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(54) **Connector terminal structure, connector and method of assembling connector**

(57) A connector has a connector terminal structure that can improve reliability by preventing burrs from being formed that cause short-circuiting of connector terminals. This connector (100) has notch parts (114) that connect carriers (115) and contacts (110) and that serve as snapping parts for snapping the carriers (115), and the notch part (114) leaves unnotch in the center part in the plate width direction and provides V-shaped notches on both sides of this unnotch. The notches (114) are formed in edge parts in the plate width direction, and are horizontally symmetrical. Further, the notch parts (114) each formed with the notches and unnotch are formed on both surfaces of the front surface and back surface of a plate.

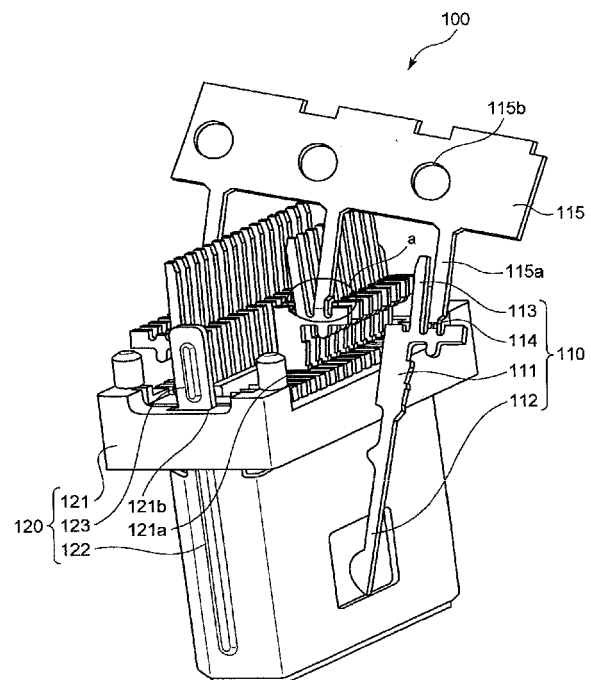


FIG. 1

Description

Technical Field

[0001] The present invention relates to a connector terminal structure that is connected electrically with an electronic component, a connector and a method of assembling a connector.

Background Art

[0002] Electronic connectors such as receptacles and sockets that are connected electrically with mating connectors such as plugs, are generally formed by covering a housing, which has connector terminals that are connected with the terminals of the mating connectors, with a metal shield case.

[0003] Connector terminals are molded by, for example, stamping out a metal plate of a base material using a press die.

[0004] Patent Literature 1 discloses a method of manufacturing a terminal apparatus that uses electrically conductive plates obtained by stamping, as male terminals. According to the method disclosed in Patent Literature 1, in the step of processing an electrically conductive component, notches (i.e. slits, hereinafter "notches") are formed on both sides of a plate by stamping, such that positions cut off in the cutting step have the reduced plate width and plate thickness, and provide tapered tip parts matching the shape of the notches in male terminals by cutting off the electrically conductive plate from the cutting position. In the step of processing an electrically conductive component, notches are provided by stamping, such the positions cut off in the cutting step have the reduced plate width and plate thickness and, consequently, a plate is easily cut off from the cutting positions, thereby preventing the cross-section, which is cut off, from being deformed and burrs from being formed.

Citation List

Patent Literature

[0005]

PTL 1: Patent 2005-50670

Summary of Invention

Technical Problem

[0006] However, although Patent Literature 1 discloses that the configuration prevents the cross-section, which is cut off, from being deformed and burrs from being formed thanks to notches, the notches in Patent Literature 1 do not prevent burrs from being formed well. That is, only providing notches does not prevent burrs from being formed in the width direction and therefore

there are cases where big, long burrs are formed. If burrs are left between connector terminals that constitute a connector, there is a problem of causing a trouble that adjacent connector terminals short-circuit. Further, as the density of an IC module and so on becomes higher, the pitches between connector terminals become narrower, and the connector is more likely to be influenced by burrs that are formed. Furthermore, although, even if burrs are left between connector terminals, short-circuiting of connector terminals may be prevented, when dust and so on get in the connector, burrs contact dust and so on and then adjacent connector terminals short-circuit, or burrs move due to vibration and so on and then adjacent connector terminals short-circuit, thereby undermining reliability.

[0007] It is therefore an object of the present invention to provide a connector terminal structure, connector and method of assembling the connector for improving reliability by preventing burrs from being formed that cause shorting circuiting of connector terminals.

Solution to problem

[0008] To achieve the above object, the connector terminal structure according to the present invention in which a carrier and a connector terminal are connected through a snapping part, employs a configuration in which wherein the snapping part comprises a plurality of notches sandwiching a unnotch part on a line at which the carrier is snapped.

[0009] To achieve the above object, the connector according to the present invention having a connector terminal to connect with an electronic component, employs a configuration in which: the connector terminal has a snapping part for snapping a carrier; and the snapping part has a plurality of notches sandwiching a unnotch part on a line at which the carrier is snapped.

