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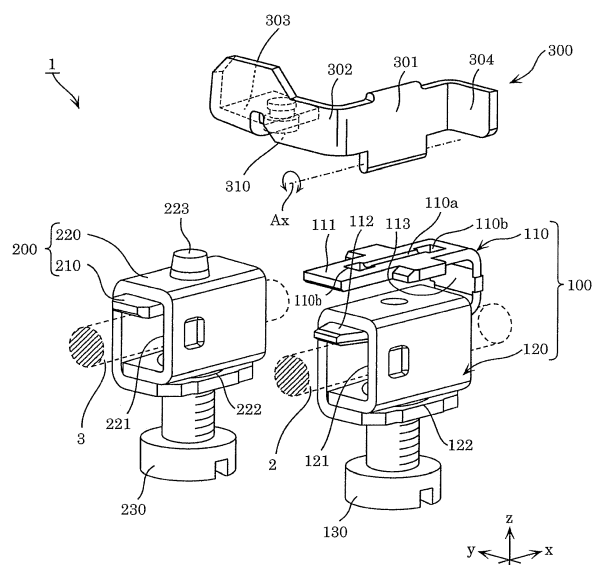
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(54) **SWITCH STRUCTURE AND SWITCH**

(57) [Solution] Switch structure 1 for switching between electrical connection and disconnection of fixed contact 223 and wire 2 includes: switching element 300 made of sheet metal and including movable contact 310 which comes into contact with and separates from fixed contact 223; and first terminal member 110 made of sheet metal and including first portion 111 which includes a pivot portion serving as a pivot on which switching element 300 swings, and second portion 112 with which the wire comes into contact, wherein the sheet metal of first terminal member 110 is metal plate 110M having first surface S1 and second surface S2 opposite first surface S1, and first surface S1 includes a surface of first portion 111 with which switching element 300 is in contact at the pivot portion, and a surface of second portion 112 with which wire 2 comes into contact.

FIG. 1



Description

[Technical Field]

5 **[0001]** The present invention relates to a switch structure and a switch which includes the switch structure.

[Background Art]

10 **[0002]** Conventionally, a switch which opens and closes an electric circuit is known. A switch includes a switch structure for switching between electrical connection and disconnection of a plurality of wires (opening and closing), for example.

[0003] As a switch structure of this type, a switch structure which electrically connects and disconnects two wires has been known (see Patent Literature (PTL) 1). In this case, the switch structure includes, for example, a first terminal electrically connected to one of the two wires, a second terminal electrically connected to the other of the two wires, and a switching element which electrically connects and disconnects the first terminal and the second terminal.

15 **[0004]** In such a switch structure, for example, the first terminal includes a support portion which swingably supports the switching element, the second terminal includes a fixed contact, and the switching element includes a movable contact. The switching element is caused to swing on the support portion of the first terminal which serves as a pivot, to cause the movable contact of the switching element to come into contact with and separate from the fixed contact of the second terminal. Electrical connection and disconnection of the two wires is controlled by the contact/separation
20 operation of the switching element.

[0005] As a switch structure, a configuration of bringing a wire into direct contact with a terminal has been known. FIG. 20 illustrates an example of this configuration and is a switch structure which electrically connects and disconnects three wires. FIG. 20 illustrates an example of conventional switch structure 1001, where (a) is an exploded perspective view of switch structure 1001, and (b) and (c) are side views for illustrating switching motion of switch structure 1001.

25 **[0006]** As illustrated in (a) to (c) of FIG. 20, conventional switch structure 1001 includes first terminal 1100, two second terminals 1200, and switching element 1300.

[0007] First terminal 1100 is, for example, made of a metal block, and is a pivot-portion component having a pivot portion serving as a pivot of the swing of switching element 1300. Specifically, first terminal 1100 includes support portion 1110a (depression) which supports switching element 1300, insertion hole 1121 through which a wire (not illustrated) is inserted, and screw hole 1122 which engages with screw 1130 for fixing the wire inserted through insertion hole 1121. First terminal 1100 having this configuration is disposed between two second terminals 1200.
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[0008] Two second terminals 1200 each have insertion hole 1221 where a wire (not illustrated) is inserted and are each made of, for example, a metal block. The upper surfaces of second terminals 1200 have fixed contacts 1223.

[0009] Switching element 1300 is formed by bending two strip-shaped areas of substantially rectangle sheet metal in the opposite directions so that the front side of one area and the back side of the other area are viewed. Movable contacts 1310 are provided on distal end portions of the bent two strip-shaped portions. A foot portion of the central portion of switching element 1300 serves as a swing pivot portion, and switching element 1300 swings on the foot portion which is a pivot.
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[0010] As illustrated in (b) and (c) of FIG. 20, switching element 1300 swings right and left, to cause movable contact 1310 to come into contact with and separate from fixed contact 1223. In other words, swing of switching element 1300 causes two movable contacts 1310 of switching element 1300 to come into contact with and separate from fixed contacts 1223 of two second terminals 1200.
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[Citation List]

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[Patent Literature]

[0011] [PTL 1] Japanese Unexamined Patent Application Publication No. H01-151122

50 [Summary of Invention]

[Technical Problem]

[0012] In the switch structure, the switching element swings in conjunction with switch operation made by a user. Along with the swing of the switching element, the switching element and the pivot-portion component (terminal) serving as a pivot of the switching element rub against one another several thousand times or tens of thousands of times at the contact plane between the switching element and the pivot-portion component, which leads to wear of the switching element and the pivot-portion component. As a result, an increase in contact resistance between the switching element
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and the pivot-portion component decreases the performance of the switch structure, which is a problem.

[0013] Furthermore, the switching element and/or the pivot-portion component are made of metal, and thus deteriorate due to the air (moisture and oxygen, for instance) and/or heat. This results in, for instance, an increase in contact resistance between the switching element and the pivot-portion component, and an increase in contact resistance between the pivot-portion component and a wire. Consequently, the performance of the switch structure falls, which is a problem.

[0014] Furthermore, in the switch structure illustrated in FIG. 20, first terminal 1100 which is the pivot-portion component and second terminals 1200 are made of metal blocks. Thus, insertion holes 1121 and 1221 through which wires are inserted are formed by cutting such as carving. This increases the manufacturing cost of first terminal 1100 and second terminals 1200.

[0015] The present invention has been conceived to solve the above problems, and an object thereof is to provide a switch structure and a switch which can be manufactured at low cost and readily cope with a fall in performance due to an increase in contact resistance.

[Solution to Problem]

[0016] In order to achieve the above object, an aspect of a switch structure according to the present invention is a switch structure for switching between electrical connection and disconnection of a fixed contact and a wire, the switch structure including: a switching element made of sheet metal and including a movable contact which comes into contact with and separates from the fixed contact; and a first terminal member made of sheet metal and including a first portion which includes a pivot portion serving as a pivot on which the switching element swings, and a second portion with which the wire comes into contact, wherein the sheet metal of the first terminal member is a metal plate having a first surface and a second surface opposite the first surface, and the first surface includes a surface of the first portion with which the switching element is in contact at the pivot portion, and a surface of the second portion with which the wire comes into contact.

[Advantageous Effects of Invention]

[0017] The switch structure and the switch can be manufactured at low cost, and readily cope with a fall in performance due to an increase in contact resistance.

[Brief Description of Drawings]

[0018]

FIG. 1 is an exploded perspective view of a switch structure according to an embodiment;
 FIG. 2A is a perspective view illustrating a switch opened state of the switch structure according to the embodiment;
 FIG. 2B is a perspective view illustrating a switch closed state of the switch structure according to the embodiment;
 FIG. 3A is a cross-sectional view of the switch structure (in the switch closed state) according to the embodiment taken along the yz plane;
 FIG. 3B is a cross-sectional view of the switch structure (in the switch closed state) according to the embodiment taken along the xz plane;
 FIG. 4A is a perspective view of a first terminal member of a first terminal of the switch structure according to the embodiment;
 FIG. 4B is a top view of the first terminal member of the first terminal of the switch structure according to the embodiment;
 FIG. 4C is a cross-sectional view (a cross-sectional view taken along line IVC-IVC in FIG. 4B) of the first terminal member of the first terminal of the switch structure according to the embodiment;
 FIG. 5 includes (a) which is a plan view illustrating an unbent form of a metal plate to be used as the first terminal member of the first terminal of the switch structure according to the embodiment, and (b) which is a side view of the metal plate;
 FIG. 6 is a cross-sectional view of the metal plate taken along line VI-VI in (a) of FIG. 5;
 FIG. 7A is a perspective view of a second terminal member of the first terminal of the switch structure according to the embodiment;
 FIG. 7B is a cross-sectional view for illustrating a state when a screw is screwed into the second terminal member of the first terminal of the switch structure according to the embodiment;
 FIG. 8A is a perspective view of a switching element of the switch structure according to the embodiment;
 FIG. 8B is a perspective view of the switching element of the switch structure according to the embodiment;

FIG. 8C is a side view of the switching element of the switch structure according to the embodiment;
 FIG. 9 is an external perspective view of the switch according to the embodiment;
 FIG. 10 is an exploded perspective view of the switch according to the embodiment;
 FIG. 11 is a perspective cross-sectional view of the switch according to the embodiment;
 FIG. 12A is a cross-sectional view of the switch (in the switch opened state) according to the embodiment;
 FIG. 12B is a cross-sectional view of the switch (in the switch closed state) according to the embodiment;
 FIG. 13A illustrates a configuration when wires run through the switch structures;
 FIG. 13B illustrates a configuration when wires run through the switch structures;
 FIG. 14 is a cross-sectional view illustrating configurations of a switch structure and a switch according to Variation 1;
 FIG. 15 is a cross-sectional view illustrating a configuration of a switch structure according to Variation 2;
 FIG. 16 is a cross-sectional view illustrating another configuration of a switch structure according to Variation 2;
 FIG. 17 is a cross-sectional view illustrating a configuration of a switch structure according to Variation 3;
 FIG. 18 is a cross-sectional view illustrating another configuration of the switch structure according to Variation 3;
 FIG. 19A is a perspective view illustrating a configuration of a first terminal member of a first terminal for use in a switch structure according to Variation 4;
 FIG. 19B includes (a) which is a plan view of a metal plate to be used as a first terminal member of a first terminal for use in the switch structure according to Variation 4, and (b) which is a side view of the metal plate; and
 FIG. 20 includes (a) which is an exploded perspective view of a conventional switch structure, and (b) and (c) which are side views for illustrating switching motion of the conventional switch structure.

[Description of Embodiments]

Embodiment

[0019] The following describes embodiments of the invention. Note that the embodiments described below each show a preferable, specific example. The numerical values, shapes, materials, constituent elements, the arrangement and connection of the constituent elements, and others indicated in the following embodiments are mere examples, and are not intended to limit the present invention. Therefore, among the constituent elements in the following embodiments, constituent elements not recited in any of the independent claims defining the most generic part of the present invention are described as arbitrary constituent elements.

[0020] Note that the drawings are schematic diagrams, and do not necessarily provide strictly accurate illustration. Accordingly, for example, scales are not necessarily the same in the drawings. Note that the same numeral is given to substantially the same configuration throughout the drawings, and a redundant description is omitted or simplified.

Switch Structure

[0021] First, the entire configuration of switch structure 1 according to the embodiment is described with reference to FIGS. 1 to 3B. FIG. 1 is an exploded perspective view of switch structure 1 according to the embodiment. FIG. 2A is a perspective view illustrating a switch opened state of switch structure 1, and FIG. 2B is a perspective view illustrating a switch closed state of switch structure 1. FIG. 3A is a cross-sectional view of switch structure 1 (in the switch closed state) taken along the yz plane, and FIG. 3B is a cross-sectional view of switch structure 1 (in the switch closed state) taken along the xz plane. Note that in the present embodiment, the x axis, the y axis, and the z axis are axes of a three-dimensional rectangular coordinate system, and the z axis direction is the vertical direction.

[0022] Switch structure 1 is a switching device for switching between electrical connection and disconnection of a fixed contact and a wire. As illustrated in FIGS. 1 to 3B, switch structure 1 includes first terminal 100 connected to wire 2, second terminal 200 which includes fixed contact 223 and is connected to wire 3, and switching element 300 which includes movable contact 310 that is movable relative to fixed contact 223, and electrically connects and disconnects first terminal 100 and second terminal 200. Wire 2 (first wire) and wire 3 (second wire) are conductive wires made of metal, for example.

