latch 62), the embedding state of the connector 1 and the connector 51 is released. In addition, on the left side wall 21c of the connector 1 shown in the Figure 9-11, although the embed aiding part 32 is connected to the base 31, in real use, the embed aiding part 32 is cut from the substantial central tip of the base 31.

[0073] Then, the structure of the large connector among the second connectors is illustrated by reference to the accompanying drawings. Figure 12 is a perspective view explaining the configuration of one example of the large connector, namely connector 71, when viewed from the upper right angle to the front. Figure 13 is a perspective view explaining the configuration of the connector 71 as shown in Figure 12 when viewed from the upper left angle to the front. The connector 71 has a housing 72 and two connecting terminals 73, 74. The housing 72 is made from synthetic resin such as ABS resin, polypropylene or polystyrene, nylon 66, polybutylene terephthalate (PBT), and is formed by such means as injection molding and extrusion molding.

[0074] The housing 72 includes a main body 81, a rectangular protruding part 82, protruding bars 83 and 84. The main body 81, the rectangular protruding part 82, the protruding bars 83 and 84 are formed integrally. The main body 81 has a terminal housing chamber 81 a into which the connecting terminal 73 connected with a wire (not shown) is inserted, and a terminal housing chamber 81 b into which the connecting terminal 74 connected with a wire (not shown) is inserted.

[0075] On the upper part of the main body 81 and in the substantial centre thereof, the rectangular protruding part 82 is formed integrally with the main body 81 and extends substantially parallel to the connector axis of the main body 81 (longitudinal axis, for the inserting direction of the connector 1). The rectangular protruding part 82 is formed integrally with a contacting part entering portion 82a, a latch protrusion 82b, and an operating part 82c from the front side to the back side. A substantially rectangular opening 82aa is formed at the contacting part entering portion 82a. When the connector 71 is inserted into the connector 1, a portion of the contacting part 28 formed on the upper projection 24 constituting the connector 1 enters.

[0076] The latch protrusion 82b is formed on the sub-

stantial central portion of the rectangular protruding part 82. As shown in Figure 14 and Figure 15, when the connector 71 is inserted into the connector 1, the latch protrusion 82b is inserted into and caught by the opening 41 formed on the substantial centre of the top plate part 21f included in the main body 21 to constitute the housing 11 of the connector 1. Besides, when the connector 71 is detached, the rectangular protruding part 82 is bent and the latch protrusion 82b is disengaged from the opening 41 by pressing the operating part 82c formed on the rectangular protruding part 82. If in the case of the above mentioned state being maintained, the connector 71 is pulled towards the back of the connector 71, the embedding state of the connector 1 and the connector 71 is released.

[0077] The protruding bars 83 and 84 are guided by the guide grooves 39 and 40 formed on each of the two ends of the top plate 21f when the connector 71 is embedded to the connector 1. As discussed above, the guide groove 39 is formed to be shallow for about two thirds of the distance from the portion connected to the upper projection part 24 of the top plate part 21f to the opening 21a, and to be deep from the position to the opening 21a. Correspondingly, the protruding bar 83 is formed to be low for about two thirds of the distance from the front of the connector 71 to the operating part 82c, and to be high from the position to the operating part 82c. That is to say, a step part 83a is formed. Thus, when the connector 71 is embedded to the connector 1, the step part 83a formed of the protruding bar 83 of the connector 71 abuts against the step part 39a formed at the boundary of the shallow portion and the deep portion of the guide groove 39. Besides, on the left side wall 21c of the connector 1 shown in the Figure 14 and 15, although the embed aiding part 32 is connected to the base 31, in real use, the embed aiding part 32 is cut from the substantial central tip of the base 31.

[0078] Then, Figure 16 is a perspective view explaining the configuration of another example of the small connector, namely connector 121, when viewed from the upper right angle to the front. Figure 17 is a perspective view explaining the configuration of the connector 121 as shown in Figure 16 when viewed from the upper left angle to the front. And Figure 18 is a perspective view explaining the state that the connector 121 is embedded in the connector 1 as shown in Figure 1. Figure 19 is a perspective view explaining the state that the connector 121 is embedded in the connector 1 when viewed from an angle different from the angle in Figure 18. Further, Figure 20 is a side view explaining the state that the connector 121 is embedded in the connector 1. Figure 21 is a front view explaining the state that the connector 121 is embedded in the connector 1. Figure 22 is a section view explaining the state that the connector 121 is embedded in the connector 1. In the Figure 18-22, the same numerals represent the same parts as the parts in the Figure 1-6, and the description thereof is omitted.

[0079] The connector 121 has a housing 122 and two connecting terminals 123,124. The housing 122 is made from synthetic resin such as ABS resin, polypropylene or polystyrene, nylon 66, polybutylene terephthalate (PBT), and is formed by such means as injection molding and extrusion molding.

[0080] The housing 122 includes a main body 131, a protrusion for a latch 132. The main body 131 and the protrusion for the latch 132 are formed integrally. The main body 131 includes a terminal having chamber 131 a into which the connecting terminal 123 connected with a wire (not shown) is inserted , and a terminal having chamber 131b into which the connecting terminal 124 connected with a wire (not shown) is inserted. The protrusion for the latch 132 is formed on the left side surface of the tip 131c of the main body 131 to be integrated therewith. The protrusion for the latch 132 extends substantially horizontally from the left side surface of the tip 131 c of the main body 131 to the left side, and then extends rearward substantially parallel to the connector axis of the main body 131 (longitudinal axis: the inserting direction of the connector 1). That is to say, the protrusion for the latch 132 is formed to bend due to elastic deformation. The length of the protrusion for the latch 132 is about equal to the length of the main body 131.

[0081] A latch protrusion 132a is formed in the substantial centre of the protrusion for the latch 132 and on the left side surface thereof. In the protrusion for the latch 132 as shown in the Figure 18, 19 and 20, when the connector 121 is embedded with the connector 1, the latch protrusion 132a formed on the protrusion for the latch 132 is inserted into the opening 35 formed on the right side wall 21 d included in the main body 21 constituting the housing 11 of the connector 1, by the restoring force of the protrusion for the latch 132, to refrain the connector 121 from pulling out. Thereby, the connector 121 is securely fixed in the connector 1. Besides, by the connector 121 embedded with the connector 1, the connecting terminal 12 of the connector 1 and the connecting terminal 123 of the connector 121 connect to each other, and the connecting terminal 13 of the connector 1 and the connecting terminal 124 of the connector 121 connect to each other.

[0082] Also, when the connector 121 is detached, the protrusion for the latch 132 is bent and the latch protrusion 132a is disengaged from the opening 35 by pressing the operating part 132b formed on the protrusion for the latch 132. If in the case of maintaining the above mentioned state the connector 121 is pulled towards the back of the connector 121 (in the direction towards the end side of the protrusion for latch 132), the embedding state of the connector 1 and the connector 121 is released. In addition, as shown in Figures 19, 21 and 22, an embed aiding part 32 connected with the base 31 of the left side wall 21c of the connector 1 connects the upper rim 33 and lower rim 34.

[0083] Thus, according to the embodiment 1, the connector 1 can be connected with any of the connectors 51, 71 and 121, so the one connector 1 can cope with

various vehicle types. Thus, preparation of many kinds of connectors is not necessary, because a user can use only one kind of the connector 1 to connect the same speaker system of different vehicle type. Namely, the small connector is securely fixed in the internal space 23 of the connector 1 with the slanting part 32c, 32d of the embed aiding part 32 without limitation of the volume of the internal space 23 of the connector 1.

Embodiment 2

[0084] Figure 23 is the configuration of the connector 91 of the embodiment 2 according to the invention (front view). In the Figure 23, the same numerals represent the same parts as the parts in the Figure 1-6, and the description thereof is omitted. The difference of the connector 91 of the embodiment 2 from the connector 1 shown in Figures 1-6 is an elastic member 92 provided on the bottom plate part 21e so that force is applied upward to the second connector inserted into the internal space 23. For example, the elastic member 92 is composed of a plate springs. So, the second connector having a height lower than the height of the internal space 23 of the connector 1 is securely fixed in the internal space 23.

[0085] The elastic member 92 includes a slope from the opening 21 a to the terminal supporting portion 22 (omitted), and the slope being low at the side of the opening 21 a, and being high at the side of the terminal supporting portion 22. The elastic member 92 guides the second connector into the internal space 23.

Embodiment 3

[0086] Figure 24 is a plan view explaining the configuration of the connector 101 of the embodiment 3 according to the invention. And Figure 25 is a section view explaining the state that another example of the large connector (i.e. a connector 111) is embedded in the connector 101 as shown in Figure 24. In Figures 24 and 25, the same numerals represent the same parts as the parts in Figures 1-6, and the description thereof is omitted. The difference of the connector 101 of the embodiment 3 from the connector 1 shown in Figures 1-6 is a main body 102 newly provided, for substituting for the main body 21.

[0087] The difference of the main body 102 from the main body 21 is a top plate part 103 newly provided, for substituting for the top plate part 21f. On the top plate part 103, a thick wall 103a and a thin wall 103b are formed integrally. The thickness of the thick wall 103a is substantially equal to individual thickness of the left side wall 21c, the right side wall 21d, and the bottom plate part 21e.The thin wall 103b of substantially rectangular shape with thickness thinner than thickness of the top plate part 103 is formed in the substantial centre of the top plate part 103.