[0010] To achieve the above object, the method of assembling a connector according to the present invention includes: inserting one end part of the connector terminal that is connected with the carrier, to a predetermined position in an insertion slot of a housing of the connector; rotating an other end part of the connector terminal that is inserted in the housing, about the snapping part; and removing the carrier from the snapping part at which the carrier breaks by the rotation leaving the connector terminal that is inserted in the housing.

Advantageous Effects of Invention

[0011] The present invention can improve reliability by preventing burrs from being formed that cause short-circuiting of connector terminals.

Brief Description of Drawings

[0012]

FIG.1 shows the configuration of an electronic component connector according to an embodiment of the present invention;

FIG.2 is a top view of the electronic component connector according to the above embodiment;

FIG.3A is an overall plan view showing the configuration of a contact of the electronic component connector according to the above embodiment;

FIG.3B is a plan view showing a notch part of the contact of the electronic component connector according to the above embodiment;

FIG.4 is a cross-sectional view seen from the arrow in the A-A line in FIG.3A;

FIG.5 is a perspective view showing the shape of the notch part of a contact of the electronic component connector according to the above embodiment;

FIG.6 is a perspective view showing the shape of a conventional notch part; and

FIG.7 shows burrs formed in notch parts after carriers are snapped.

Description of Embodiments

[0013] Hereinafter, an embodiment of the present invention will be explained in detail below with reference to the accompanying drawings.

[0014] FIG.1 is a perspective view of an electronic component connector according to an embodiment of the present invention, and FIG.2 is a top view of the electronic component connector.

[0015] As shown in FIG.1 and FIG.2, electronic component connector 100 has: electrically conductive contacts 110 (i.e. connector terminals) that are connected with terminals of a mating receptacle; and housing 120 that aligns and accommodates a plurality of contacts 110.

[0016] Contact 110 is formed with: base part 111; insertion part 112 that is inserted in the insertion slot of housing 120; plug part 113 that projects to the outside after a carrier is snapped to serve as a plug of electronic component connector 100; and notch part 114 that connects carrier 115 and contact 110 and that serves as a snapping part which snaps carrier 115.

[0017] Contact 110 is connected with carrier 115, which is a base material (i.e. tie bar), before carrier 115 is snapped. In FIG.1, a plurality of (here, three) contacts 110 are connected with carrier 115. Contacts 110 and carrier 115 are blanked integrally by, for example, stamping a metal substrate and formed. Carrier 115 has one end parts 115a that extend toward the contact 110 side, and this one end part 115a connects with base part 111 through notch part 114. A plurality of carrier holes 115b are provided in each carrier 115 at predetermined pitch intervals. Carrier holes 115b are utilized to engage with jigs (not shown) and snap carrier 115.

[0018] Housing 120 is formed by molding resin, and has: housing body 121; case 122 that is virtually a rectangular parallelepiped; and projecting base 123 of a plate shape projecting from the upper face of case 122

toward the housing body 121 side.

[0019] Housing body 121 has: insertion slot 121a in which insertion part 112 of contact 110 is inserted; and insertion slot 121b in which projecting base 123 of a plate shape is inserted, and housing body 121 fits in case 122 by inserting projecting base 123 in insertion slot 121b without space between projecting base 123 and insertion slot 121b.

[0020] The characteristics of the present embodiment lie in the shape of notches of notch parts 114 of contacts 110.

[0021] FIG.3 is a plan view showing the configuration of contact 110 shown in FIG.1, FIG.3A is an overall plan view of contacts 110, FIG.3B is a plan view showing notch part 114 of contact 110 and FIG.4 is a cross-sectional view seen from the arrow in the A-A line in FIG.3A. Further, FIG.5 is a perspective view showing the shape of notch part 114 of contact 110, and FIG.6 is a perspective view showing the shape of a conventional notch part.

[0022] As shown in FIG.3A, carrier 115 and contacts 110 are connected through notch parts 114, the snapping parts.

[0023] As shown in FIG.3B and FIG.4, notch part 114 has notches having the shapes of a letter V which leave a predetermined width in the center part in the plate width direction and reduce only the thickness of the plate on both sides of this center part. To be more specific, notch part 114 has the following shape.

[0024] As shown in FIG.5, notch part 114 does not make a notch throughout the plate width direction (here, the width of one end part 115a of carrier 115), and is shaped such that a notch is not made in part of the plate. According to the present embodiment, in notch part 114, unnotch 114a having a width of dimension X2 is left in the center part having the plate width of dimension X1, and V-shaped notches 114b and 114c having the widths of dimensions $(X1-X2)/2$ are made on both sides of this unnotch 114a. That is, notch part 114 employs a configuration where unnotch 114a that connects one end part 115a of carrier 115 and contact 110 is formed like a bridge as the center part sandwiched by V-shaped notches 114b and 114c. In notch part 114, unnotch 114a is provided in the center part of the plate width, so that notch 114b and notch 114 are horizontally symmetrical. Further, notch part 114 has a shape with a plurality of notches 114b and notches 114c.