[0023] First terminal 100, second terminal 200, and switching element 300 are each made of sheet metal and formed by processing a metal plate. Since components included in switch structure 1 are made of sheet metal as mentioned above, the components can be produced using a progressive pressing machine or a forming machine, thus reducing the manufacturing cost.

[0024] As illustrated in FIGS. 2A and 2B, switching element 300 can swing on swing pivot axis Ax, as indicated by arrow R. Swing pivot axis Ax is in the direction parallel to the x axis in the present embodiment. Movable contact 310 of switching element 300 comes into contact with and separates from fixed contact 223 by switching element 300 swinging (turning) in the direction indicated by arrow R.

[0025] Specifically, by movable contact 310 separating from fixed contact 223 as illustrated in FIG. 2A, switch structure

1 is brought into the switch opened state, and wires 2 and 3 are electrically disconnected. On the other hand, by movable contact 310 coming into contact with fixed contact 223 as illustrated in FIG. 2B, switch structure 1 is brought into the switch closed state, and wires 2 and 3 are electrically connected.

[0026] Switch structure 1 having such a configuration switches between electrical connection and disconnection of fixed contact 223 and wire 2. In the present embodiment, switch structure 1 electrically connects and disconnects two wires (wires 2 and 3).

[0027] The following describes configurations of first terminal 100, second terminal 200, and switching element 300 in further detail, with reference to FIGS. 1 to 3B.

[First terminal]

[0028] As illustrated in FIGS. 1 to 3B, first terminal 100 is a support component which supports switching element 300. Furthermore, first terminal 100 is a pivot-portion component (pivot terminal) which includes a pivot portion serving as a pivot of the swing of switching element 300.

[0029] First terminal 100 includes two members, namely, first terminal member 110 made of sheet metal and second terminal member 120 made of sheet metal. In the present embodiment, the sheet metal of first terminal member 110 is a metal plate made of a metal material having conductivity higher than the material of second terminal member 120. For example, the material of first terminal member 110 is brass, and the material of second terminal member 120 is iron.

[0030] First terminal member 110 includes support portion 110a which supports switching element 300. Support portion 110a is a pivot portion serving as a pivot on which switching element 300 swings. As illustrated in FIGS. 3A and 3B, in the present embodiment, support portion 110a is a depression whose cross section is a semicircular arc, and is extending in the direction along swing pivot axis Ax (x axis direction). A contact area of first terminal member 110 and switching element 300 can be increased by extending support portion 110a along swing pivot axis Ax as described above. This decreases contact resistance between first terminal member 110 and switching element 300.

[0031] Switching element 300 and wire 2 are directly connected to first terminal member 110, and first terminal member 110 is in contact with switching element 300 and wire 2 so as to be electrically connected thereto. In first terminal member 110, a surface with which switching element 300 is in contact at a pivot portion (support portion 110a) and a surface with which wire 2 comes into contact are included in the same surface of the metal plate.

[0032] Here, a configuration of first terminal member 110 is described in further detail with reference to FIGS. 4A to 4C, and also to FIGS. 1 to 3B. FIG. 4A is a perspective view of first terminal member 110 of first terminal 100, FIG. 4B is a top view of first terminal member 110, and FIG. 4C is a cross-sectional view of first terminal member 110 taken along line IVC-IVC in FIG. 4B.

[0033] As illustrated in FIGS. 4A to 4C, first terminal member 110 includes first portion 111 having support portion 110a (depression), and second portion 112 with which wire 2 comes into contact. In the present embodiment, first terminal member 110 further includes third portion 113.

[0034] Specifically, first terminal member 110 has a substantially U shape, and includes first portion 111 and second portion 112 facing one another, and third portion 113 which connects one edge portion of first portion 111 and one edge portion of second portion 112.

[0035] First portion 111 and second portion 112 are located with a predetermined space therebetween. First portion 111 and second portion 112 are two upright portions erecting from third portion 113 which is located at the bottom of the U shape. Although first portion 111 and second portion 112 are parallel to one another in the present embodiment, first portion 111 and second portion 112 are not necessarily parallel to one another.

[0036] As illustrated in FIGS. 1 to 3B, first portion 111 includes support portion 110a which supports switching element 300. First portion 111 is in contact with foot portion 301 of switching element 300 at support portion 110a. As illustrated in FIGS. 3A and 3B, foot portion 301 of switching element 300 fits in support portion 110a. First portion 111 has through holes 110b provided at end portions of support portion 110a in the longitudinal direction. Note that first portion 111 is in a position spaced apart from second terminal member 120, and a predetermined space is present between the inner surface of first portion 111 and the external surface of second terminal member 120.

[0037] Second portion 112 is inserted in insertion hole 121 of second terminal member 120. Second portion 112 is held at second terminal member 120. By inserting second portion 112 in insertion hole 121, first terminal member 110 is incorporated in second terminal member 120.

[0038] Third portion 113 connects first portion 111 and second portion 112, and the space between first portion 111 and second portion 112 corresponds to the length of third portion 113. Note that third portion 113 is not inserted in insertion hole 121 of second terminal member 120.

[0039] First terminal member 110 having such a configuration is a terminal plate which is made using a metal plate having two opposite surfaces. Specifically, first terminal member 110 is formed by bending metal plate 110M as illustrated in FIGS. 5 and 6.

[0040] Metal plate 110M is a flat metal member having first surface S1 and second surface S2 opposite first surface

S 1. FIG. 5 illustrates metal plate 110M which is unbent, where (a) is a plan view of metal plate 110M and (b) is a side view of metal plate 110M. FIG. 6 is a cross-sectional view of metal plate 110M taken along line VI-VI in (a) of FIG. 5.

[0041] A surface treatment is applied to the surface of metal plate 110M as additional processing. In the present embodiment, a surface treatment is applied only to first surface S1 of metal plate 110M, among first surface S1 and second surface S2. Specifically, plating such as silver plating or tinning is applied to first surface S1 as a surface treatment, and plating layer 110M2 is formed on first surface S1 of metal plate 110M, as illustrated in FIG. 6. In this case, metal plate 110M includes, for example, metal base (for example, brass) 110M1 and plating layer 110M2 formed on the surface of metal base 110M1.

[0042] First terminal member 110 is formed into a U shape having three portions, namely, first portion 111, second portion 112, and third portion 113 as illustrated in FIGS. 4A to 4C, by bending metal plate 110M illustrated in FIG. 5 twice.

[0043] Specifically, first terminal member 110 is formed by bending metal plate 110M such that second surface S2 of first portion 111 and second surface S2 of second portion 112 face one another. A surface treatment is applied only to first surface S1 of metal plate 110M in the present embodiment, and thus metal plate 110M is bent such that portions of the surface of metal plate 110M to which a surface treatment is not applied (second surface S2) face one another. In other words, metal plate 110M is bent such that the surface of metal plate 110M to which a surface treatment is applied (first surface S1) faces outward.

[0044] In first terminal member 110 having such a configuration, the surface of first portion 111 (first contact surface) with which switching element 300 is in contact at a pivot portion (support portion 110a) and the surface of second portion 112 with which wire 2 comes into contact (second contact surface) are included in first surface S1 of metal plate 110M, and thus are included in the same surface.

[0045] In the present embodiment, a surface treatment is applied only to first surface S1, among first surface S1 and second surface S2. Thus, a contact surface of first portion 111 (first contact surface) with switching element 300 and a contact surface of second portion 112 (second contact surface) with wire 2 are included in the surface to which a surface treatment is applied (first surface S1).

[0046] The following describes second terminal member 120 of first terminal 100. Second terminal member 120 is a holder which holds wire 2. As illustrated in FIGS. 1 to 3B, second terminal member 120 has insertion hole 121 (insertion portion) in which wire 2 and second portion 112 of first terminal member 110 are inserted. In the present embodiment, second terminal member 120 is a square cylindrical terminal frame formed by bending a metal plate into a frame shape. Insertion hole 121 is formed in second terminal member 120 by bending a metal plate into a frame shape in the above manner.

[0047] Here, a configuration of second terminal member 120 is described in further detail, with reference to FIGS. 7A and 7B, and also to FIGS. 1 to 3B.

[0048] FIG. 7A is a perspective view of second terminal member 120 of first terminal 100 of switch structure 1 according to the embodiment, and FIG. 7B is a cross-sectional view for illustrating a state when screw 130 is screwed into second terminal member 120.

[0049] As illustrated in FIGS. 7A and 7B, second terminal member 120 is a pillar terminal in the present embodiment. Specifically, screw 130 (terminal screw) is provided in second terminal member 120, and wire 2 inserted in insertion hole 121 is held in second terminal member 120 by being clamped with screw 130 (clamping member). More specifically, second terminal member 120 includes screw hole (internal thread) 122, and screw hole 122 engages with screw (external thread) 130. Screw hole 122 is formed penetrating through one inner wall of second terminal member 120.

[0050] In the present embodiment, second portion 112 of first terminal member 110 is also inserted in insertion hole 121 of second terminal member 120. By screwing screw 130 into screw hole 122 in a state where second portion 112 and wire 2 are both inserted in insertion hole 121 of second terminal member 120, wire 2 inserted in insertion hole 121 is pushed against second portion 112 and fixed. Accordingly, wire 2 and first terminal member 110 come into contact with and are electrically connected to one another.

[Second terminal]

[0051] As illustrated in FIGS. 1 to 3B, second terminal 200 is a fixed terminal which includes fixed contact 223. Fixed contact 223 is provided at a position where movable contact 310 of switching element 300 comes into contact with and separates from fixed contact 223.

[0052] Second terminal 200 includes two members, namely first terminal member 210 made of sheet metal and second terminal member 220 made of sheet metal. In the present embodiment, the sheet metal of first terminal member 210 is a metal plate made of a metal material having higher conductivity than the material of second terminal member 220. For example, the material of first terminal member 210 is brass, and the material of second terminal member 220 is iron.

[0053] First terminal member 210 is a terminal strip having high conductivity and made of a flat metal plate. First terminal member 210 is inserted in insertion hole 221 of second terminal member 220.

[0054] Second terminal member 220 is a holder which holds wire 3. Second terminal member 220 has insertion hole

221 (insertion portion) in which wire 3 and first terminal member 210 are inserted. In the present embodiment, second terminal member 220 is a square cylindrical terminal frame formed by bending a metal plate into a frame shape. Insertion hole 221 is formed in second terminal member 220 by bending the metal plate into a frame shape as mentioned above.

[0055] In the present embodiment, second terminal member 220 is a pillar terminal, and has a similar configuration as second terminal member 120 of first terminal 100. Specifically, screw 230 (terminal screw) is provided in second terminal member 220, and wire 3 inserted in insertion hole 221 is pushed against first terminal member 210 by being clamped with screw 230 (clamping member). More specifically, second terminal member 220 has screw hole (internal thread) 222 which engages with screw (external thread) 230. Wire 3 inserted in insertion hole 221 is clamped and fixed by screw 230 being screwed into screw hole 222. Screw hole 222 is formed penetrating through one inner wall of second terminal member 220.

[0056] Furthermore, fixed contact 223 is provided on the upper surface of second terminal member 220. Fixed contact 223 is fixed to second terminal member 220 using first terminal member 210. For example, rivet-shaped fixed contact 223 is inserted in through holes provided in first terminal member 210 and second terminal member 220, and the head of fixed contact 223 is riveted, which fixes fixed contact 223 to second terminal member 220. As an example, fixed contact 223 is a composite contact formed by joining, for instance, silver or a silver alloy having excellent spark resistance, for instance, to the head of a rivet-shaped base material such as a copper alloy.

[0057] Such a configuration of fixed contact 223 allows wire 3 inserted in second terminal member 220 to be in direct contact with at least one of first terminal member 210 to which fixed contact 223 is connected and fixed contact 223, not via second terminal member 220. Thus, an inexpensive metal material can be used as the sheet metal material of second terminal member 220.

[Switching element]

[0058] As illustrated in FIGS. 1 to 3B, switching element 300 includes movable contact 310 which comes into contact with and separates from fixed contact 223 of second terminal member 220 of second terminal 200. Switching element 300 is swingably supported by support portion 110a of first terminal member 110 of first terminal 100, and the position of movable contact 310 is changed by the swing of switching element 300.

[0059] Movable contact 310 is fixed to contact portion 303 of switching element 300 by being riveted, for example, as with fixed contact 223 of second terminal 200. As an example, movable contact 310 is a composite contact formed by joining, for instance, silver or a silver alloy having excellent spark resistance, for instance, to the head of a rivet-shaped base material such as a copper alloy.