[0088] As shown in Figure 25, if one of the large connector, i.e. the connector 111, is inserted into the internal space 23 through the opening 21 a of the connector 101 constructed as above, the connector 111 is inserted in the state that a protrusion for the latch 112 is bent due to elastic deformation, and a latch protrusion 112a formed on the substantial centre of the upward portion of the protrusion for the latch 112 reaches below the thin wall 103b. Thus, the latch protrusion 112a breaks through the thin wall 103b by the restoring force of the protrusion for the latch 112, and an opening 105 is formed in the substantial centre of the top plate part 103, and the latch protrusion 112a is inserted into the opening 105. Thereby, the connector 111 is embedded into the connector 101 and securely fixed to refrain from the pulling out of the connector 111. Also, the thin wall 103b can be cut off beforehand to form the opening 105, and then the latch protrusion 112a may be inserted into the opening 105.

[0089] Further, as shown in Figure 26, a portion of the thin wall 103b can also be cut off beforehand, or the opening 105 is formed between 103a and the thin wall 103b, and by inserting the latch protrusion 112a into the opening 105, the connector 111 is embedded into the connector 101 and securely fixed to refrain from pulling out of the connector 111, and proper modifications can also be made.

Embodiment 4

[0090] Figure 27 is a perspective view explaining the configuration of the connector 1 of the embodiment 4 according to the invention. Figure 28 is a perspective view explaining the configuration of the connector 1 as shown in Figure 27 when viewed from a slightly left angle to the front. Figure 29 is a perspective view explaining the configuration of the connector 1 as shown in Figure 27 when viewed from a slightly right angle to the front. Besides, Figure 30 is a perspective view explaining the configuration of the connector 1 as shown in Figure 27 when viewed from a slightly upper side to the back. The left view of the connector of the embodiment is shown in Figure 5. The perspective view of the main body and the terminal supporting portion in the connector is shown in Figure 6. The perspective view of the connector viewed from an upper right angle to the front is shown in Figure 7. The perspective view of the connector viewed from an upper left angle to the front is shown in Figure 8. In addition, Figure 11 is a section view explaining the state that the connector as shown in Figure 7 is embedded in the connector as shown in Figure 27. Figure 12 is a perspective view explaining the configuration of one example of the large connector when viewed from an upper right angle to the front. Figure 13 is a perspective view explaining the configuration of the connector as shown in Figure 12 when viewed from tan upper left angle to the front.

[0091] The only difference of the embodiment from Embodiment 1 will be introduced. In this embodiment, the left side wall 21c is composed of the base 31. The base 31 extends from a portion connected to the left projection part 25 towards the opening 21 a. On the other

hand, the top end and the lower end of the base 31 are connected to the upper rim 33 and the lower rim 34, up to the opening 21 a. In the following, connector having small size in the left-right direction is referred to as "the small connector".

[0092] Two slanting parts 32c, 32d are formed inside of the base 31. In order that the small connector is securely housed in the internal space 23, when embedded with the small connector, these slanting parts 32c, 32d guide the small connector to hold the small connector in the internal space 23 or press the small connector to the right side wall 21 d. Besides, these slanting parts 32c and 32d are disposed in positions nearer to the opening 21 a, compared to connecting terminals 12 and 13, in the internal space 23. Thus, the connection of connecting terminal constituting the small connector with the connecting terminals 12, 13 is not obstructed, while the small connector being housed in the internal space 23.

[0093] Moreover, when the connector 51 is detached, the protrusion for the latch 62 is bent and the latch protrusion 62a is disengaged from the opening 41 by pressing the operating part 62b formed on the protrusion for the latch 62. If in the case of maintaining the above mentioned state the connector 51 is pulled towards the back of the connector 51 (in the direction towards the end side of the protrusion for the latch 62), the embedding state of the connector 1 with the connector 51 is released.

[0094] Then, Figure 16 is a perspective view explaining the configuration of another example of the small connector, i.e. connector 121. Figure 20 is a side view explaining the state that the connector 121 is embedded in the connector as shown in Figure 27. Figure 21 is a front view explaining the state that the connector 121 is embedded in the connector as shown in Figure 27. Figure 22 is a section view explaining the state that the connector 121 is embedded in the connector as shown in Figure 27. In Figures 20-21, the same numerals represent the same parts as the parts in the Figure 27-31, and the description thereof is omitted.

[0095] A latch protrusion 132a is formed in the substantial centre of the protrusion for the latch 132 and on the left side surface thereof. In the protrusion for the latch 132 as shown in Figures 21, when the connector 121 is embedded with the connector 1, the latch protrusion 132a formed on the protrusion for the latch 132 is inserted into the opening 35 formed on the right side wall 21 d included in the main body 21 constituting the housing 11 of the connector 1, by the restoring force of the protrusion for the latch 132, to refrain the connector 121 from being pulled out. Thereby, the connector 121 is securely fixed in the connector 1. Besides, by the connector 121 embedded with the connector 1, the connecting terminal 12 of the connector 1 and the connecting terminal 123 of the connector 121 connect each other, and the connecting terminal 13 of the connector 1 and the connecting terminal 124 of the connector 121 connect each other.

[0096] Also, when the connector 121 is detached, the protrusion for the latch 132 is bent and the latch protrusion 132a is disengaged from the opening 35 by pressing the operating part 132b formed on the protrusion for the latch 132. If in the case of maintaining the above mentioned state the connector 121 is pulled towards the back of the connector 121 (in the direction towards the end side of the protrusion for latch 132), the embedding state of the connector 1 and the connector 121 is released.

Embodiment 5

[0097] Figure 35 is the configuration of the connector 91 of the embodiment 5 according to the invention (front view). In Figure 35, the same numerals represent the same parts as the parts in Figures 27-31, and the description thereof is omitted. The only difference of the embodiment from the above embodiment will be introduced. The difference of the connector 91 of the embodiment 5 from the connector 1 shown in Figures 27-31 is an elastic member 92 newly provided on the bottom plate part 21e so that force is applied upward by the second connector inserted into the internal space 23. For example, the elastic member 92 is composed of plate springs. So, the second connector having the height lower than the height of the internal space 23 of the connector 1 is securely fixed in the internal space 23.

[0098] The elastic member 92 includes a slope from the opening 21 a to the terminal supporting portion 22 (omitted), and the slope being low at the side of the opening 21 a, and being high at the side of the terminal supporting portion 22. The elastic member 92 guides the second connector into the internal space 23.

Embodiment 6

[0099] Figure 36 is a plan view explaining the configuration of the connector 101 of the embodiment 6 according to the invention. Figure 37 is a section view explaining the state that another example of the large connector (i.e. connector 111) is embedded in the connector 101 as shown in Figure 36. In Figures 36 and 37, the same numerals represent the same parts as the parts in Figures 27-30, and the description thereof is omitted. The only difference of this embodiment from the above embodiment will be introduced. The difference of the connector 101 of the embodiment 6 from the connector 1 shown in Figures 27-30 is a main body 102 newly provided, for substituting for the main body 21.

[0100] While the embodiment of the invention has been described by reference to the accompanying drawings, the specific configuration is not limited to the embodiment. Even if the technical content described in every embodiment is combined, all variations in design without departing from the spirit and scope of the invention are included in the invention.

[0101] For example, the embodiment of the first connector and the second connector having two connecting terminals is described, but it is not limited thereto, and the first connector and the second connector may have

more than three connecting terminals.

[0102] In addition, in the embodiment 3, the example is described that the generally rectangular thin wall 103b is formed on the top plate part of the connector 101, but it is not limited thereto, and the generally rectangular thin wall can also be formed on the bottom plate part of the first connector. Needless to say, a protrusion for a latch must be formed in the lower part of the second connector correspondingly.

[0103] In addition, the technology of each embodiment can be interchangeable under the condition that the object and the configuration of each embodiment have not specific conflict and problem.

Claims

1. A connector comprising:

a housing including an internal space, and a connecting terminal supported by the housing,
a first wall constituting the internal space of the housing and supporting the connecting terminal,
a second wall substantially orthogonal to the first wall to form the internal space having an embed aiding part,
wherein the embed aiding part is free to rotate around the second wall and has a projection-shaped part protruding toward the internal space.

2. The connector according to claim 1, wherein the projection-shaped part includes a side extending toward the internal space, wherein the side of the projection-shaped part has a slope surface for guiding sloping from the second wall toward the first wall.

3. The connector according to claim 2, wherein the housing includes a plurality of the second walls,
wherein one of the second walls has the embed aiding part, other of the second walls has an opening for embedding,
wherein the first wall has a contacting part extending toward the internal space,
wherein the contacting part of the first wall extends substantially parallel to the second walls.

4. The connector according to claim 3, wherein
the end of embed aiding part has a latch part to connect the second wall to the housing.

5. The connector according to claim 1, further comprising an elastic member protruding toward the internal space,
wherein the elastic member is provided on a third wall orthogonal to the first wall and the second wall respectively.

6. The connector according to claim 1, further comprising a third wall substantially orthogonal to the first wall and the second wall respectively,
wherein the third wall has a thick wall and a thin wall enclosed by the thick wall.

7. The connector according to claim 1, further comprising,
a connecting part connecting the embed aiding part and the second wall, wherein the thickness of the connecting part is less than the thickness of the second wall,
wherein the embed aiding part is free to rotate around the second wall by the connecting part bending to the second wall,
wherein a straight line, substantially parallel to the first wall and the second wall respectively, passing through the second wall, is an axis around which the embed aiding part rotates.

8. A connecting structure of connectors comprising,
a first connector and a second connector as the connector according to Claim 1,
wherein the second connector is arranged in the internal space of the first connector, and the second connector is fixed in the first connector.

9. The connecting structure of connectors according to claim 8,
wherein the projection-shaped part of the embed aiding part presses the second connector toward the internal space of the first connector.