[0025] Further, notch parts 114 are provided in the front surface and back surface of the snapping part that connects carrier 115 and contact 110.

[0026] Here, the widths of notches 114b and 114c (dimension: $(X1-X2)/2$) and the width of unnotch 114a (dimension: X2) are set based on the plate width (dimension: X1) and the pitch width between adjacent contacts 110. In case where the pitch width is narrower than the plate width (dimension: X1) in a connector, there is a problem that burrs are formed, thereby causing short-circuiting. The inventors of the present invention have found out based on an experiment that the lengths of

burrs that are formed virtually correspond to the width of a notch. In case where the pitch width is narrower than the plate width (dimension: X1), the essential requirement is that the widths of notches 114b and 114c (dimension: $(X1-X2)/2$) are narrower than the pitch width. Therefore, taking into account the relationship between the pitch width and the plate width (dimension: X1), the width of unnotch 114a (dimension: X2) is set such that the widths of notches 114b and 114c (dimension: $(X1-X2)/2$) are narrower than the pitch width. If the above condition is met, the widths of notches 114b and 114c (dimension: $(X1-X2)/2$) can be set at random, that is, the width of unnotch 114a (dimension: X2) can be set at random. However, if the width of unnotch 114a is much wider than the widths of notches 114b and 114c, there is a risk that carrier 115 is not snapped smoothly and therefore the width of unnotch 114a is preferably minimum.

[0027] Further, notch part 114 is provided in the plate width direction and, consequently, when contact 110 and carrier 115 are blanked integrally by stamping a metal substrate and formed, notch part 114 can be formed at the same time by providing convex parts matching notch part 114 in the punch or dies used in stamping.

[0028] Meanwhile, with the shape of a conventional notch part shown in FIG.6, V-shaped notches 11 that reduce the plate thickness are provided throughout the plate width direction of contact 10 in both surfaces of the front surface and the back surface.

[0029] A method of attaching contacts 110 of electronic component connector 100 formed as described above will be explained.

[0030] As shown in FIG.1, housing 120 that is assembled by inserting and fitting projecting base 123 of case 122 in insertion slot 121b of housing body 121; and contact 110 connected with carrier 115, are prepared.

[0031] Insertion part 112 of contact 110 connected with carrier 115 is inserted in insertion slot 121a of housing body 121. As shown in FIG.2, insertion slots 121a of housing body 121 are provided in two rows in symmetry on both sides of the center line in the front face of housing 120, and a plurality of insertion slots 121a are arranged at predetermined pitches in each row. With the present embodiment, first row insertion slot 121a and second row insertion slot 121a are arranged side by side. First row insertion slot 121a refers to insertion slot 121a of housing body 121 in which contact 110 shown in FIG.1 is being attached. In this case, contact 110 connected with carrier 115 is inserted in insertion slot 121a of housing body 121 in the direction shown in FIG.1. Further, FIG.1 shows an example where three contacts 110 are connected with carrier 115, and insertion part 112 of second contact 110 is inserted in first row insertion slot 121a. When insertion part 112 of contact 110 is inserted in first row insertion slot 121a, plug part 113 of contact 110 projects in the direction opposite to the insertion direction of insertion part 112. Further, notch part 114 that continues to base part 111 of contact 110 is provided closer to the outside than plug part 113, and is connected with one end part

115a of carrier 115.

[0032] As shown by a in FIG.1, insertion part 112 of contact 110 is inserted in first row insertion slot 121 to a predetermined position that stops insertion of contact 110, and then carrier 115 that is connected with contact 110 is rotated to incline in the length direction of contact 110, and is raised again. The stress to bend this carrier 115 concentrates on notch part 114 which serves as the snapping part that connects carrier 115 and contact 110. By inclining carrier 115 90 degrees once and raising carrier 115 upright again, carrier 115 breaks in notch part 114, so that contact 110 is cut off from carrier 115. After carrier 115 is snapped in this way, there are cases where burrs are formed in notch part 114 that is cut off. The present embodiment is directed to minimizing the dimensions of burrs that are formed after carrier 115 is snapped from contacts 110 to prevent the negative influences such as short-circuiting in advance. This will be described below with reference to FIG.7.

[0033] When carrier 115 is cut off, contacts 110 are aligned in housing body 121 projecting plug part 113. According to the same attaching method, contacts 110 have already been attached in second row insertion slot 121a. Contacts 110 attached in second row insertion slot 121a and contacts 110 attached in first row insertion slot 121a are linearly symmetrical with respect to the center line in the front face of housing 120. Meanwhile, when contacts 110 are attached in second row insertion slot 121a, the front surface and back surface of contact 110 that is connected with carrier 115 are reverse, and the direction to bend carrier 115 is opposite compared to FIG.1.

[0034] By attaching all contacts 110 to housing body 121, the step of attaching contacts 110 of electronic component connector 100 is finished (see FIG.2).