[0060] Here, a configuration of switching element 300 is described in further detail with referenced to FIGS. 8A to 8C, and also to FIGS. 1 to 3B. FIGS. 8A and 8B are perspective views of switching element 300, and FIG. 8C is a side view of switching element 300.

[0061] As illustrated in FIGS. 8A to 8C, switching element 300 includes foot portion 301 (first portion), arm portion 302 (second portion), contact portion 303 (third portion), and bent portion 304 (fourth portion). As described above, switching element 300 is made of sheet metal, and is formed by bending a metal plate. Accordingly, foot portion 301, arm portion 302, contact portion 303, and bent portion 304 of switching element 300 form one continuous piece. In the present embodiment, the material of switching element 300 is the same as the material of first terminal member 110 of first terminal 100, that is, brass.

[0062] Foot portion 301 is substantially rectangular, and is supported by first terminal member 110 of first terminal 100. The edge portions of foot portion 301 are connected to arm portion 302 and bent portion 304.

[0063] One edge of foot portion 301 in the vertical direction is a pivot portion serving as a pivot on which switching element 300 swings, and is in contact with support portion 110a of first terminal member 110. In the present embodiment, one edge of foot portion 301 is a ridge extending narrowly in the direction along swing pivot axis Ax. Specifically, as illustrated in FIG. 3A, the one edge of foot portion 301 is a ridge whose cross-sectional shape is a semicircular arc. The one edge of foot portion 301 is thus extending along swing pivot axis Ax, which increases the contact area of first terminal member 110 and switching element 300. This decreases contact resistance between first terminal member 110 and switching element 300.

[0064] On the other hand, another edge of foot portion 301 in the vertical direction (a portion on the opposite side of the one edge) receives force for switch operation. The other edge of foot portion 301 is chamfered, and serves as an operation portion where force for swinging switching element 300 is applied.

[0065] Arm portion 302 connects foot portion 301 and contact portion 303. Arm portion 302 is bent at right angle to foot portion 301 such that the angle between the principal surface of arm portion 302 and the principal surface of foot portion 301 is approximately 90 degrees. Arm portion 302 is formed to have a side crossing swing pivot axis Ax (orthogonal to swing pivot axis Ax in the present embodiment).

[0066] Movable contact 310 is provided on contact portion 303. Contact portion 303 is bent at right angle to arm portion 302 such that the angle between the principal surface of contact portion 303 and the principal surface of foot portion

301 and the angle between the principal surface of contact portion 303 and the principal surface of arm portion 302 are both approximately 90 degrees. Contact portion 303 is formed so as to have a surface parallel to swing pivot axis Ax.

[0067] Bent portion 304 is formed at a position on a side of foot portion 301 opposite the side where arm portion 302 is located. Bent portion 304 is substantially rectangular and is bent in the opposite direction of arm portion 302. Bent portion 304 is used as, for example, a balancer or a swing range limit portion for limiting the swing of switching element 300.

[0068] Arm portion 302 has a side crossing swing pivot axis Ax, and thus switching element 300 having such a configuration achieves higher strength even though the cross-sectional area of arm portion 302 is small, compared to the case where arm portion 302 has a side parallel to swing pivot axis Ax. Accordingly, this allows necessary and sufficient contact pressure force to be readily applied from movable contact 310 toward fixed contact 223. In addition, the strength of switching element 300 is secured by a structure achieved in view of strength of materials, and thus the amount of sheet metal used can be reduced by decreasing the thickness and the size of sheet metal for forming switching element 300. As a result, the material cost and the manufacturing cost can be reduced, thus improving design flexibility.

[0069] A portion of switching element 300 in contact with first portion 111, first portion 111, and second portion 112 are disposed overlapping in the stated order in the height direction (z axis direction) of switch structure 1. Specifically, foot portion 301 of switching element 300, first portion 111, and second portion 112 are disposed overlapping vertically downward in the stated order. Furthermore, in the present embodiment, foot portion 301 of switching element 300, first terminal member 110 (first portion 111 and second portion 112), second terminal member 120, and screw 130 are disposed so as to be located on the surface of projection of second terminal member 120 in the height direction of switch structure 1.

[Conclusion]

[0070] As mentioned above, switch structure 1 according to the present embodiment includes: switching element 300 made of sheet metal and including movable contact 310 which comes into contact with and separates from fixed contact 223; and first terminal member 110 made of sheet metal, and including first portion 111 which includes a pivot portion (support portion 110a) serving as a pivot on which switching element 300 swings, and second portion 112 with which wire 2 comes into contact. First surface S1 of metal plate 110M includes the surface of first portion 111 with which switching element 300 is in contact at the pivot portion (support portion 110a) and the surface of second portion 112 with which wire 2 comes into contact.

[0071] This readily allows coping with a decrease in performance of switch element 1 resulting from an increase in contact resistance by wear of first portion 111 (first terminal member 110) and switching element 300 due to the swing of switching element 300, and an increase in contact resistance caused by deterioration of first portion 111 (first terminal member 110) and switching element 300 due to the air (moisture and oxygen, for instance) and/or heat.

[0072] In other words, the surface of first portion 111 with which switching element 300 is in contact at a pivot portion (support portion 110a) and the surface of second portion 112 with which wire 2 comes into contact are included in the same surface of metal plate 110M, and thus additional processing or an additional treatment, for instance, can be simultaneously performed on these two contact surfaces. This readily allows coping with a decrease in performance of switch element 1. For example, a decrease in performance of switch element 1 can be coped with by performing additional processing or an additional treatment, for instance, only on one side (first surface S1) of metal plate 110M.

[0073] Furthermore, switching element 300 and first terminal member 110 are both made of sheet metal, and thus switching element 300 and first terminal member 110 can be processed and formed without using cutting such as carving. Accordingly, switching element 300 and first terminal member 110 can be manufactured at low cost. Hence, switch structure 1 can be manufactured at low cost.

[0074] As described above, according to the present embodiment, switch structure 1 can be manufactured at low cost, and a decrease in performance due to an increase in contact resistance can be readily coped with. This yields a low-cost switch structure excellent in long term reliability.

[0075] In the present embodiment, the switch structure includes second terminal member 120 made of sheet metal and having insertion hole 121 in which wire 2 and second portion 112 are inserted.

[0076] Accordingly, second terminal member 120 can be processed and formed without using cutting, and thus second terminal member 120 can also be manufactured at low cost. Hence, switch structure 1 can be manufactured at lower cost.

[0077] Furthermore, screw 130 is provided in second terminal member 120, and wire 2 inserted in insertion hole 121 is pushed against second portion 112 by being clamped with screw 130.

[0078] This configuration causes, by tightening screw 130, wire 2 to come into contact with first terminal member 110 which supports switching element 300 which includes movable contact 310. In this manner, by merely tightening screw 130, wire 2 and movable contact 310 can be electrically connected via switching element 300 and first terminal member 110. Accordingly, switch structure 1 electrically connected to wire 2 can be obtained at low cost using a simple configuration.

[0079] Furthermore, first terminal member 110 is formed by bending metal plate 110M in the present embodiment.

[0080] Accordingly, additional processing or an additional treatment can be performed only on one side of unbent metal plate 110M, and thus a decrease in performance of switch element 1 can be readily coped with.

[0081] Furthermore, in the present embodiment, first surface S1 of metal plate 110M includes the surface of first portion 111 with which switching element 300 is in contact at a pivot portion (support portion 110a) and the surface of second portion 112 with which wire 2 comes into contact, and a surface treatment is applied only to first surface S1, among first surface S1 and second surface S2.

[0082] By applying a surface treatment only to one side, that is, first surface S1 of metal plate 110M as described above, wear and deterioration of first terminal member 110 and switching element 300 can be inhibited at lower cost, compared with the case where a surface treatment is applied to both sides.

[0083] In the present embodiment, the surface treatment applied to first surface S1 of metal plate 110M is plating, and plating layer 110M2 is formed on first surface S1.

[0084] Wear resistance improves by plating a surface of metal plate 110M as described above. This decreases the amount of wear of first terminal member 110 due to a long-term use of switch structure 1. Furthermore, deterioration of first terminal member 110 due to the air and/or heat can also be inhibited by plating metal plate 110M.

[0085] Moreover, by plating only one side (first surface S1) of metal plate 110M as in the present embodiment, the amount of plating used can be reduced compared with the case where both sides of metal plate 110M are plated, which achieves a reduction in the manufacturing cost. Accordingly, a low cost switch structure excellent in long term reliability can be obtained.

[0086] Furthermore, the surface treatment applied to first surface S1 of metal plate 110M is not limited to plating, and may be another surface treatment such as shot peening.

[0087] The surface of metal plate 110M can be hardened by performing shot peening on metal plate 110M as described above, which improves wear resistance. This reduces the amount of wear of first terminal member 110 due to a long-term use of switch structure 1.

[0088] In the present embodiment, first terminal member 110 is formed such that second surface S2 of first portion 111 and second surface S2 of second portion 112 face one another. Specifically, first terminal member 110 has a substantially U shape.

[0089] Accordingly, first terminal member 110 can be manufactured by processing sheet metal at low cost, and thus a switch structure can be manufactured at low cost.

[0090] In the present embodiment, a portion of switching element 300 in contact with first portion 111, first portion 111, and second portion 112 are disposed overlapping in the stated order.

[0091] In this manner, a portion of switching element 300 in contact with first portion 111, first portion 111, and second portion 112 are disposed so as to be stacked in the height direction (z axis direction), which achieves a size reduction of switching element 300 and first terminal member 110 in the directions orthogonal to the height direction (x axis direction and y axis direction).

[0092] Specifically, in the present embodiment, foot portion 301 of switching element 300, first terminal member 110 (first portion 111 and second portion 112), second terminal member 120, and screw 130 are disposed so as to be located on the surface of projection of second terminal member 120 in the height direction.

[0093] This achieves a reduction in the entire size of switch structure 1 in the direction orthogonal to the height direction.

Switch

[0094] The following describes switch 10 according to the embodiment, with reference to FIGS. 9 to 12B. FIG. 9 is an external perspective view of switch 10 according to the embodiment, FIG. 10 is an exploded perspective view of switch 10, and FIG. 11 is a perspective cross-sectional view of switch 10. Furthermore, FIGS. 12A and 12B are cross-sectional views of switch 10, FIG. 12A illustrates a switch opened state, and FIG. 12B illustrates a switch closed state.

[0095] As illustrated in FIGS. 9 to 12B, switch 10 is, for example, a switch which controls electrical connection and disconnection of a plurality of wires, and includes switch structure 1 as described above, housing 11 which houses switch structure 1, and operation button 12 (knob) for swinging switching element 300 of switch structure 1. In the present embodiment, switch 10 further includes fixing base 13, coiled spring 14 (spring), and operating finger 15 (plunger). Housing 11, operation button 12, and fixing base 13 are resin-molded components, for example.

[0096] Switch 10 has, for example, a rocker switch structure which swings (rocks) switching element 300 of switch structure 1 on the swing pivot axis. Note that switch structure 1 can be used to achieve, for example, a toggle switch which is operated with a stick knob, other than the rocker switch.

[0097] The following describes constituent elements of switch 10 in detail.

[Housing]

[0098] Housing 11 is an accommodation case having a substantially box shape, for housing switch structure 1. Switch-

ing element 300, first terminal member 110 of first terminal 100, and fixing base 13 are housed in the space surrounded by first peripheral walls 11a of housing 11.

[0099] On the external surfaces of first peripheral walls 11a of housing 11, two protrusions 11b serving as pivots are disposed facing outward, on a line in the x axis direction parallel to the swing pivot axis. Engaging portions 11c (snap fittings), which are used when switch 10 is installed and fixed being embedded in the wall of a building, for instance, are provided on the opposite external surfaces of first peripheral walls 11a in the y axis direction.

[0100] Second terminal member 120 of first terminal 100, second terminal 200 (first terminal member 210 and second terminal member 220), screw 130, and screw 230 are housed in the space surrounded by second peripheral walls 11d of housing 11. Note that the bottom of housing 11 has openings through which a screwdriver for rotating screws 130 and 230 can be put in.

[0101] Second peripheral wall 11d has openings 11e passing through entire housing 11 in the x axis direction. Openings 11e allow wires inserted in insertion hole 121 of second terminal member 120 of first terminal 100 and insertion hole 221 of second terminal member 220 of second terminal 200 to pass through housing 11 linearly. In other words, openings 11e allow wires to pass through switch 10.

[Operation button]

[0102] Operation button 12 is a button for a user to make switch operation, and serves as a cover of housing 11. User operation on operation button 12 swings switching element 300 of switch structure 1.