10. The connecting structure of connectors according to claim 8, further comprising a third wall substantially orthogonal to the first wall and the second wall respectively,
wherein the third wall has a thick wall and a thin wall enclosed by the thick wall,
wherein the second connector has a protrusion part toward the third wall of the first connector,
wherein the protrusion part penetrates through the thin wall of the third wall.

11. The connecting structure of connectors according to claim 8, further comprising a third wall substantially orthogonal to the first wall and the second wall respectively,
wherein third wall has a thick wall and a thin wall enclosed by the thick wall,
wherein the second connector has a protrusion part toward the third wall of the first connector,
wherein the protrusion part is inserted into an opening formed in the thin wall.

12. The connecting structure of connectors according to claim 11,
wherein the second connector is fixed in the first con-

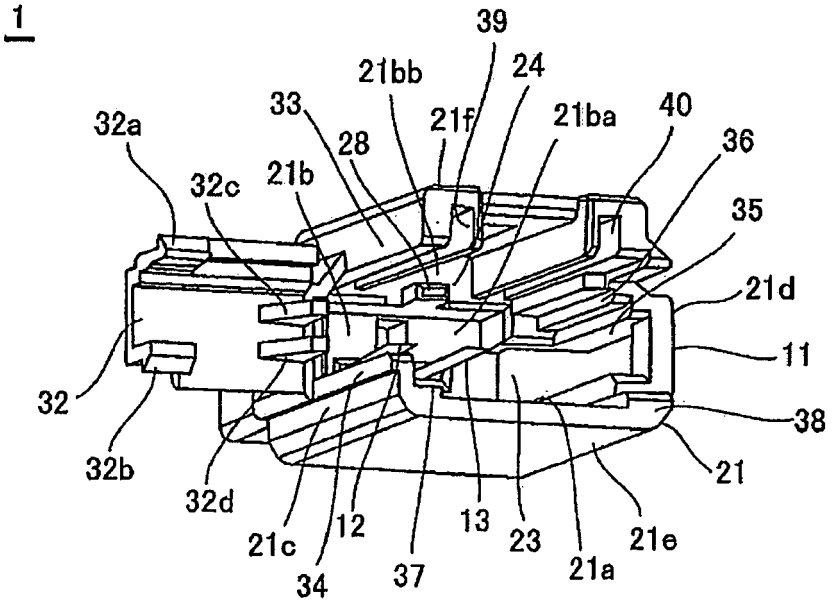
nector by the embed aiding part.

13. A connecting structure of connectors comprising,
a first connector and a second connector,
wherein a portion of the second connector is arranged in the first connector,
wherein the first connector including:

a housing having an internal space in which the portion of the second connector is arranged; and
a connecting terminal supported by the housing, for connecting the second connector to the outside electrically,
a wall of the housing which faces the second connector having a thick wall and a thin wall which is thinner than the thick wall,
wherein the second connector has a protrusion part toward the wall of the housing, which passes through the thin wall, thereby the second connector is fixed in the first connector.

14. The connecting structure of connectors according to claim 13,
wherein the protrusion part penetrates through the thin wall by inserting the second connector into the first connector.

15. The connecting structure of connectors according to claim 13,
wherein the protrusion part is inserted into an opening formed in the thin wall of the first connector.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21f
21ba
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32a
28
36
32c
21b
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21d
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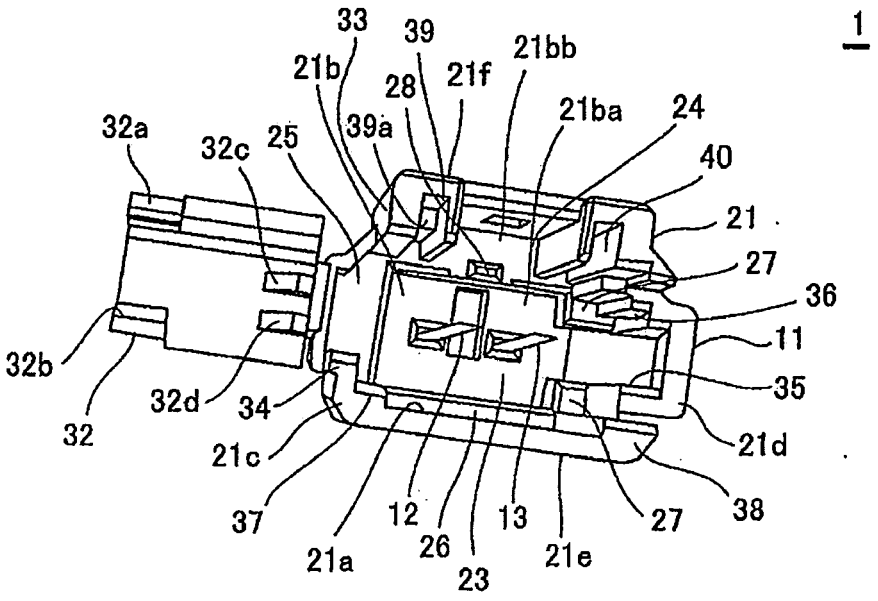
32d
21c
12
13
23
21e
34
37
21a

FIG. 1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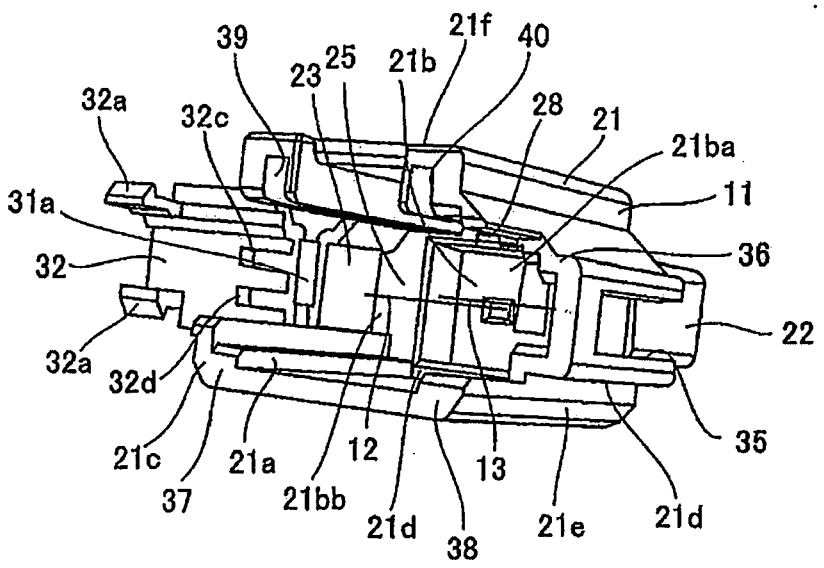
23
21e

FIG. 2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36
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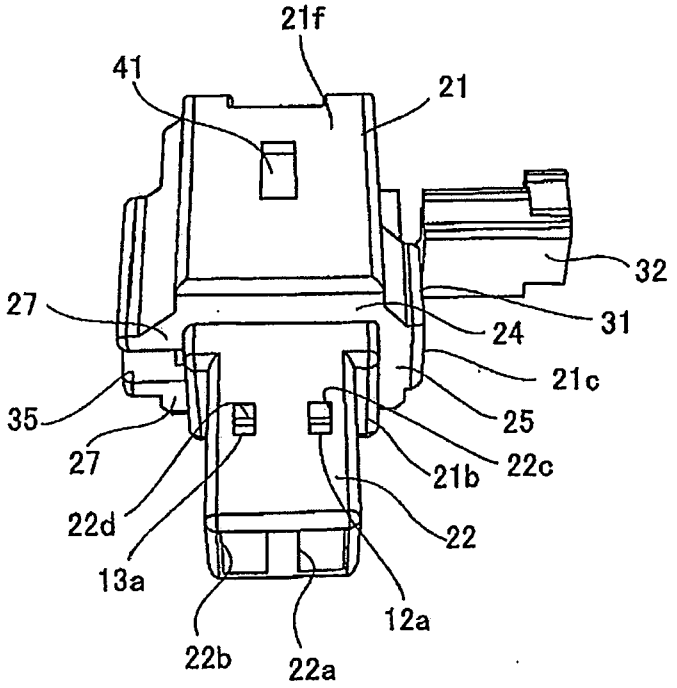
13
21e
21d

FIG. 3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41
21
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25
27
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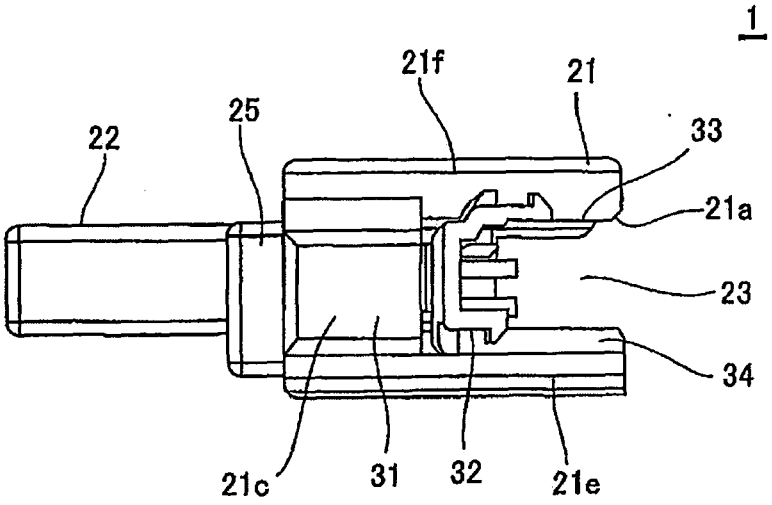
22c
22d
22
13a
12a
22b
22a