[0035] As explained above in detail, electronic component connector 100 according to the present embodiment has notch parts 114 that connect carriers 115 and contacts 110 and that serve as parts to snap carriers 115 from contacts 110, and notch part 114 leaves unnotch 114a in the center part of the plate width and provides V-shaped notches 114b and 114c on both sides of this unnotch 114a. Notches 114b and 114c are formed in edge parts in the plate width direction and are horizontally symmetrical. Further, notch parts 114 formed with notches 114b and 114c and unnotch 114a are formed in both surfaces of the front surface and the back surface of a plate. By this means, it is possible to prevent burrs from being formed. Further, even if burrs are formed, it is possible to make the length of burrs that are formed much shorter. Consequently, it is possible to improve reliability by preventing burrs from being formed that cause short-circuiting of connector terminals.

[0036] FIG.7 shows burrs formed in notch parts after carriers are snapped, FIG.7A shows contacts 110 according to the present embodiment and FIG.7B shows conventional contacts. Meanwhile, FIG.7 is presented by tracing photographs showing burrs that are actually

formed. The measurement condition is the same except for the configuration of notch parts.

[0037] As shown in FIG. 7B, with a conventional example, notch parts 11 having a notch shape shown in FIG. 6 are used and, therefore, burrs having the same length as the notch width are formed after contacts are snapped. When burrs are formed, there is a possibility that burrs move due to heat of reflows and so on or due to vibration, there is a risk that adjacent contacts short-circuit particularly in a connector in which the pitches between connector terminals are narrow. Further, even in case where short-circuiting does not take place at a given time point such as upon shipping, if big, long burrs are left, it is not possible to improve reliability because there is an inherent possibility of short-circuiting.

[0038] By contrast with this, with the present embodiment, notch part 114 has unnotch 114a, thereby limiting the sizes of burrs that are formed, by the widths of notches 114b and 114c. That is, a burr formed in notch 114b and a burr formed in notch 114 are formed separately and are not connected. Further, the total length of burrs formed in notches 114b and 114c of adjacent contacts 110 is less than the pitch width, so that there is no risk of causing short-circuiting of adjacent contacts 110. Furthermore, burrs that are formed are small, so that it is possible to secure reliability for many years and reduce the possibility of short-circuiting when dust and so on get in the connector.

[0039] As shown in FIG. 7A, it is confirmed with the present embodiment that few burrs are formed in notch parts 114 of contacts 110. Further, it is also confirmed that burrs 116 that are formed are extremely small.

[0040] Furthermore, burrs that are formed are small and the negative influences due to these burrs can be prevented, so that it is not necessary to perform removal of burrs such as coining that needs to be performed in a separate step. Consequently, it is possible to simplify the steps of finishing and reduce manufacturing cost.

[0041] The above explanation is an illustration of a preferable embodiment of the present invention, and the scope of the present invention is not limited to this. The configuration of the above contacts and the attaching method thereof are one example, and these may be variously modified with additions within the scope of the present invention.

[0042] Although, for example, a module that is connected with electronic component connector 100 has been explained as a plug with the present embodiment, the present invention is not limited to this and this module may be any module such as a receptacle as long as this module is a connector having connector terminals to connect with an electronic component.

[0043] Further, although contacts 110 and carriers 115 are punched by stamping metal substrates and formed, the essential requirement is that connector terminals have notch parts 114 and these notch parts 114 may be formed separately from the step of punching contacts 110 and carriers 115.

[0044] Furthermore, although notch part 114 has notches having the shapes of a letter V which leave a predetermined width in the center part in the plate width direction and reduce only the thickness of plate on both sides of the center part, the essential requirement is that a plurality of notches are provided in one plate width direction and the number of notches or unnotches, locations to form notches, the shape of notches and the depth of notches can be appropriately changed. Still further, notches include cutouts, slits and grooves.

[0045] Although notch parts 114 are provided in both surfaces with the present embodiment, notch part 114 may be provided in one surface. Further, another surface other than the front surface and back surface may be provided. Furthermore, notch part 114 may be formed along the outer periphery of a cylindrical shape. That is, notch part 114 that connects carrier 115 and contact 110 may have a round shape in the cross-section. In case where notch part 114 has a round shape in the cross-section, it is anticipated that the degree of freedom to snap carrier 115 is increased in a direction in which carrier 115 is snapped.

[0046] Further, although names such as "connector terminal structure" and "electronic component connector" are used with the present embodiment for ease of explanation, names such as "terminal component," "connector terminal," "plug" or "receptacle" may be possible. Further, there may be cases where contacts are referred to as "connector terminals" and carriers are referred to as "body materials" or "tie bars."

[0047] Although an embodiment of the present invention has been described above, the present invention is not limited to the above embodiment and can be variously modified based on the technical concept of the present invention, and it naturally follows that the present invention covers these various modifications.

Industrial Applicability

[0048] The connector terminal structure, connector and method of assembling the connector according to the present invention provide an advantage of preventing burrs from being formed that cause short-circuiting of connector terminals even when pitch sizes between connector terminals are narrow in the connection target, and are useful to connect with an electronic component.