[0103] Operation button 12 covers the upper opening of first peripheral walls 11a of housing 11. The side walls of operation button 12 in the x axis direction have openings 12a in which two protrusions 11b of housing 11 fit. The width of operation button 12 increases at the portions of protrusions 11b by pushing operation button 12 against housing 11 from above, and openings 12a engage with protrusions 11b by the snap fitting structure. Operation button 12 makes swing motion (rocking motion, seesaw motion) about protrusions 11b serving as pivots. In other words, operation button 12 is swingably supported by housing 11, and swings switching element 300 when the switch is operated by external operation such as a user operation.

[0104] Operation button 12 holds an end of coiled spring 14, and causes coiled spring 14 to apply biasing force to switching element 300. Cylinder 12b for housing operating finger 15 and coiled spring 14 for biasing to cause swing is erected at the center of the inside of operation button 12. A protrusion to be inserted in coiled spring 14 to attach coiled spring 14 to operation button 12 is provided on the bottom portion of cylinder 12b.

[Fixing base]

[0105] Fixing base 13 fixes components of switch structure 1 to one another in housing 11. Second terminal member 120 of first terminal 100 and second terminal member 220 of second terminal 200 are fixed by fixing base 13, inside housing 11.

[0106] Fixing base 13 includes substantially rectangular plate 13a, two terminal retainers 13b disposed opposite each other at a substantially center portion of plate 13a, spark shield 13c having two adjoining walls and a top cover and disposed on the side of terminal retainer 13b, and stopper 13d.

[0107] Terminal retainers 13b each have a slit-shaped recess (cave) extending in the x axis direction, in a side facing the other of the terminal retainers. In other words, terminal retainers 13b have a structure having two adjoining walls and a top cover, as with spark shield 13c described above. First terminal member 110 (first portion 111) of first terminal 100 is inserted in the recesses of terminal retainers 13b.

[0108] Spark shield 13c prevents spread of a substance that scatters due to sparks produced at a contact between movable contact 310 of switching element 300 and fixed contact 223 of second terminal 200.

[0109] Stopper 13d limits the range of swing of switching element 300 at a position where bent portion 304 of switching element 300 comes into contact when switching element 300 is placed in the opened state.

[Coiled spring, operating finger]

[0110] Coiled spring 14 is an elastic body which applies biasing force to switching element 300 of switch structure 1 in the swing direction. Coiled spring 14 elastically stretches in cylinder 12b of operation button 12 and moves reciprocally and linearly inside cylinder 12b, with the lower end of coiled spring 14 being joined to operating finger 15. When switching element 300 is incorporated in switch 10, biasing force F of coiled spring 14 (see FIG. 11) applies pressure to switching element 300 against first terminal 100 (first terminal member 110), and switching element 300 is biased in the swing direction.

[0111] Operating finger 15 has, at the lower end, recess 15a in which foot portion 301 of switching element 300 is inserted, and applies biasing force F of coiled spring 14 to switching element 300. The upper portion of operating finger

15 is inserted in coiled spring 14, and held at coiled spring 14.

[Operation of switch]

[0112] The following describes operation of switch 10 with reference to FIGS. 12A and 12B.

[0113] As illustrated in FIGS. 12A and 12B, by inserting wire 2 in insertion hole 121 of second terminal member 120 of first terminal 100 and tightening screw 130, wire 2 is electrically connected to movable contact 310 via first terminal member 110 and switching element 300.

[0114] On the other hand, by inserting wire 3 in insertion hole 221 of second terminal member 220 of second terminal 200 and tightening screw 230, wire 3 is electrically connected to fixed contact 223 directly or via first terminal member 210.

[0115] As illustrated in FIG. 12A, if operation button 12 is pressed in the left rotating direction as indicated by arrow R1, switching element 300 swings in the right rotating direction indicated by arrow R2. In this case, fixed contact 223 and movable contact 310 are separated, and switch 10 is placed in an opened state.

[0116] On the contrary, as illustrated in FIG. 12B, if operation button 12 is pressed in the right rotating direction as indicated by arrow R3, switching element 300 swings in the left rotating direction indicated by arrow R4, and movable contact 310 is pressed against fixed contact 223. In this case, fixed contact 223 and movable contact 310 come into contact with one another, and switch 10 is placed in a closed state.

[Conclusion]

[0117] As described above, according to switch 10 according to the present embodiment, switch structure 1 can be housed and fixed in housing 11, through a simple work without using a tool for incorporation.

[0118] Furthermore, switch 10 includes switch structure 1 described above, and thus can be manufactured at low cost, and has excellent long term reliability.

Example of Use of Switch Structure

[0119] Although only one switch structure 1 according to the present embodiment described above can be used, plural switch structures 1 can be used as a unit as illustrated in FIGS. 13A and 13B. FIGS. 13A and 13B illustrate a configuration when wires run through plural switch structures 1. As illustrated in FIGS. 13A and 13B, for example, plural switch structures 1 can be aligned and used. In this case, wires may run through plural switch structures 1.

[0120] Specifically, one wire 20 is sequentially inserted into second terminal members 120 of first terminals 100 of switch structures 1, as illustrated in FIG. 13A. In other words, wire 20 is used as a common wire for switch structures 1.

[0121] On the other hand, wires 31 and 32 are separately inserted into second terminal members 220 of second terminals 200 of switch structures 1. In other words, wires 31 and 32 are separately attached in correspondence with switch structures 1.

[0122] In this manner, switch structures 1 electrically connect and disconnect wire 20 to/from wire 31 and wire 20 to/from wire 32. For example, switch structure 1 can control supply of electric power to a load (for example, an electric appliance such as a lighting apparatus), as illustrated in FIG. 13B. Note that FIG. 13B illustrates the case where electric socket 40 is also used.

[0123] Since wires run through plural switch structures 1 as described above, such use of plural switch structures 1 can be achieved with further ease. Furthermore, such a way of use reduces the area for installing a switch which includes switch structures 1, also due to the narrow width of switch structures 1 in the direction along the swing pivot axis.

Variations

[0124] The following describes variations of the switch structure with reference to the drawings.

Variation 1

[0125] FIG. 14 is a cross-sectional view illustrating configurations of switch structure 1A and switch 10A according to Variation 1.

[0126] In switch structure 1 described above, support portion 110a of first terminal member 110 of first terminal 100 is a depression whose cross-sectional shape is a semicircular arc, and one edge of foot portion 301 of switching element 300 is a ridge whose cross-sectional shape is a semicircular arc, as illustrated in FIG. 3A. In other words, the depression and the one edge forming a pivot portion of switch structure 1 have concave and convex cross-sectional profiles, respectively, which are in surface-to-surface contact with one another, in FIG. 3A.

[0127] With this configuration, contact points of support portion 110a of first terminal member 110 and foot portion

301 of switching element 300 form a distribution expanding into a cylindrical surface shape along swing pivot axis Ax. This allows the pivot portion to be in surface-to-surface contact, thus reducing the contact pressure (pressing force between contact surfaces) and inhibiting wear of the pivot portion.

[0128] In contrast, in switch structure 1A and switch 10A according to this variation, support portion 110a of first terminal member 110 (first portion 111) is a depression whose cross-sectional shape is V-shaped, and one edge of foot portion 301 of switching element 300 is a ridge whose cross-sectional shape is V-shaped, as illustrated in FIG. 14. In other words, the depression and the one edge forming a pivot portion of switch structure 1A have V-shaped recessed and projecting cross-sectional profiles, respectively, which are in line-to-line contact with one another in this variation.

[0129] With this configuration, contact points of support portion 110a of first terminal member 110 and foot portion 301 of switching element 300 form a linear distribution where the bottom valley of the V shape and the tip of a wedge-like sharp shape are in contact with one another in a localized area along swing pivot axis Ax. This clearly indicates the center position of the swing of switching element 300, and prevents the position where the one edge and the depression are in contact from shifting in a direction orthogonal to swing pivot axis Ax, thus achieving stabilization of the switching motion. In addition, the pivot portion is in line-to-line contact, and thus the contact pressure is increased while the contact resistance between switching element 300 and first terminal member 110 (first portion 111) is decreased.

Variation 2

[0130] FIG. 15 is a cross-sectional view illustrating a configuration of switch structure 1B according to Variation 2.

[0131] As illustrated in FIG. 15, switch structure 1B according to this variation, foot portion 301 of switching element 300B includes two protrusions 301a. Two protrusions 301a are provided at the end portions of a semicircular arc ridge along one edge of foot portion 301 corresponding to support portion 110a of first terminal member 110, in the direction along the swing pivot axis. Two protrusions 301a are inserted in two through holes 110b provided in first terminal member 110.

[0132] According to this variation, protrusions 301a are inserted in through holes 110b, thus limiting movement of switching element 300 along support portion 110a (depression) of first terminal member 110 in the direction along the swing pivot axis. This achieves stable swing motion of switching element 300, thus inhibiting wear of switching element 300 and first terminal member 110.

[0133] Note that switch structure 1B' may be adopted which includes switching element 300B' illustrated in FIG. 16 instead of switching element 300B. Switching element 300B' illustrated in FIG. 16 includes one protrusion 301a, and portions of foot portion 301 which serve as pivots of the swing are provided at the end portions on the sides of protrusion 301a in the direction along the swing pivot axis. In this case, first portion 111 of first terminal member 110 has one through hole 110b corresponding to protrusion 301a, and support portions 110a which support switching element 300 are provided at the end portions in the direction along the swing pivot axis. Switch structure 1B' illustrated in FIG. 16 also limits movement of switching element 300 along support portion 110a (depression) of first terminal member 110 in the direction along the swing pivot axis.

Variation 3

[0134] FIG. 17 is a cross-sectional view illustrating a configuration of switch structure 1C according to Variation 3.

[0135] In switch structure 1C according to this variation, first terminal member 110C of first terminal 100C is L-shaped as illustrated in FIG. 17. Specifically, first terminal member 110C includes first portion 111 and second portion 112 only, and is formed by bending a metal plate such that the principal surfaces of first portion 111 and second portion 112 are orthogonal to one another. Second portion 112 is inserted in second terminal member 120C.

[0136] Specifically, first terminal member 110C is formed by bending a metal plate having a first surface and a second surface opposite the first surface in this variation as with the above embodiment, yet in this variation, second portion 112 is connected to an edge portion of first portion 111 such that the second surface of first portion 111 is substantially perpendicular to the second surface of second portion 112.

[0137] According to this variation, first terminal member 110 is L-shaped, and thus the distance between first terminal 100C which includes the pivot portion (support portion 110a) and second terminal 200 (not illustrated) which includes fixed contact 223 is extended. This sufficiently secures the insulation distance inside switch structure 1C.

[0138] Note that switch structure 1C' may be adopted in which first terminal member 110C' illustrated in FIG. 18 is used instead of first terminal member 110C. Also in this case, the insulation distance inside switch structure 1C' is sufficiently secured.

Variation 4

[0139] FIG. 19A is a perspective view illustrating a configuration of first terminal member 110D of first terminal for use

in a switch structure according to Variation 4. FIG. 19B illustrates metal plate 110K used for first terminal member 110D, where (a) is a plan view of metal plate 110K and (b) is a side view of metal plate 110K. Note that the switch structure according to this variation is similar to above-described switch structure 1 illustrated in FIGS. 1 to 3B, except for first terminal member 110D.

[0140] As illustrated in FIG. 19A, first terminal member 110D according to this variation is formed by bending metal plate 110K illustrated in FIG. 19B.

[0141] Metal plate 110K is a flat metal member having first surface S1 and second surface S2 opposite first surface S1, as with metal plate 110M illustrated in FIG. 6. In this variation, metal plate 110K is a clad material which is a laminate of first metal 110K1 having first surface S1 and second metal 110K2 having second surface S2.

[0142] The conductivity of first metal 110K1 is higher than the conductivity of second metal 110K2. For example, first metal 110K1 is formed of a copper-based material, and second metal 110K2 is formed of an iron-based material.

[0143] In this variation, metal plate 110K made of a clad material is used, rather than applying a surface treatment as additional processing performed on first terminal member 110D. Since first terminal member 110D is formed using such metal plate 110K, an inexpensive iron-based material having a high mechanical property, namely high component strength, can be used for second metal 110K2 having second surface S2, while a copper-based material having conductivity higher by requested electrical property, for instance, is used for first metal 110K1 having first surface S1, for example.

[0144] Accordingly, first surface S1 includes a surface of first portion 111 with which switching element 300 (not illustrated) is in contact at a pivot portion (support portion 110a) and a surface of second portion 112 with which wire 2 (not illustrated) comes into contact, and thus wear and deterioration of first terminal member 110D and switching element 300 can be inhibited. This yields low cost switch structure having excellent long term reliability.