FIG. 4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22
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23
34
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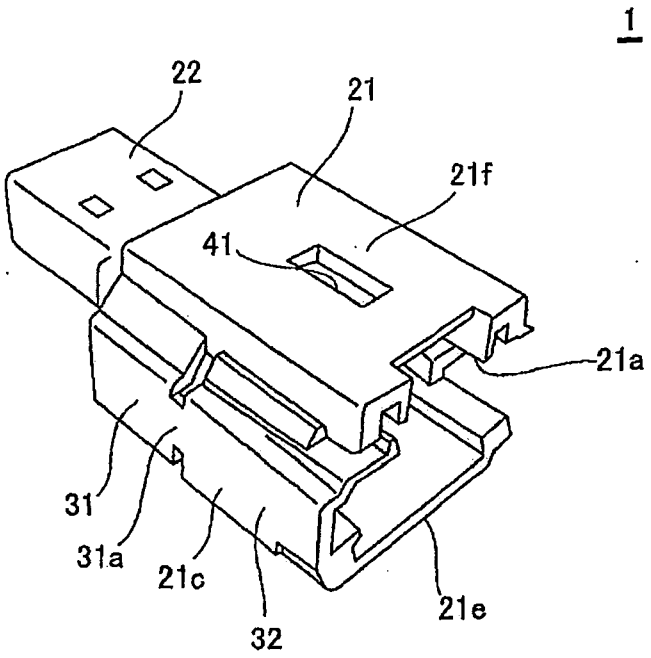
31
32
21e

FIG. 5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31a
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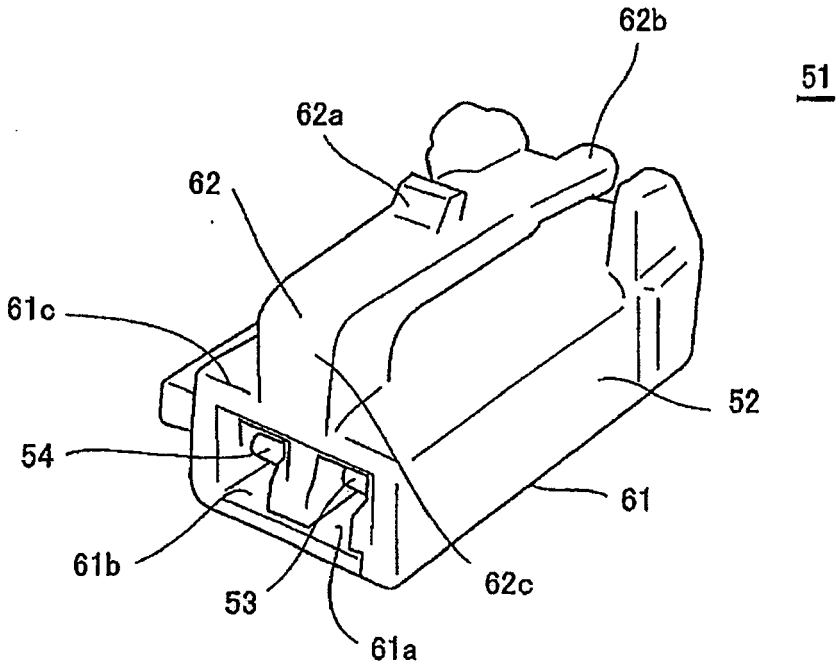
32
21e

FIG. 6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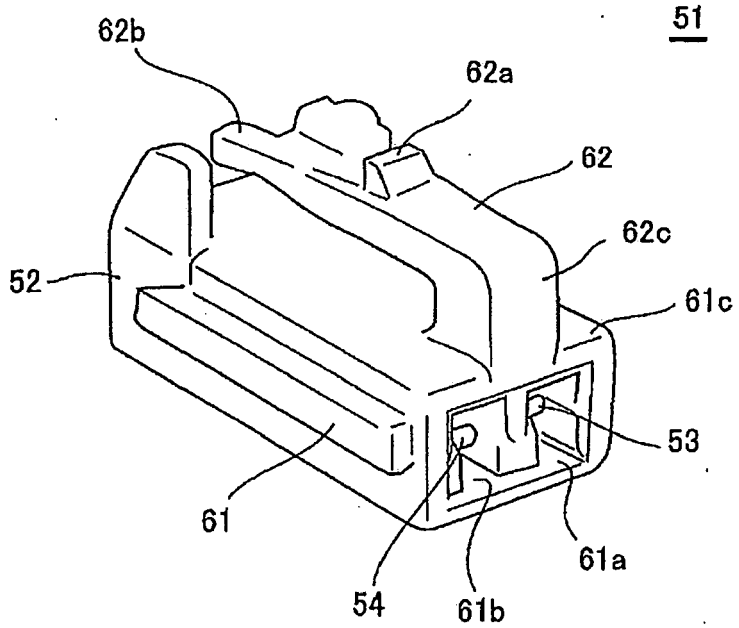
62a
62
61c
52
54
61
61b
62c
53
61a

FIG. 7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62a
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62c
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61c
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61a
54
61b

FIG. 8

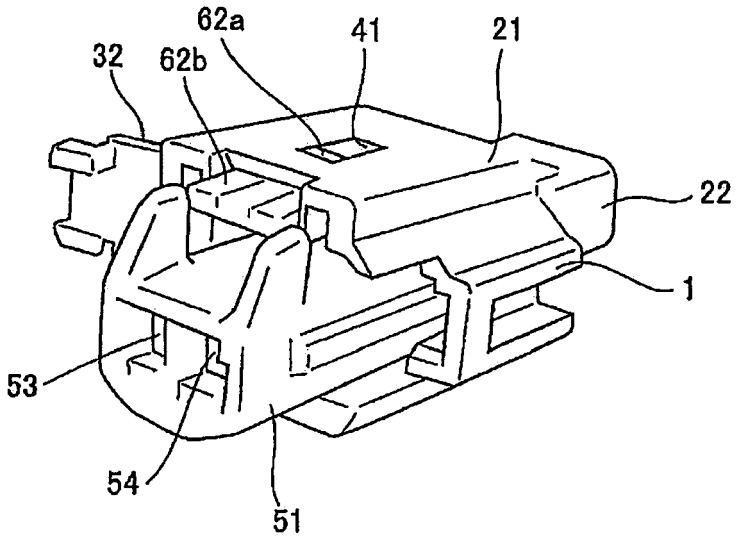


FIG. 9

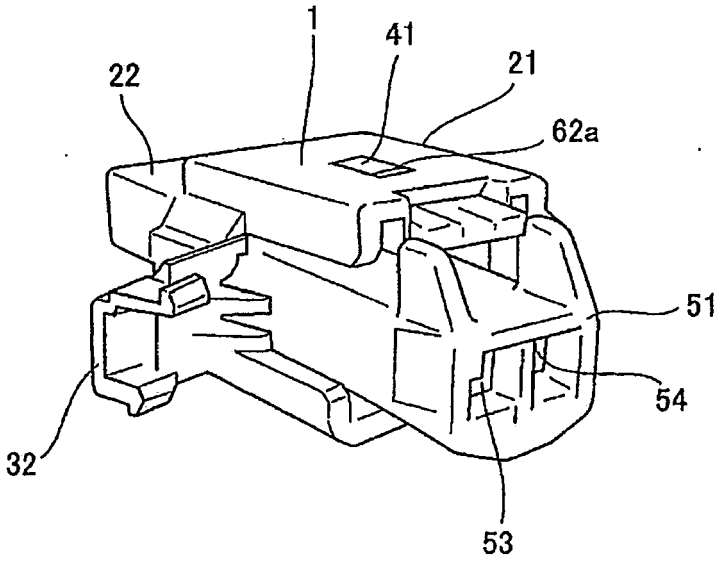


FIG. 10

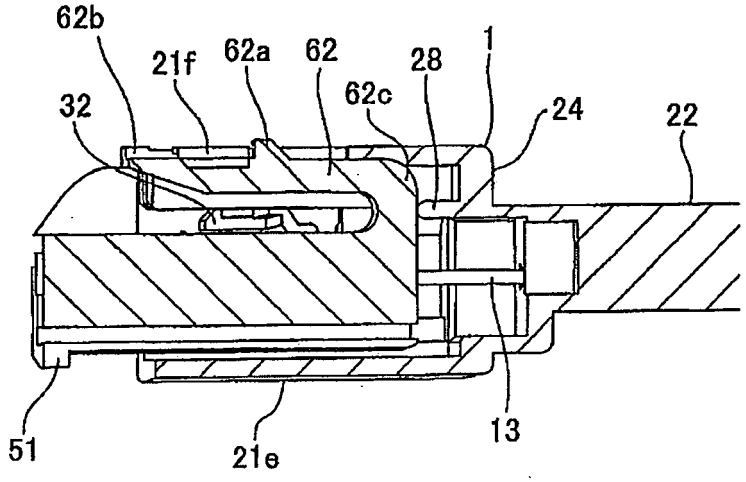
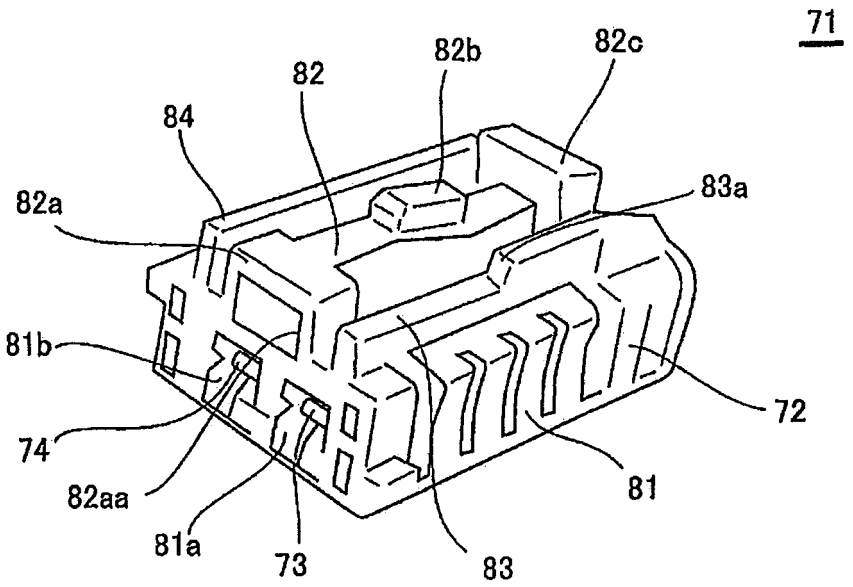