Reference Signs List

[0049]

100	ELECTRONIC COMPONENT CONNECTOR
110	CONTACT (CONNECTOR TERMINAL)
111	BASE PART
112	INSERTION PART
113	PLUG PART
114	NOTCH PART

114A	UNNOTCH
114B, 114C	NOTCH
115	CARRIER
120	HOUSING
121	HOUSING BODY
122	CASE
123	PROJECTING BASE

Claims

1. A connector terminal structure in which a carrier and a connector terminal are connected through a snapping part, wherein the snapping part comprises a plurality of notches sandwiching a unnotch part on a line at which the carrier is snapped.

2. The connector terminal structure according to claim 1, wherein:

the snapping part has a shape of a plate; and at least one of the plurality of notches is formed in an edge part in a plate width direction.

3. The connector terminal structure according to claim 1 or 2, wherein:

the snapping part has a shape of a plate; and the notches are symmetrical with respect to a center line in a longitudinal direction of the plate.

4. The connector terminal structure according to claim 1 or 2, wherein:

the snapping part has a shape of a plate; and the notches are formed in one surface or a plurality of surfaces of the plate.

5. The connector terminal structure according to any of claims 1 to 4, wherein the notch comprises one of a cutout and a groove having a shape of a letter V.

6. A connector comprising a connector terminal to connect with an electronic component, wherein:

the connector terminal comprises a snapping part for snapping a carrier; and the snapping part comprises a plurality of notches sandwiching a unnotch part on a line at which the carrier is snapped.

7. The connector according to claim 6, wherein:

the snapping part has a shape of a plate; and at least one of the plurality of notches is formed in an edge part in a plate width direction.

8. The connector according to claim 6, wherein:

the snapping part has a shape of a plate; and the notches are horizontally symmetrical with respect to a center line in a longitudinal direction of the plate.

9. The connector according to claim 6, wherein:

the snapping part has a shape of a plate; and the notches are formed in one surface or a plurality of surfaces of the plate.

10. The connector according to any of claims 6 to 9, wherein the notch comprises one of a cutout and a groove having a shape of a letter V.

11. The connector according any of claims 6 to 10, wherein the connector terminal comprises a connector terminal for one of a plug and a receptacle.

12. A method of assembling a connector comprising:

inserting one end part of the connector terminal that is connected with the carrier according to any of claims 1 to 5, to a predetermined position in an insertion slot of a housing of the connector; rotating an other end part of the connector terminal that is inserted in the housing, about the snapping part according to any of claims 1 to 5; and removing the carrier from the snapping part at which the carrier breaks by the rotation leaving the connector terminal that is inserted in the housing.