[0145] Note that in this variation, surface treatment such as plating and/or shot peening may be additionally and separately applied to metal plate 110K which is a clad material. This further inhibits wear and deterioration of first terminal member 110 and switching element 300.

Other Variations etc.

[0146] Although the above has described the switch structure and the switch according to the present invention based on the embodiment and the variations, the present invention is not limited to the embodiment and the variations described above.

[0147] For example, although first terminal member 110 made of sheet metal and used in the embodiment and the variations described above is a terminal member made by bending a metal plate, the terminal member may be a flat metal plate which is unbent. To reduce the sizes of the switch structure and the switch as in the embodiment and the variations described above, however, first terminal member 110 is preferably made by bending a metal plate.

[0148] The scope of the present invention may also include embodiments as a result of adding various modifications to the embodiment which may be conceived by those skilled in the art, and embodiments obtained by combining constituent elements and functions in the embodiment and the variations in any manner as long as the combinations do not depart from the scope of the present invention.

[Reference Signs List]

[0149]

1, 1A, 1B, 1B', 1C, 1C'	switch structure
2, 3, 20, 31, 32	wire
10, 10A	switch
11	housing
12	operation button
110, 110C, 110D, 210	first terminal member
110a	support portion
110M, 110K	metal plate
110M2	plating layer
110K1	first metal
110K2	second metal
111	first portion
112	second portion
120, 120C, 220	second terminal member
223	fixed contact

300 switching element
310 movable contact

5 **Claims**

1. A switch structure for switching between electrical connection and disconnection of a fixed contact and a wire, the switch structure comprising:

10 a switching element made of sheet metal and including a movable contact which comes into contact with and separates from the fixed contact; and

 a first terminal member made of sheet metal and including a first portion which includes a pivot portion serving as a pivot on which the switching element swings, and a second portion with which the wire comes into contact, wherein

15 the sheet metal of the first terminal member is a metal plate having a first surface and a second surface opposite the first surface, and

 the first surface includes a surface of the first portion with which the switching element is in contact at the pivot portion, and a surface of the second portion with which the wire comes into contact.

20 2. The switch structure according to claim 1, further comprising
 a second terminal member made of sheet metal and having an insertion portion in which the wire and the second portion are inserted.

25 3. The switch structure according to claim 2, wherein
 the second terminal member includes a clamping member, and
 the wire is pushed against the second portion by being clamped with the clamping member.

30 4. The switch structure according to any one of claims 1 to 3, wherein
 the first terminal member is formed by bending the metal plate.

35 5. The switch structure according to claim 4, wherein
 a surface treatment is applied only to the first surface of the metal plate, among the first surface and the second surface.

40 6. The switch structure according to claim 5, wherein
 the surface treatment is plating, and
 a plating layer is formed on the first surface.

45 7. The switch structure according to claim 5, wherein
 the surface treatment is shot peening.

50 8. The switch structure according to claim 4, wherein
 the metal plate is a clad material which is a laminate of a first metal having the first surface and a second metal having the second surface, and
 conductivity of the first metal is higher than conductivity of the second metal.

55 9. The switch structure according to any one of claims 4 to 8, wherein
 the first terminal member is formed such that the second surface of the first portion and the second surface of the second portion face one another.

60 10. The switch structure according to claim 9, wherein
 the first terminal member is substantially U-shaped.

65 11. The switch structure according to claim 9 or 10, wherein
 a portion of the switching element in contact with the first portion, the first portion, and the second portion are disposed overlapping in stated order.

70 12. The switch structure according to any one of claims 1 to 8, wherein

the second portion is connected to an edge portion of the first portion such that the second surface of the first portion is substantially perpendicular to the second surface of the second portion.

13. A switch comprising:

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the switch structure according to any one of claims 1 to 12;
a housing which houses the switch structure; and
an operation button for swinging the switching element included in the switch structure.