FIG. 11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82c
84
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83a
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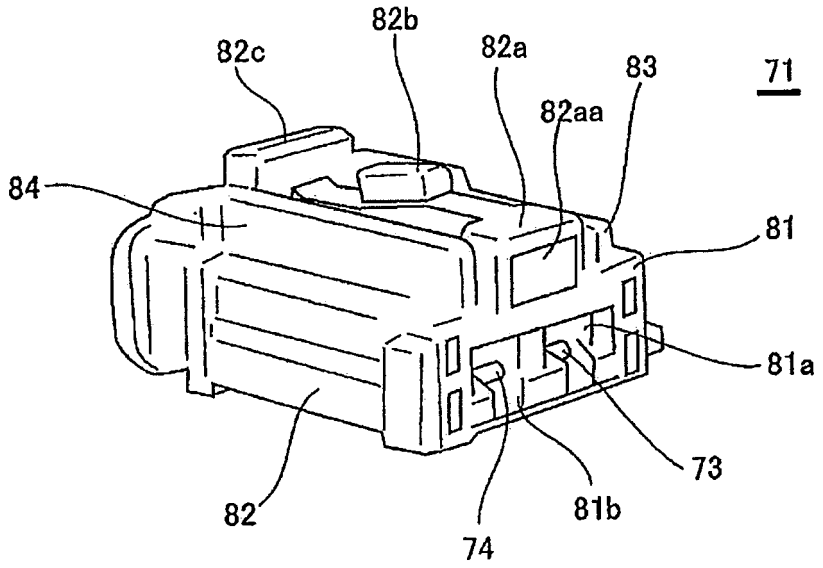
72
74
82aa
81
81a
73
83

FIG. 12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82
81b
74

FIG. 13

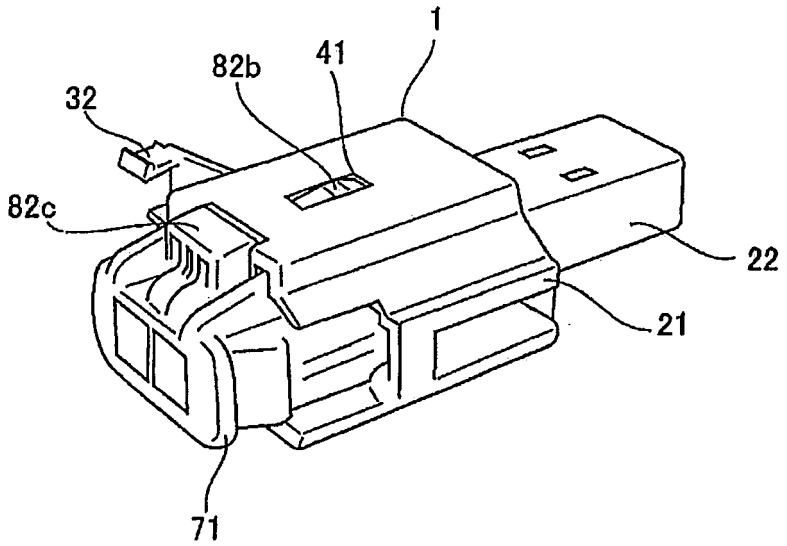


FIG. 14

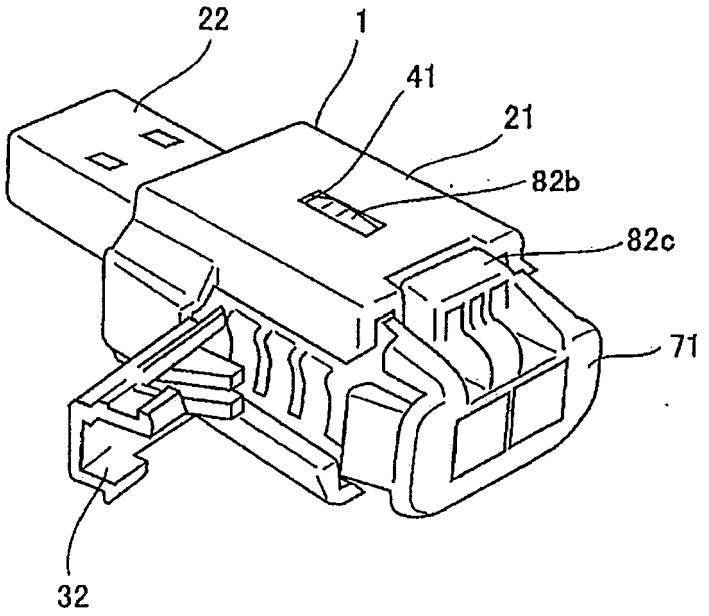
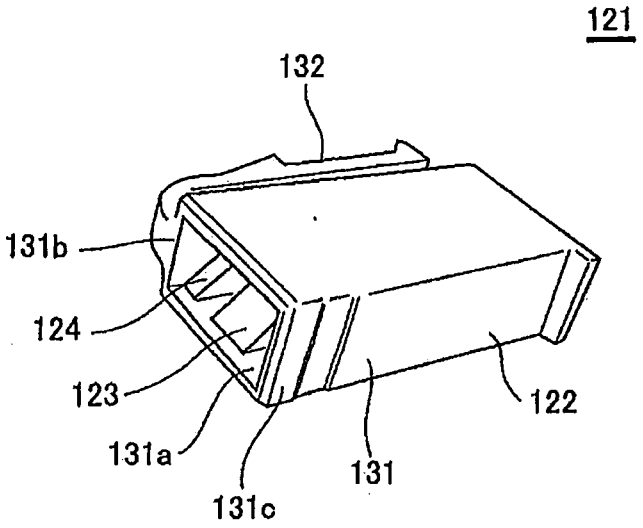


FIG. 15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132
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123
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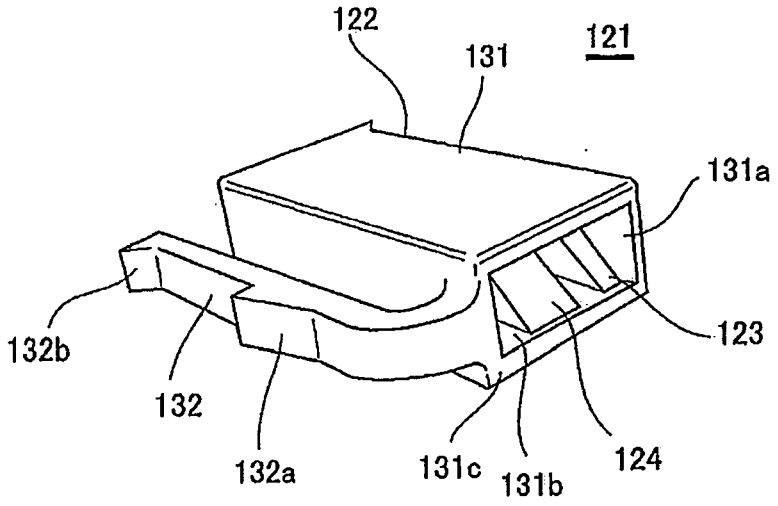
131c
131
122

FIG. 16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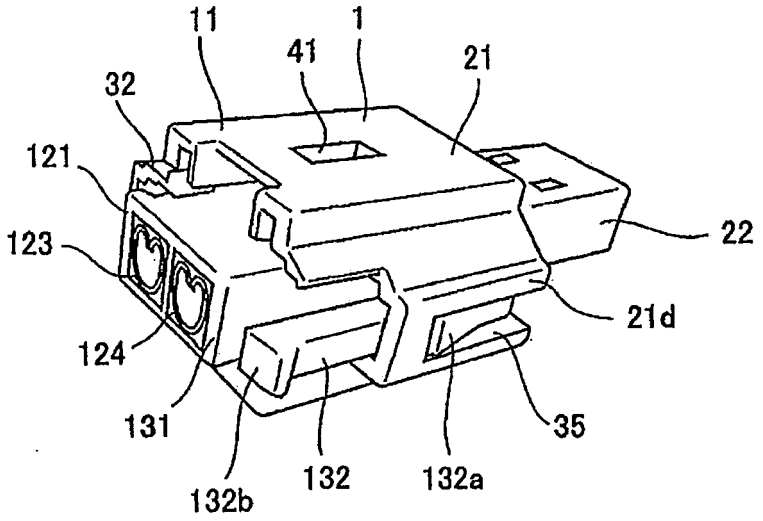
132a
131c
131b
124

FIG. 17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41
21
32
121
22
123
21d
124
131
35
132b
132
132a