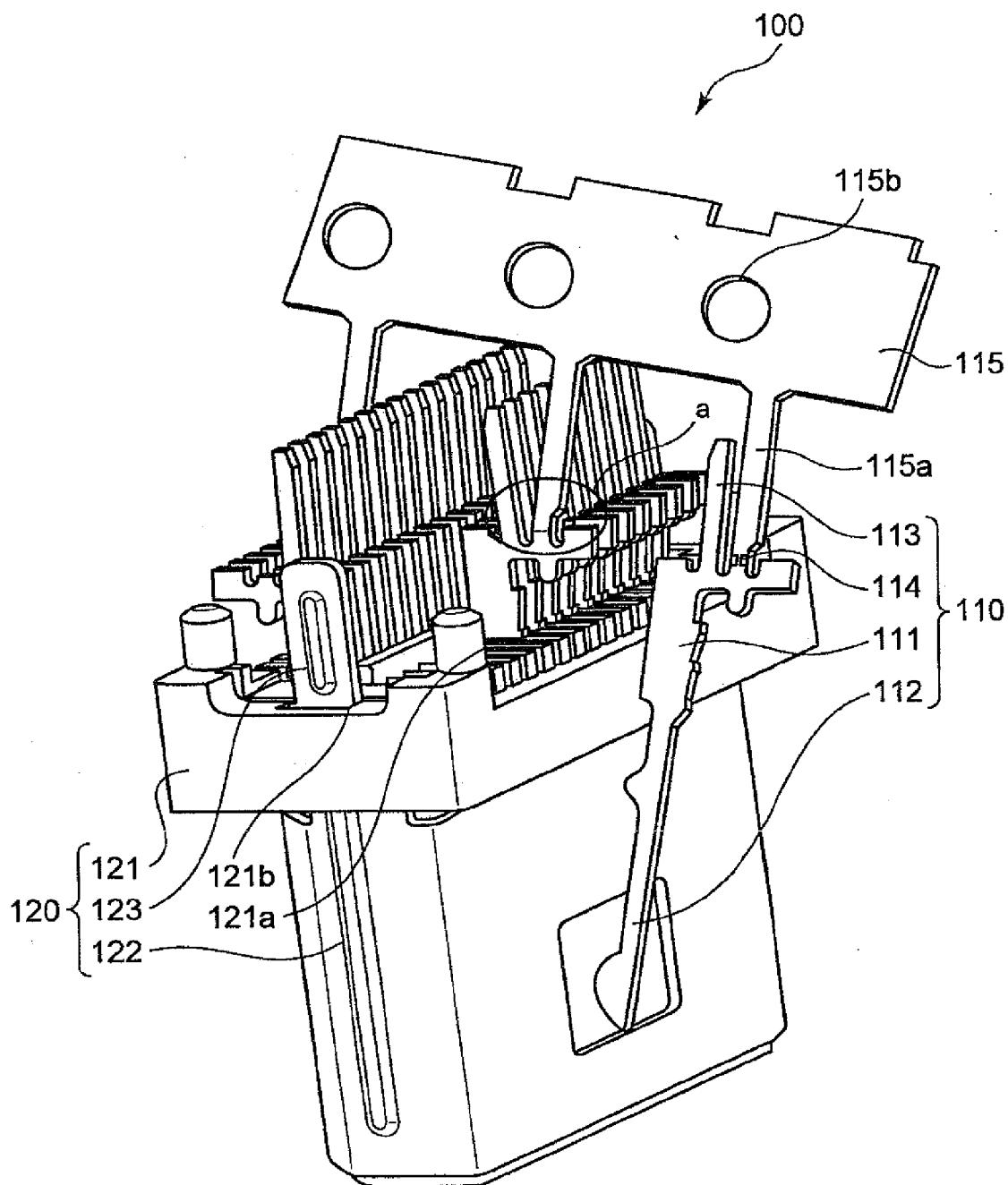


FIG. 1

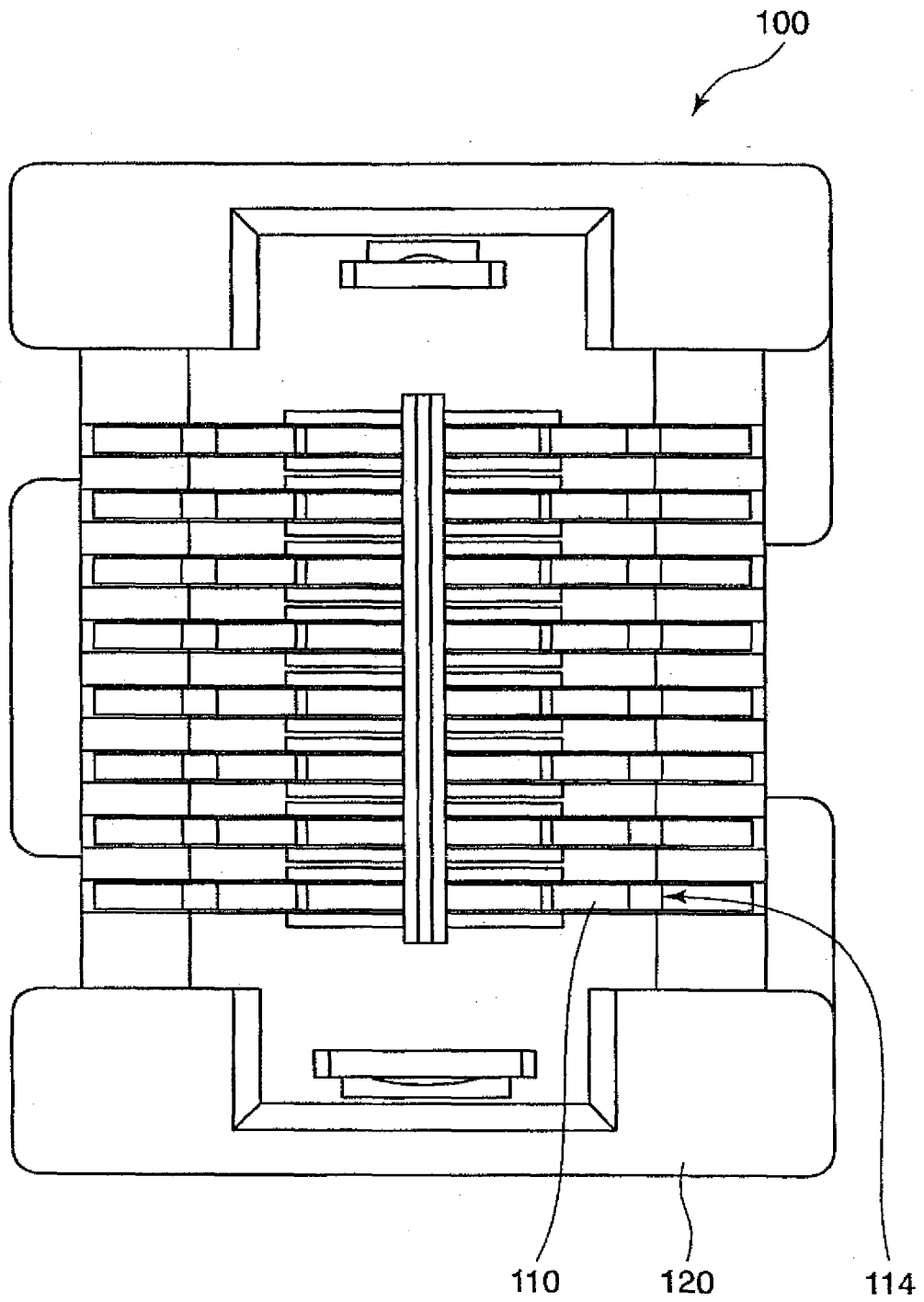


FIG. 2

FIG. 3A