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FIG. 1

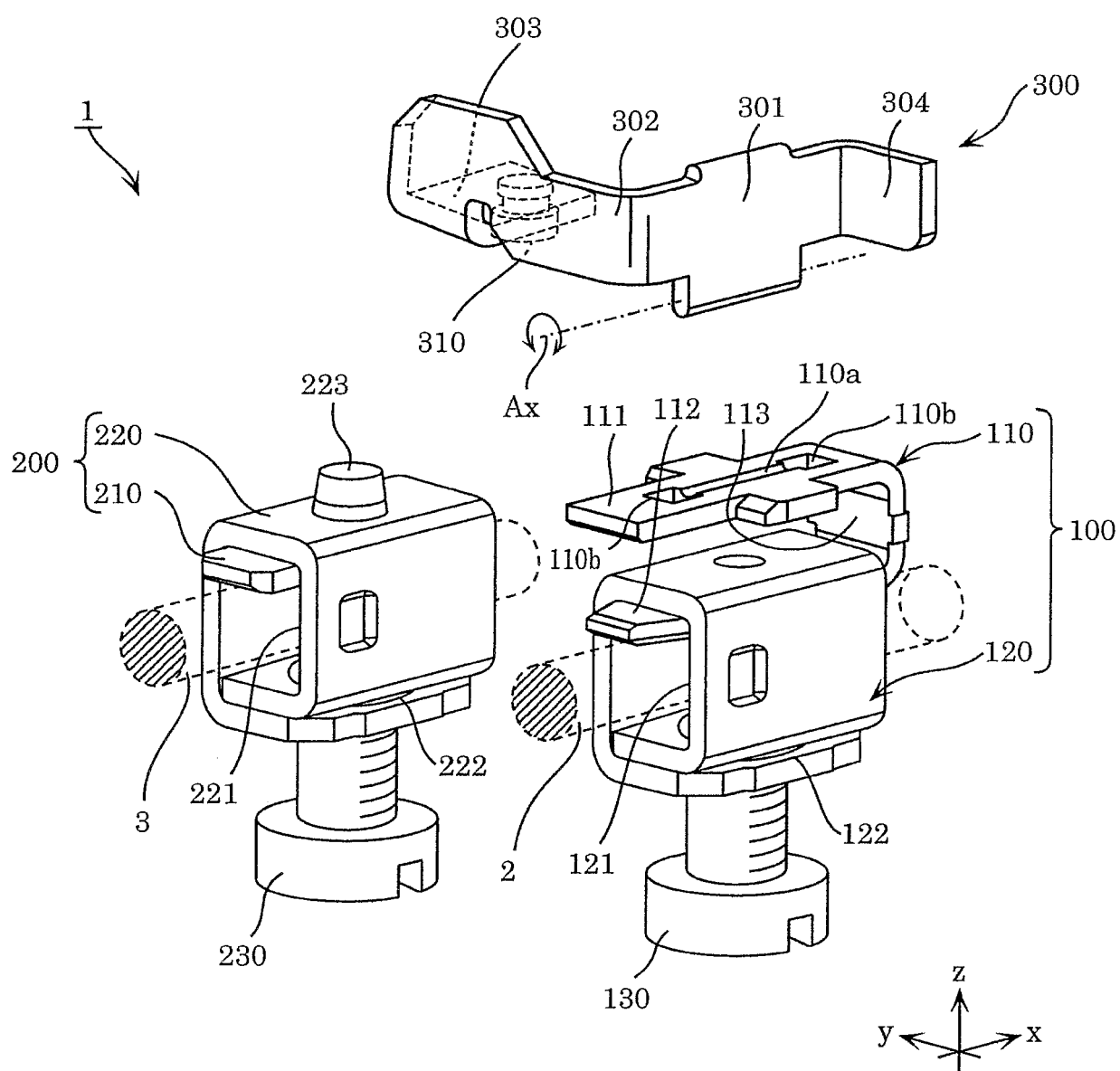


FIG. 2A

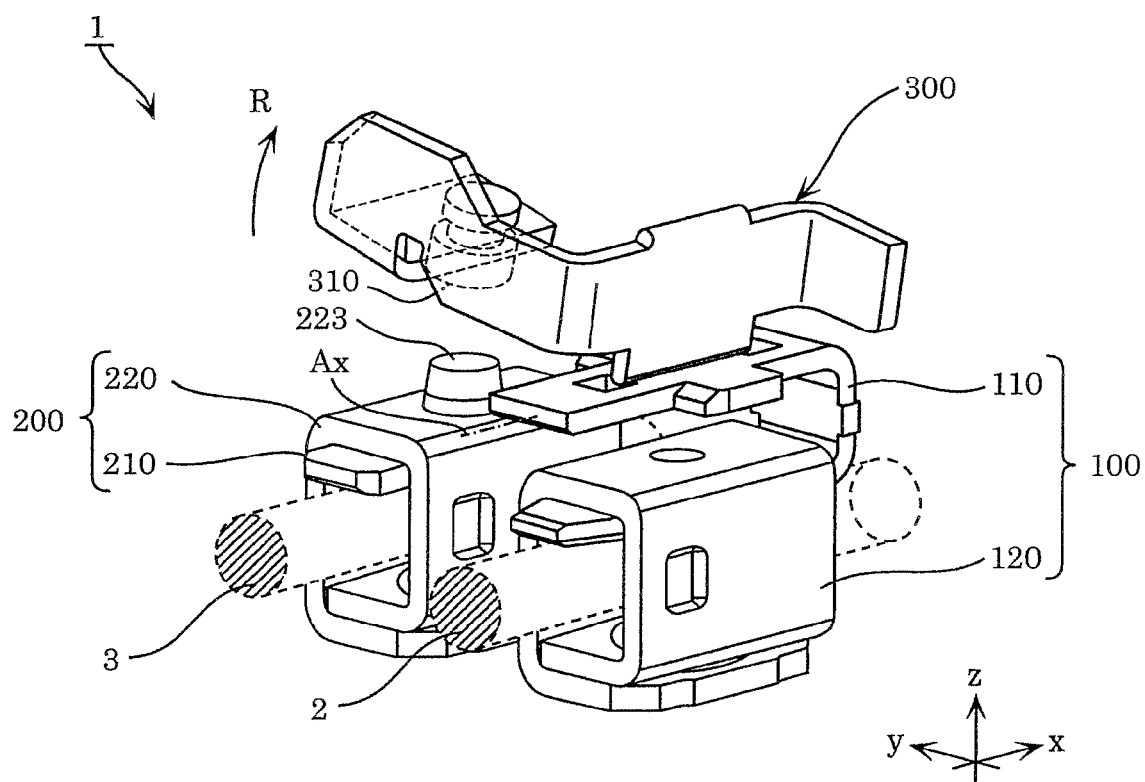


FIG. 2B

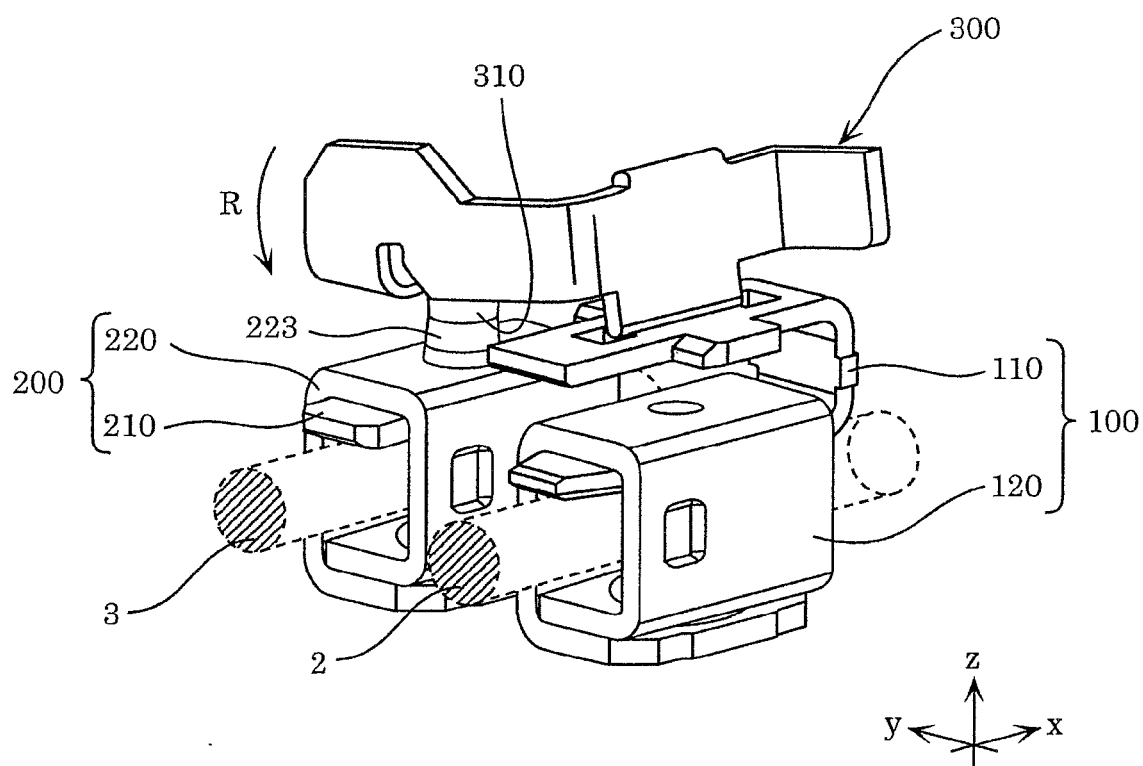


FIG. 3A

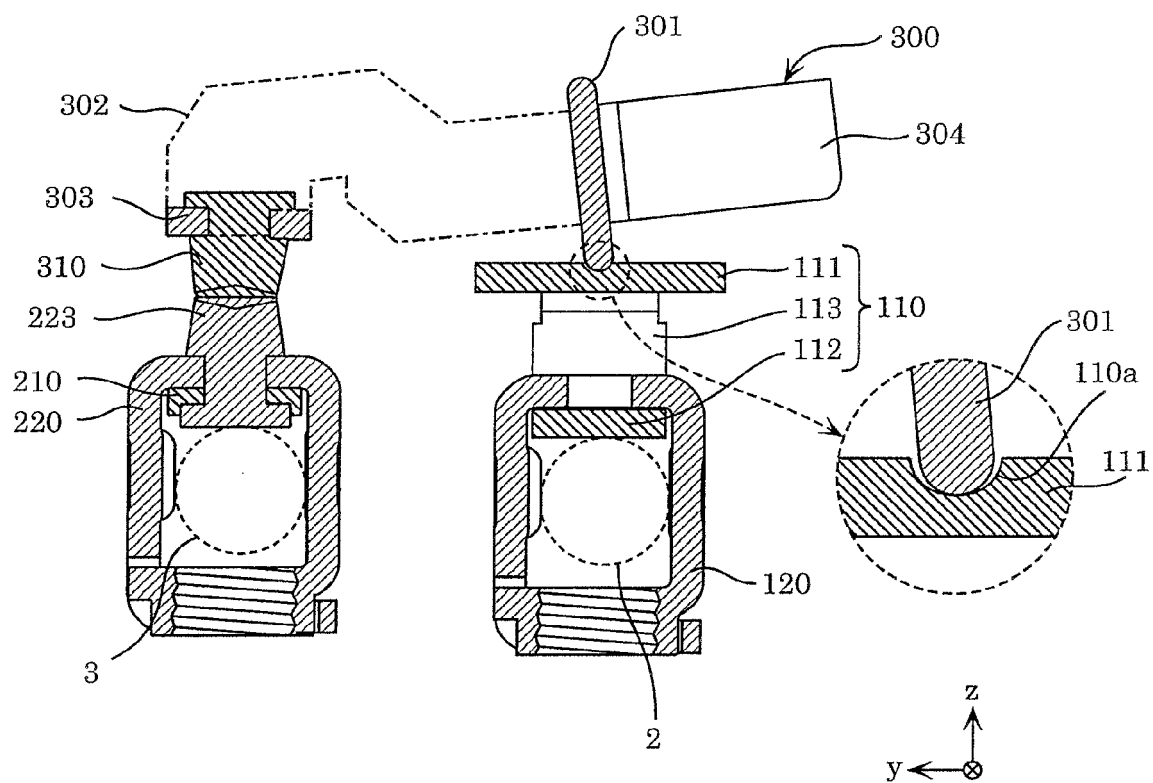


FIG. 3B

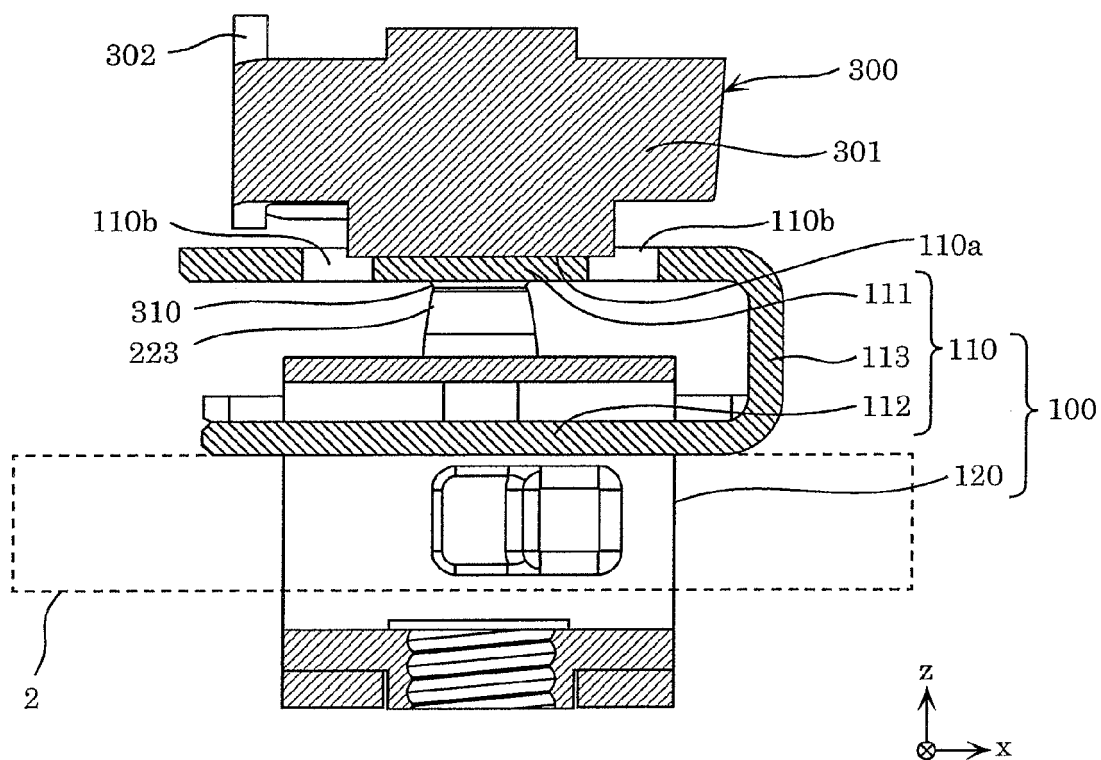


FIG. 4A

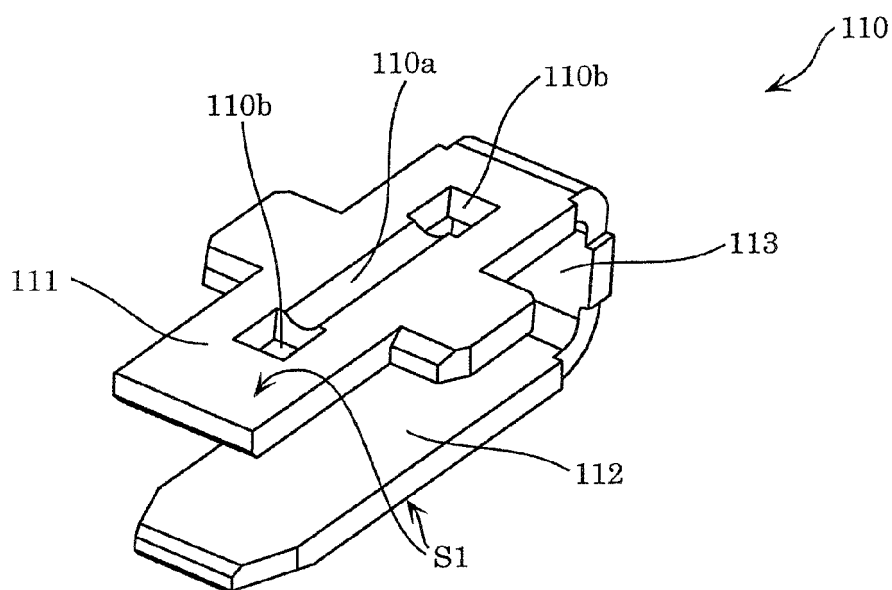