FIG. 18

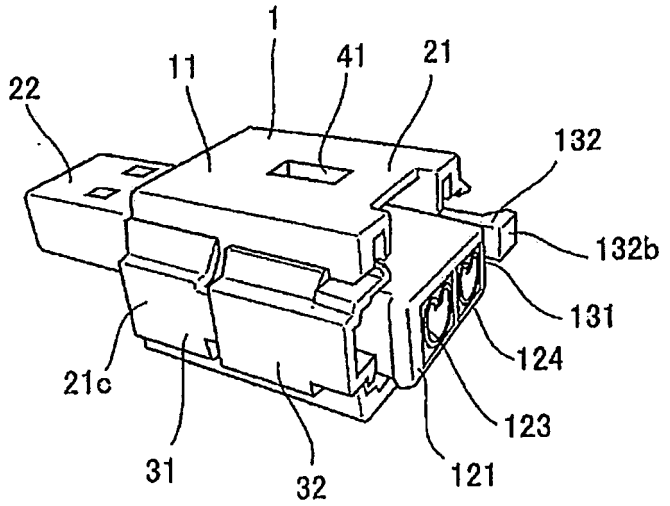
1
11
41
21
22
132
132b
131
124
21c
123
31
32
121

FIG. 19

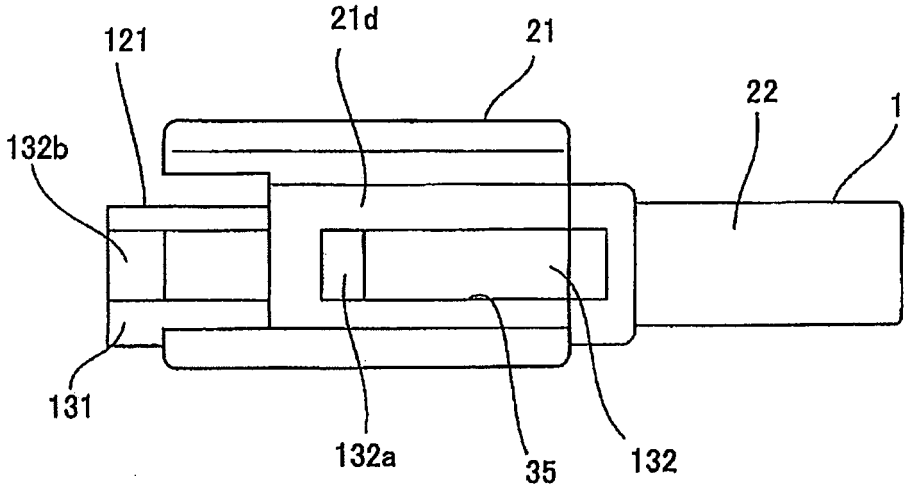
121
21d
21
22
1
132b
131
132a
35
132

FIG. 20

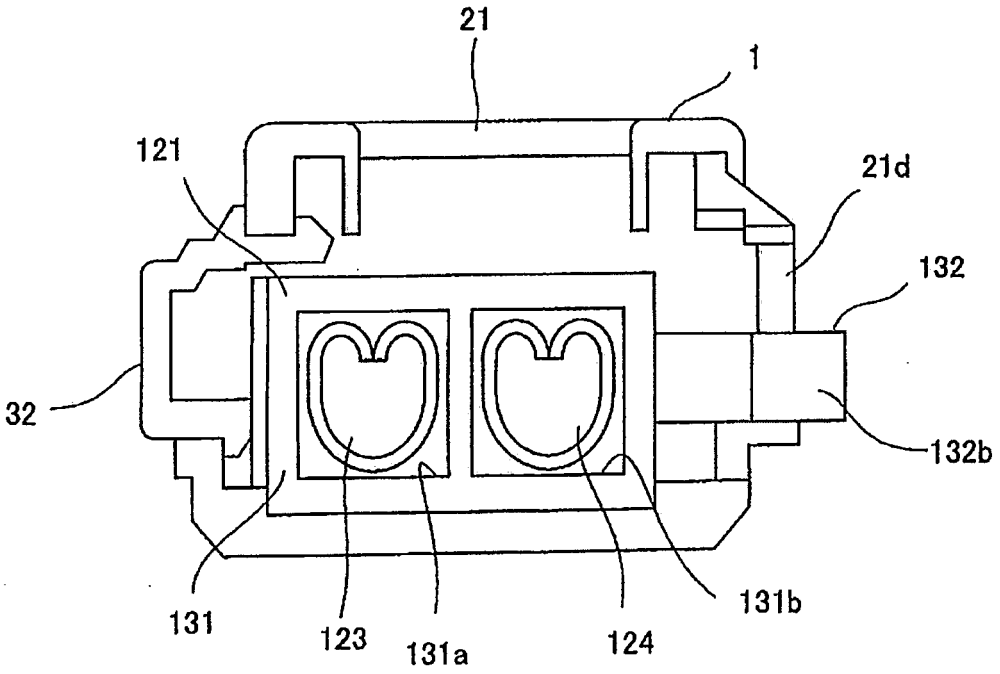
21
1
121
21d
132
32
132b
131
123
131a
124
131b

FIG. 21

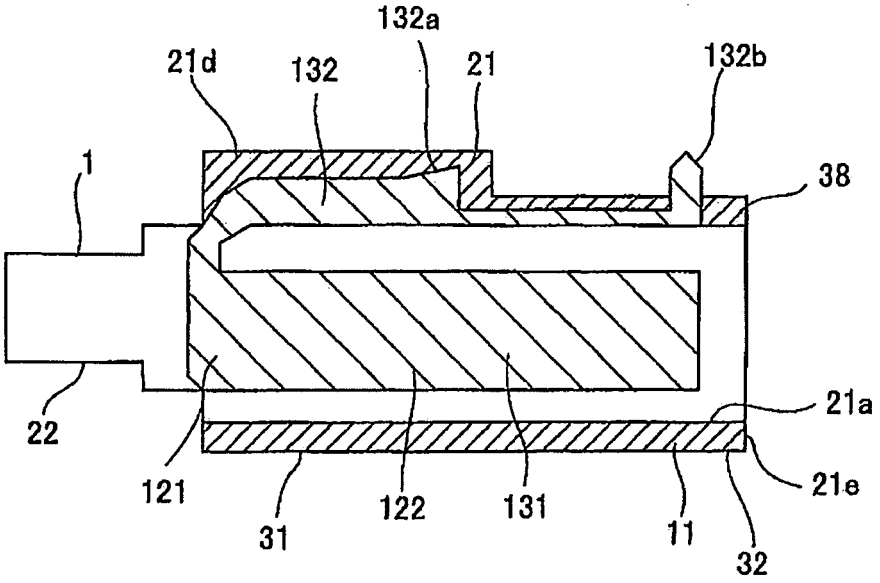
132a
21d
132
21
132b
1
38
22
21a
121
122
131
21e
31
11
32