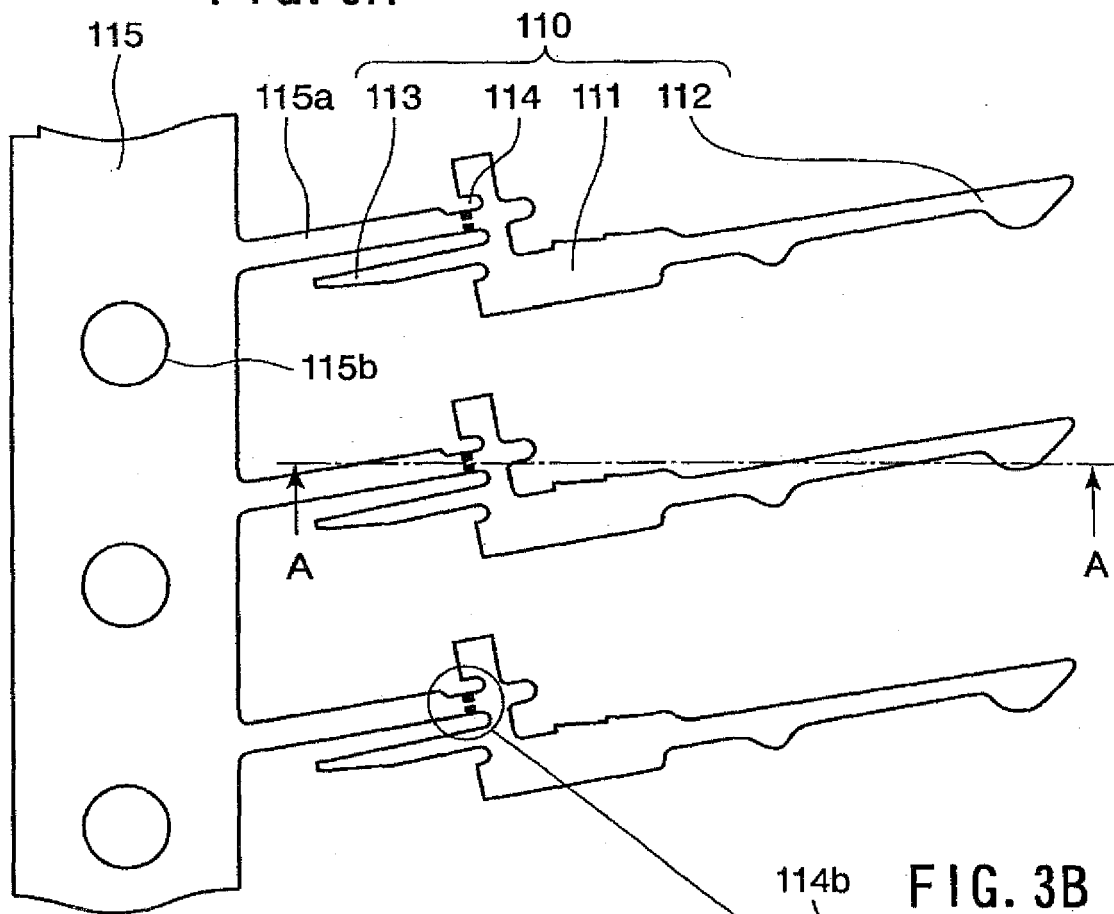


FIG. 3B

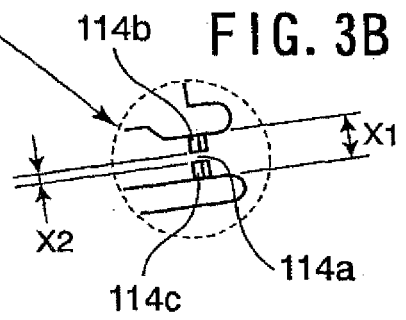
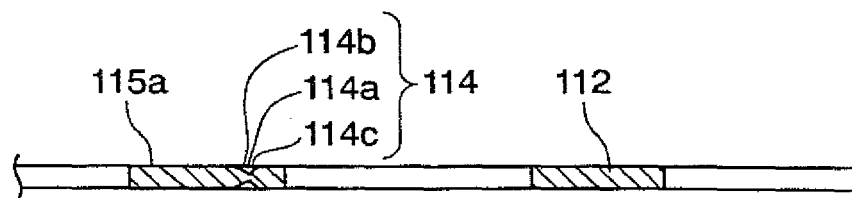