FIG. 4B

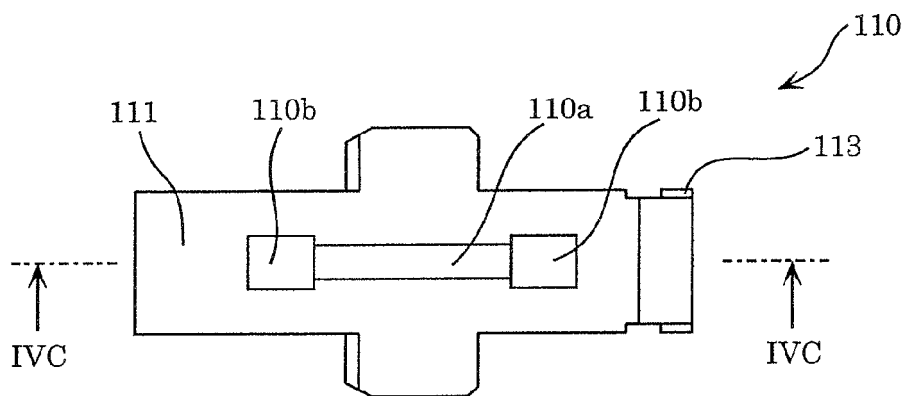


FIG. 4C

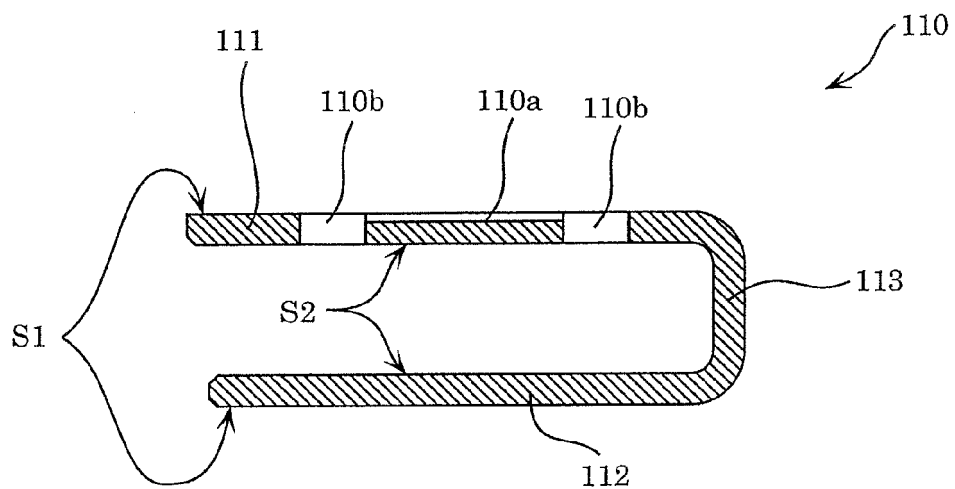


FIG. 5

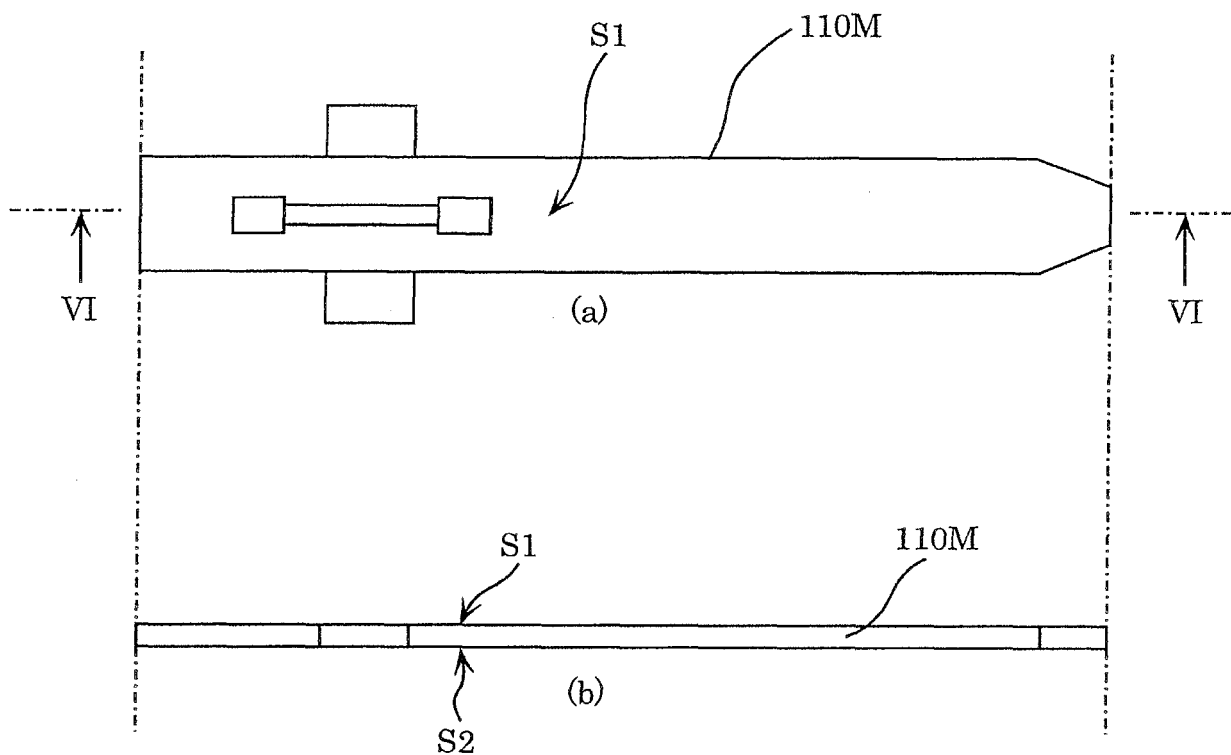


FIG. 6

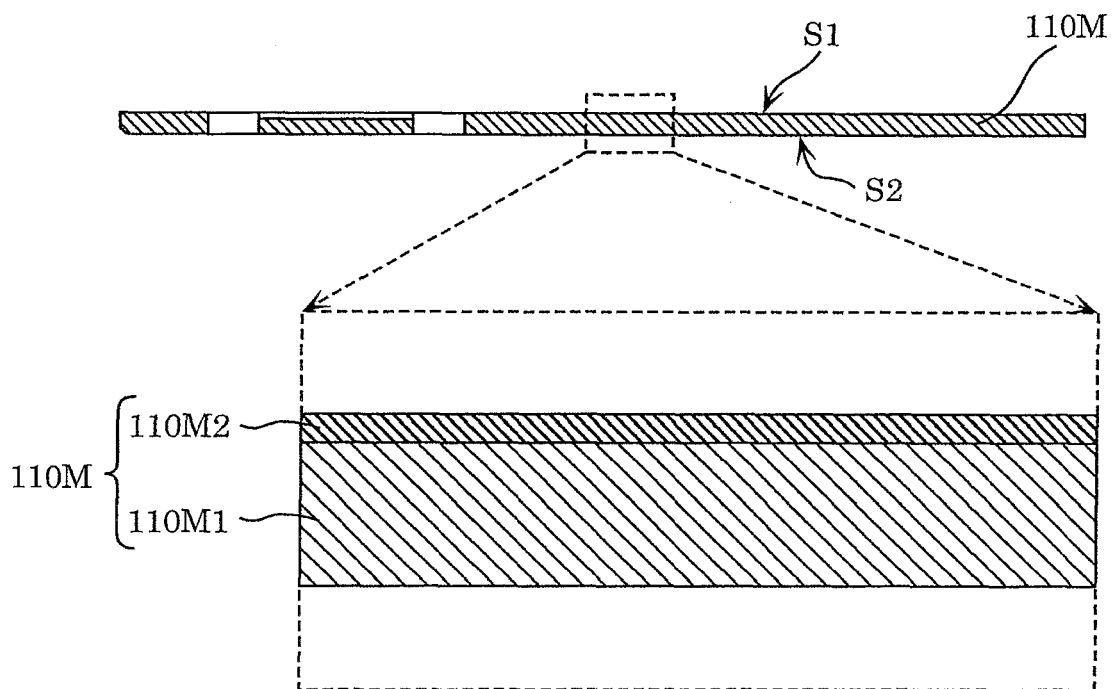


FIG. 7A

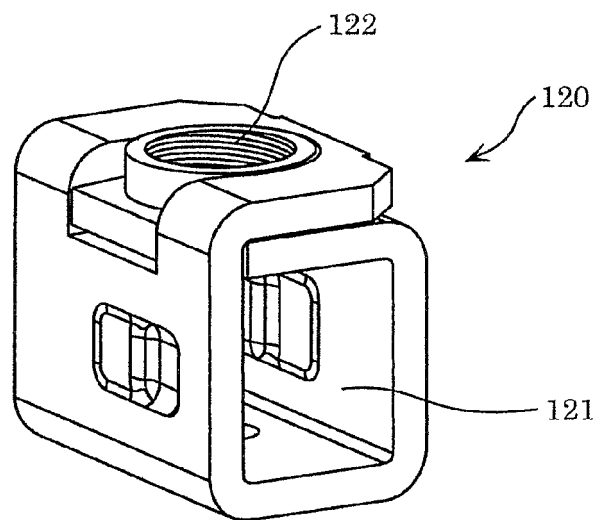


FIG. 7B

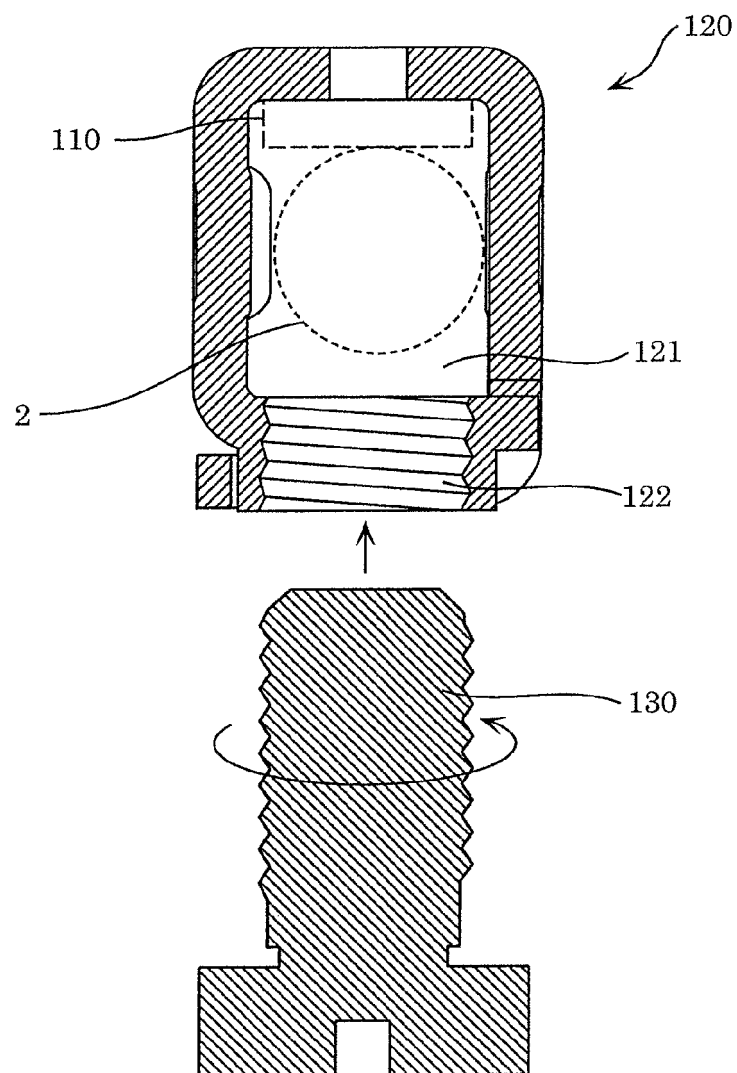


FIG. 8A