FIG. 22

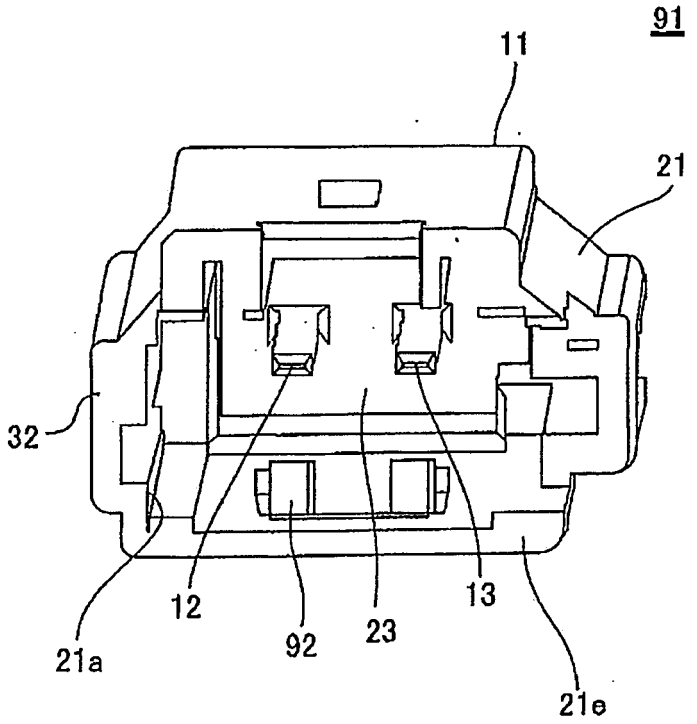
91
11
21
32
12
92
23
13
21a
21e

FIG. 23

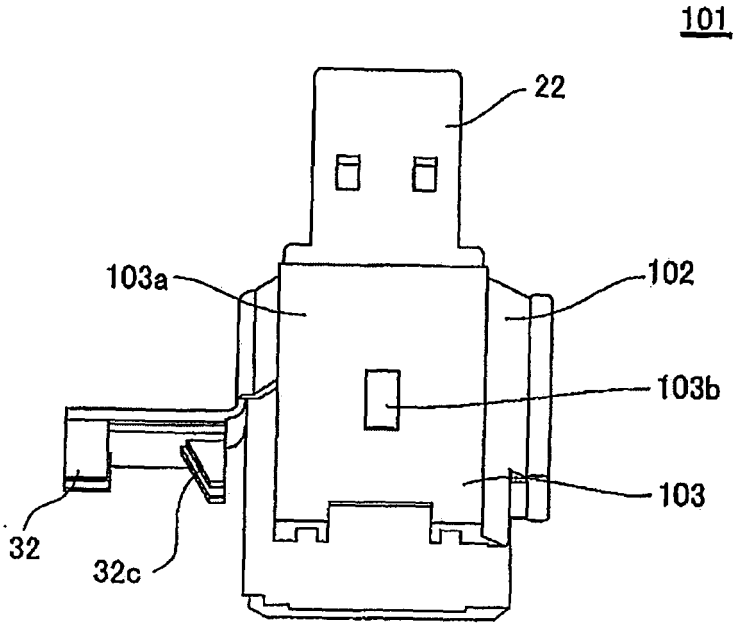
101
22
103a
102
103b
103
32
32c

FIG. 24

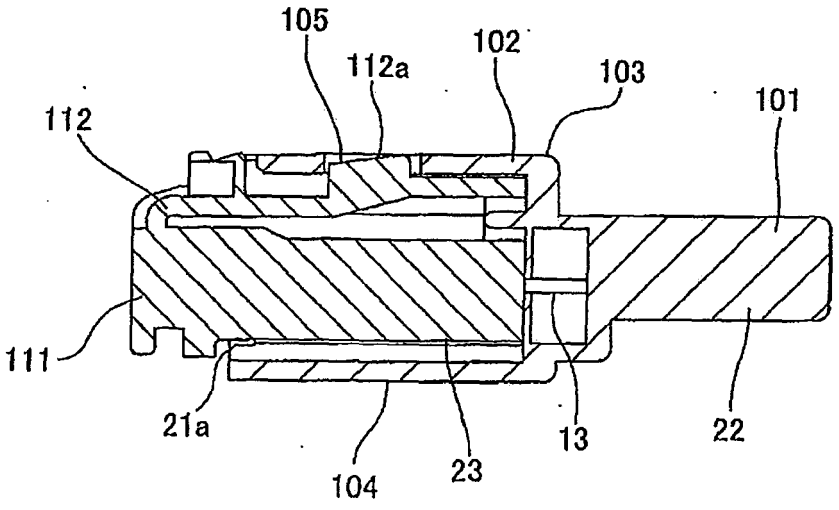
105
112a
102
103
101
112
111
21a
104
23
13
22

FIG. 25

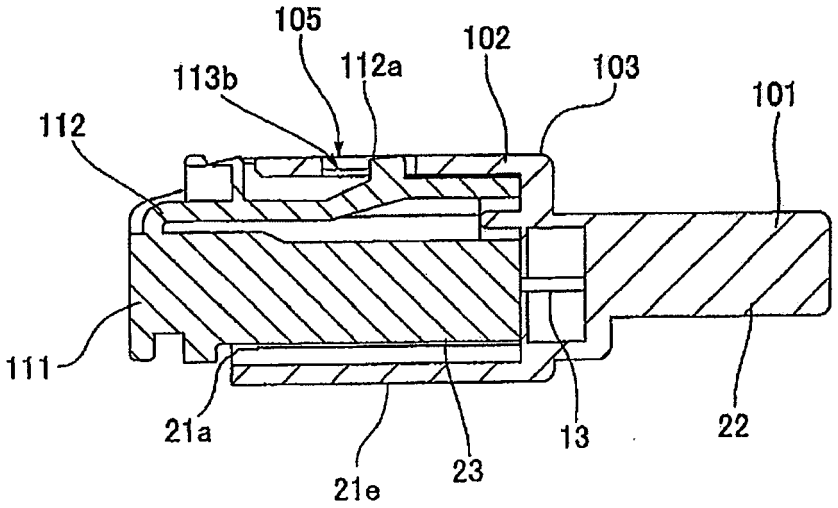

FIG. 26

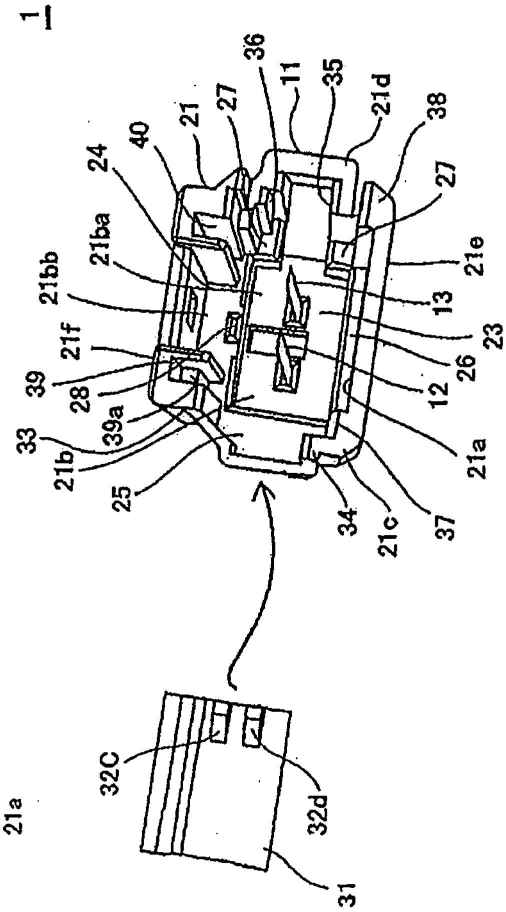
1
36
11
35
21d
38
27
40
21
24
21ba
21bb
21f
39
28
39a
33
21b
25
27
21e
13
23
26
12
21a
37
21c
34
32C
32d
31

FIG. 28

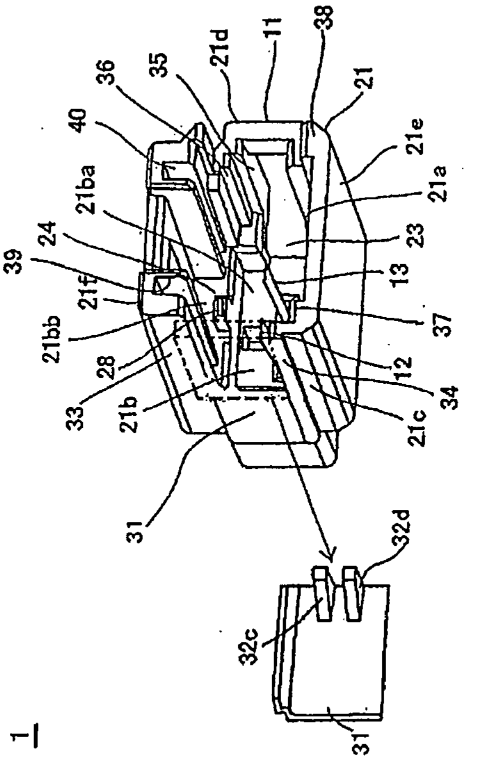
1
40
36
35
21d
11
38
21
21e
21a
21ba
23
24
39
21f
13
21bb
37
28
12
33
21b
34
21c
31
32c
32d
31

FIG. 27

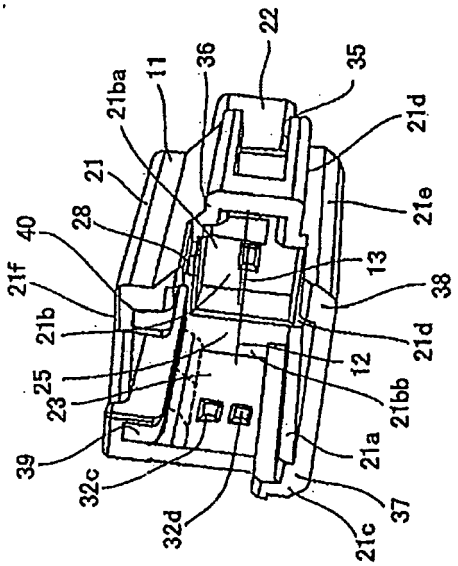
22
36
11
35
21ba
21d
21
21e
28
40
13
21f
38
21b
21d
12
25
21bb
23
21a
39
32c
37
32d
21c

FIG. 29

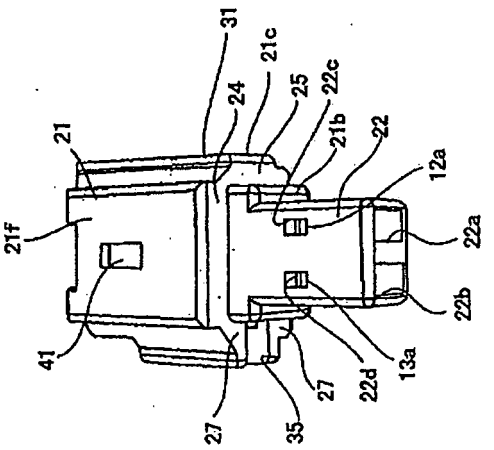
1
31
21c
24
25
22c
21b
22
21
12a
21f
22a
22b
41
13a
22d
27
27
35