FIG. 4



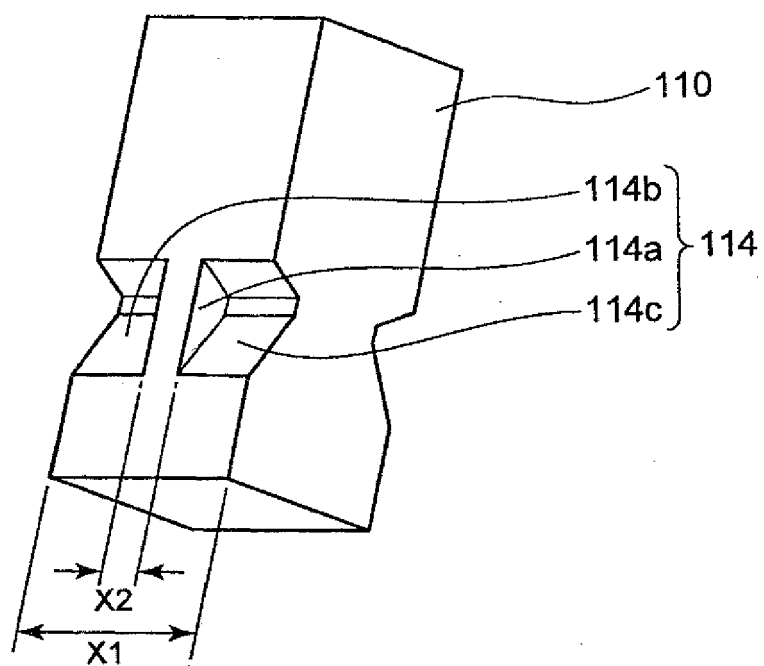


FIG. 5

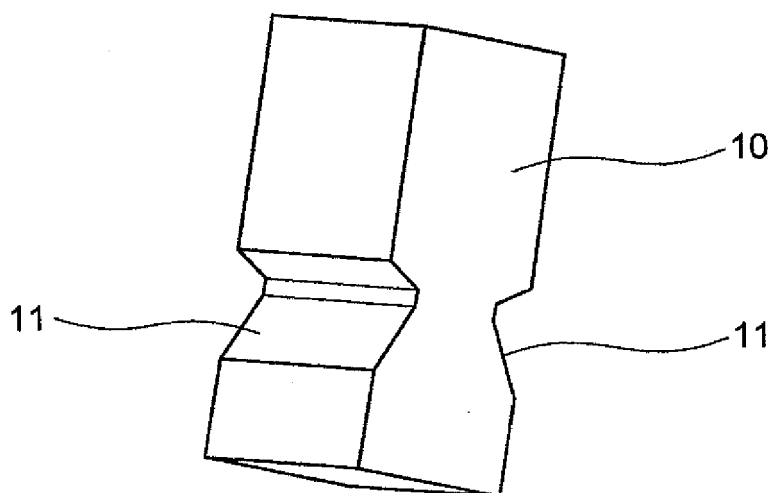


FIG. 6

FIG. 7A

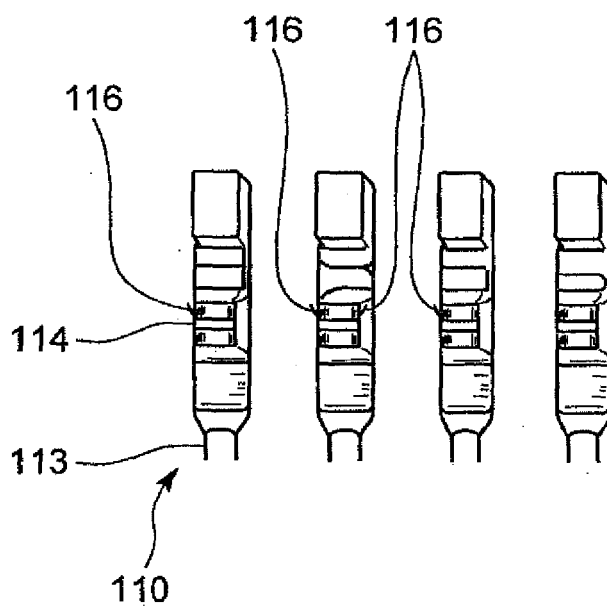
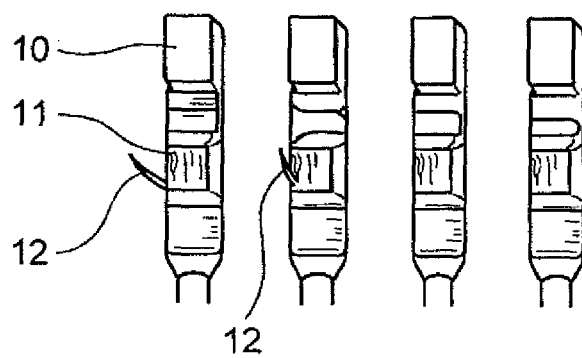


FIG. 7B



REFERENCES CITED IN THE DESCRIPTION

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