FIG. 30

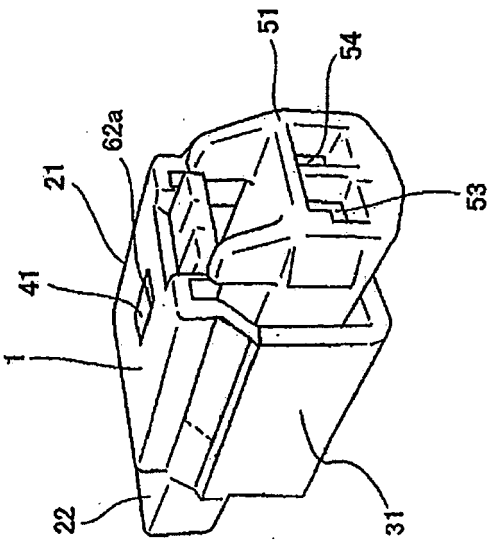

FIG. 32

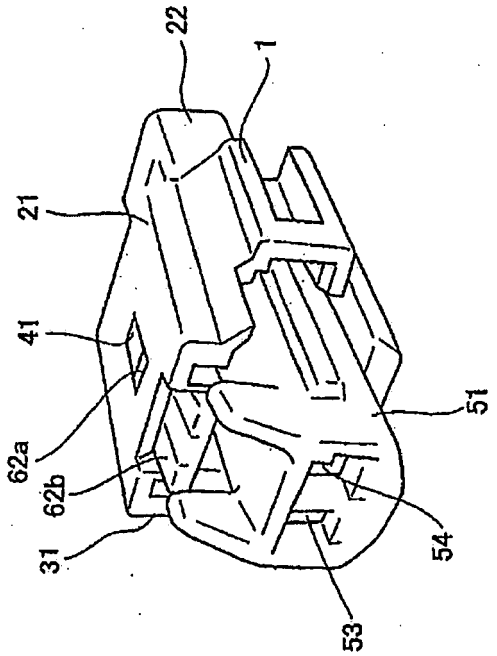

FIG. 31

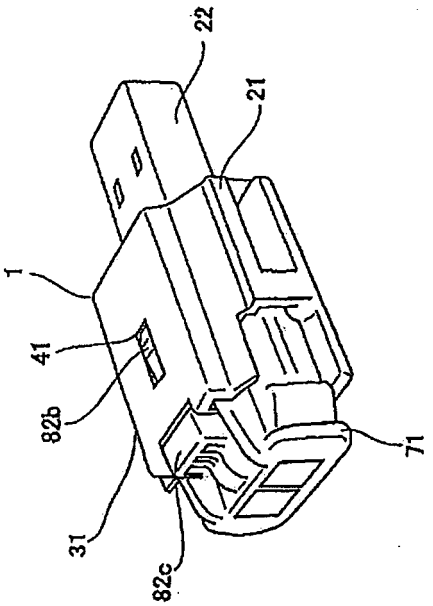

FIG. 33

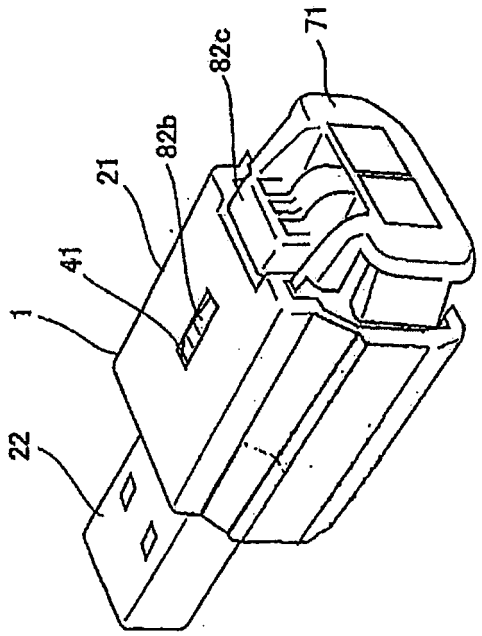

FIG. 34

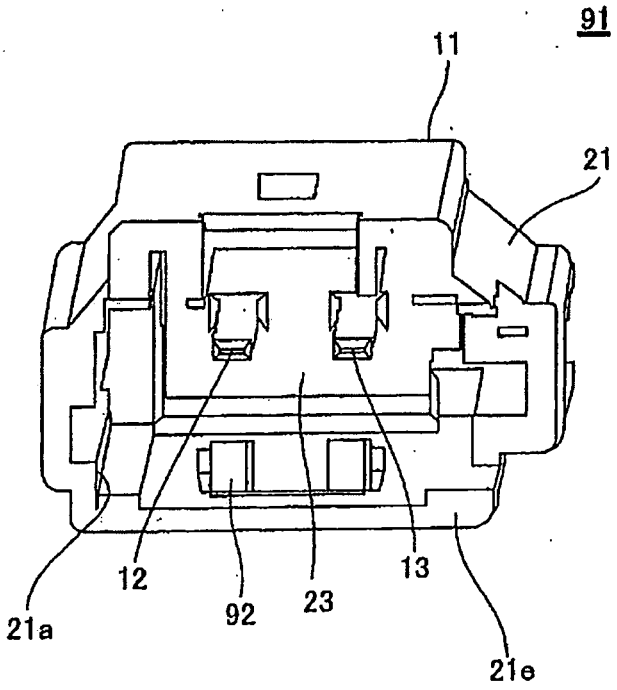

FIG. 35

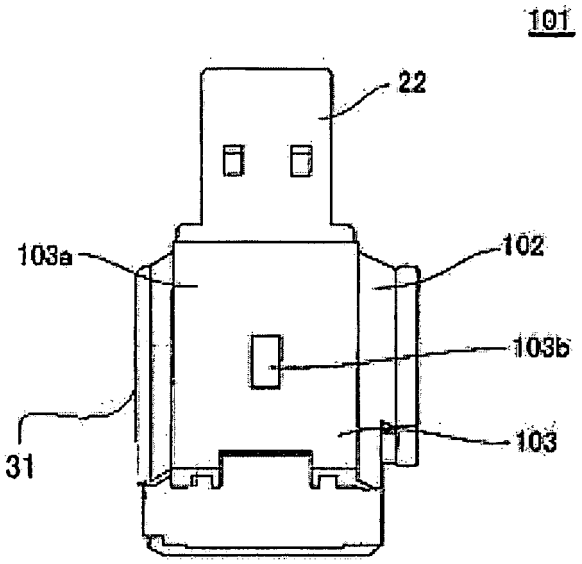
101
22
103a
102
103b
103
31

FIG. 36

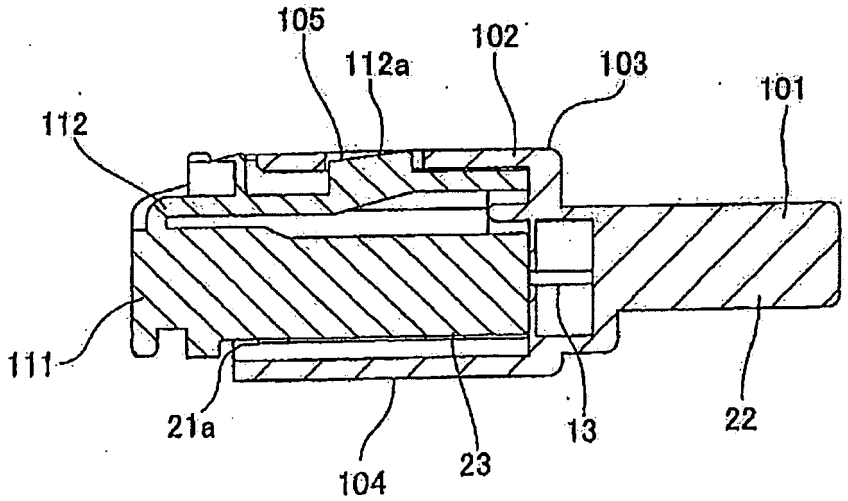
105
112a
102
103
101
112
111
21a
104
23
13
22

FIG. 37

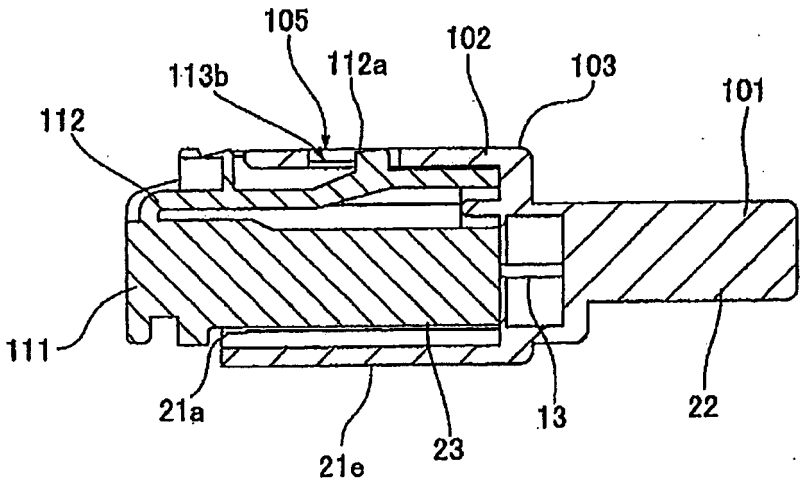
105
102
112a
103
113b
101
112
111
21a
21e
23
13
22

FIG. 38

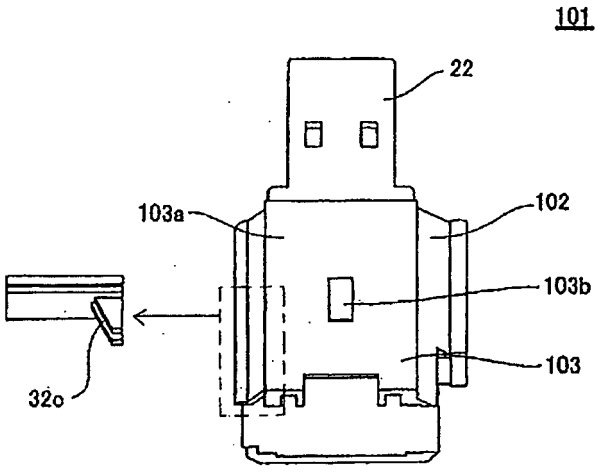
101
22
103a
102
103b
103
32o

FIG. 39

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EUROPEAN SEARCH REPORT

Application Number
EP 09 01 3350

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	GB 1 597 164 A (ROSS COURTNEY & CO LTD) 3 September 1981 (1981-09-03) * the whole document *	1-15	
A	EP 0 597 388 A2 (SUMITOMO WIRING SYSTEMS [JP]) 18 May 1994 (1994-05-18) * column 4, line 3 - column 6, line 42; figures 2,5,6,7 *	1-15	
A	US 2007/077806 A1 (MARTIN RALPH S [US] ET AL MARTIN RALPH SYKES [US] ET AL) 5 April 2007 (2007-04-05) * paragraph [0045] - paragraph [0050]; figures 8-12 *	1-15	
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H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 January 2010	Warneck, Nicolas

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