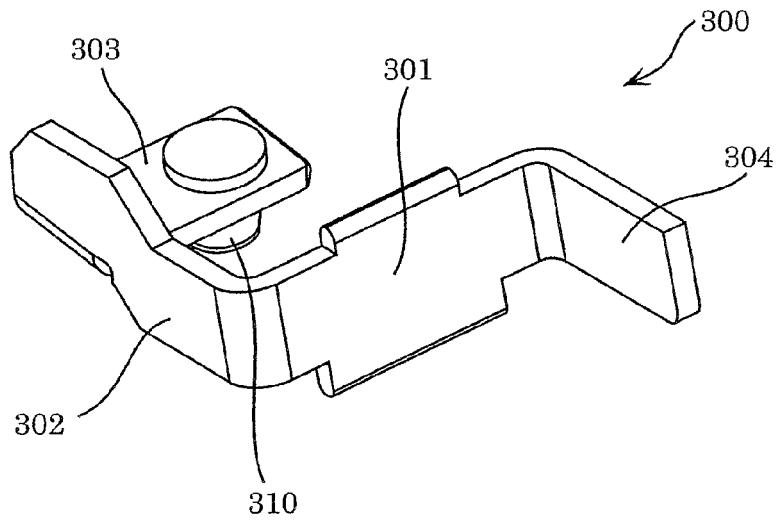


FIG. 8B

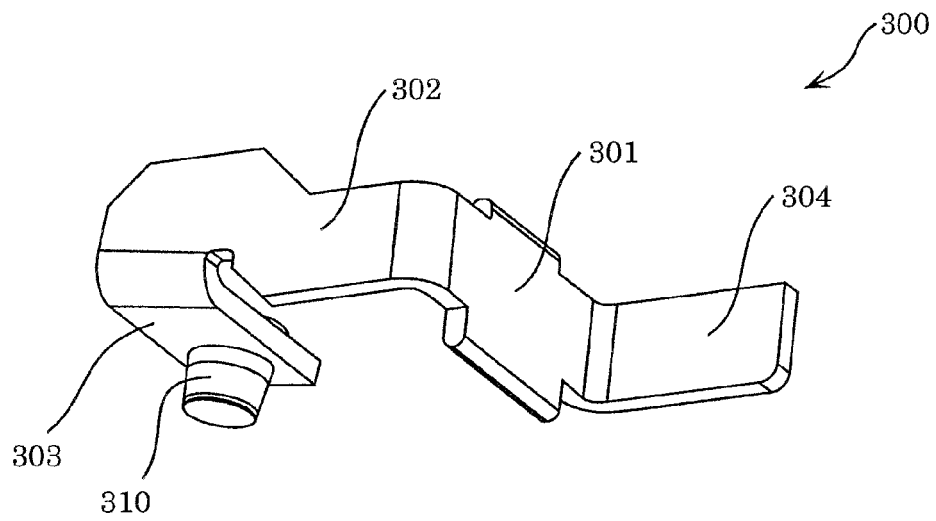


FIG. 8C

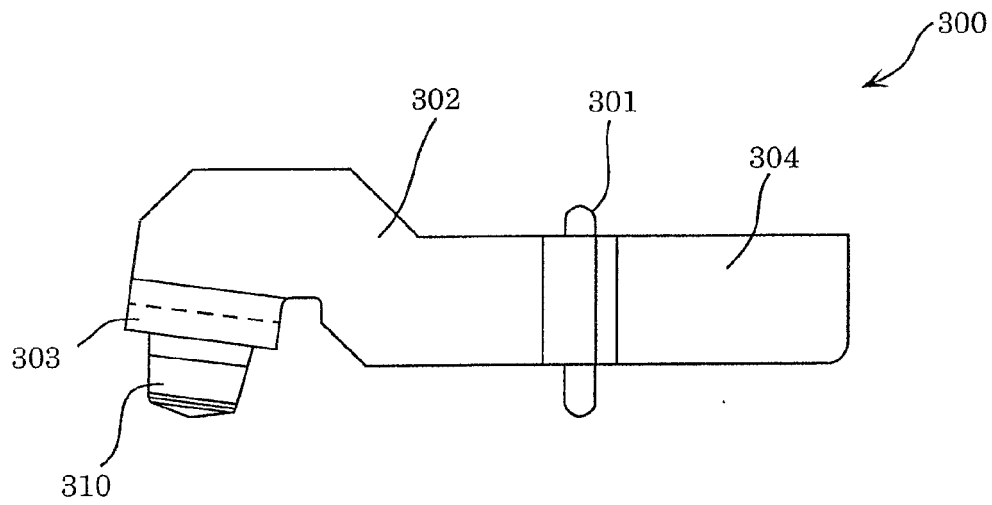


FIG. 9

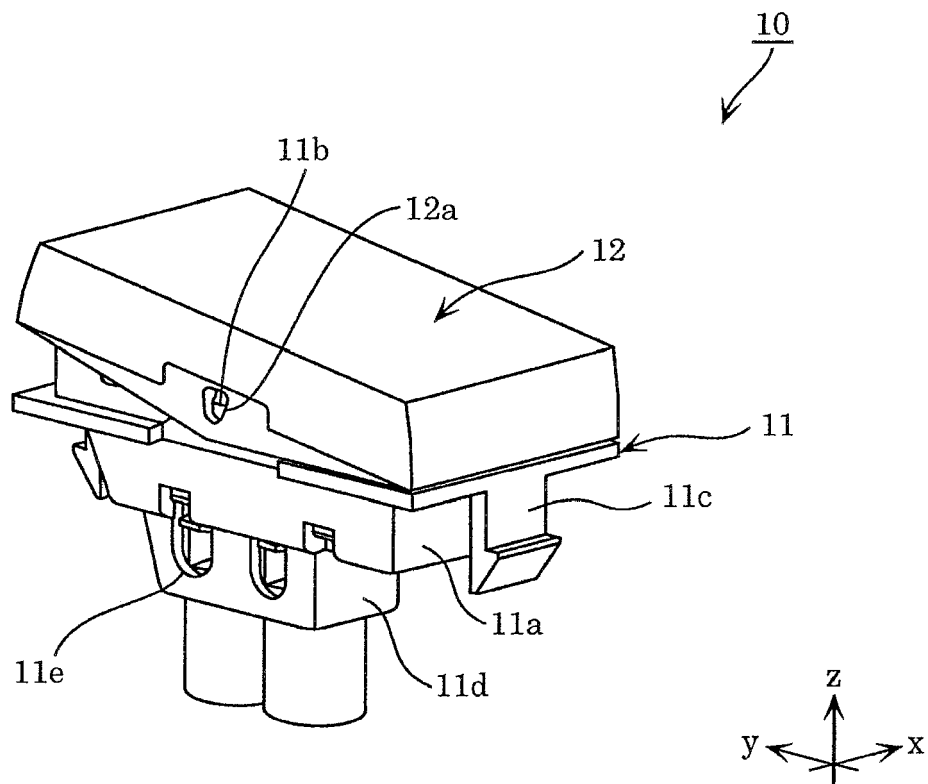


FIG. 10

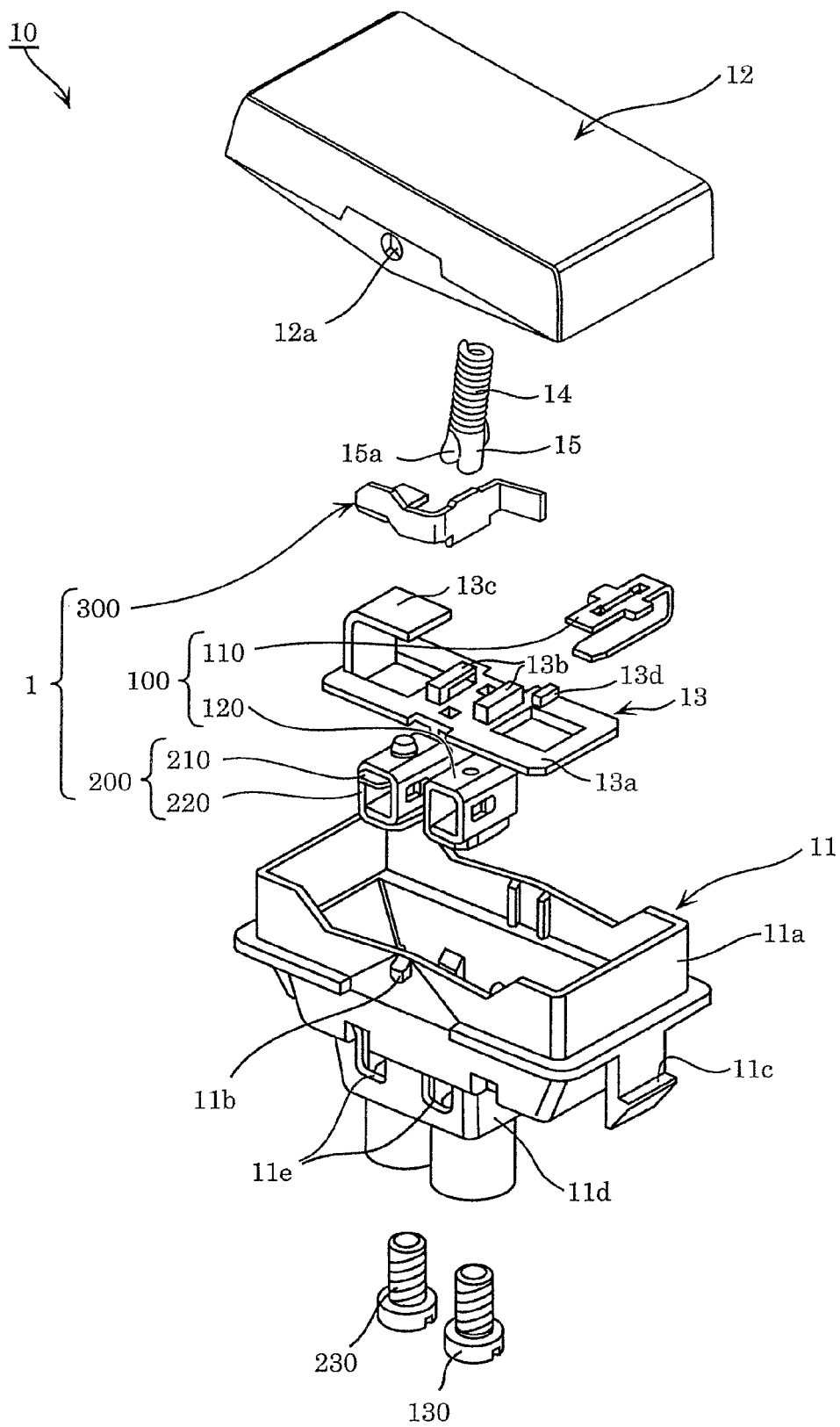


FIG. 11

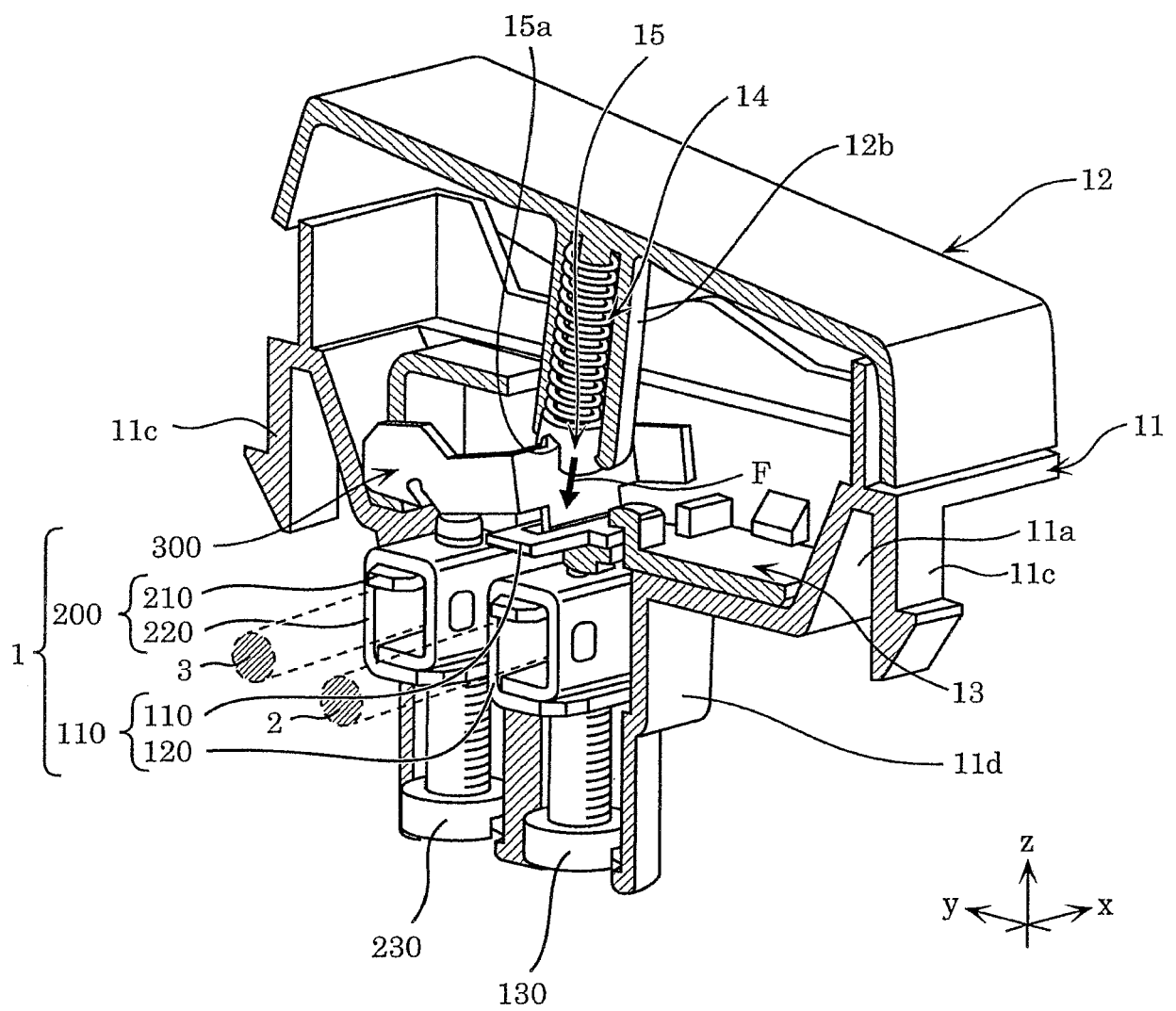


FIG. 12A

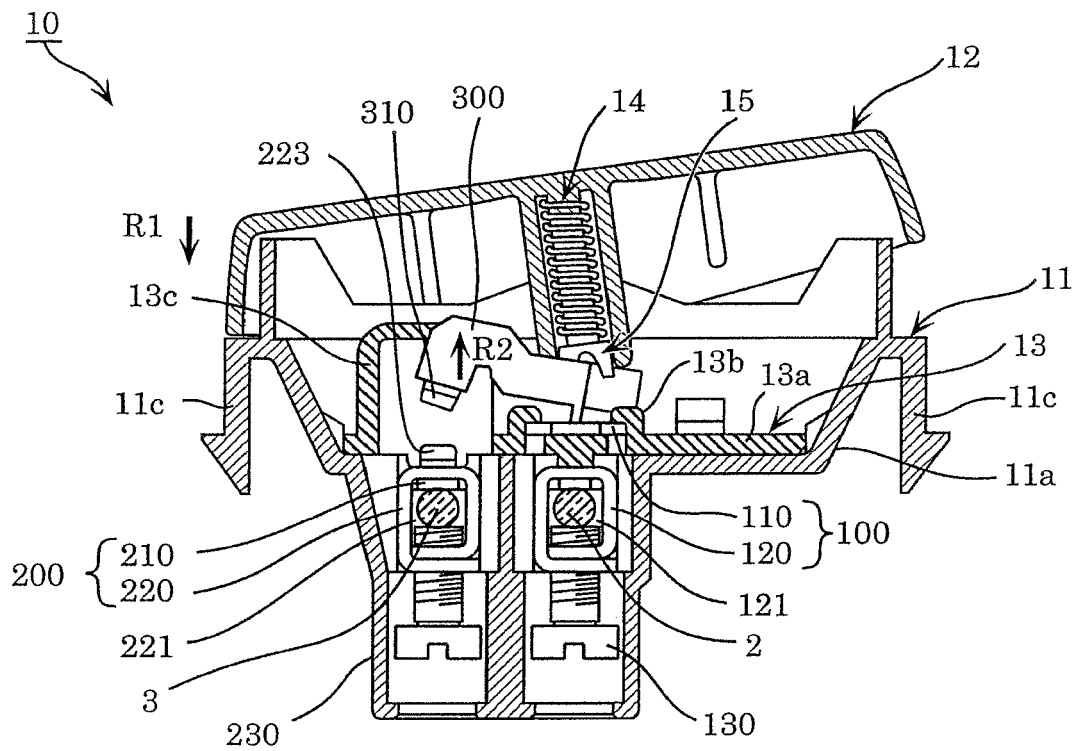


FIG. 12B

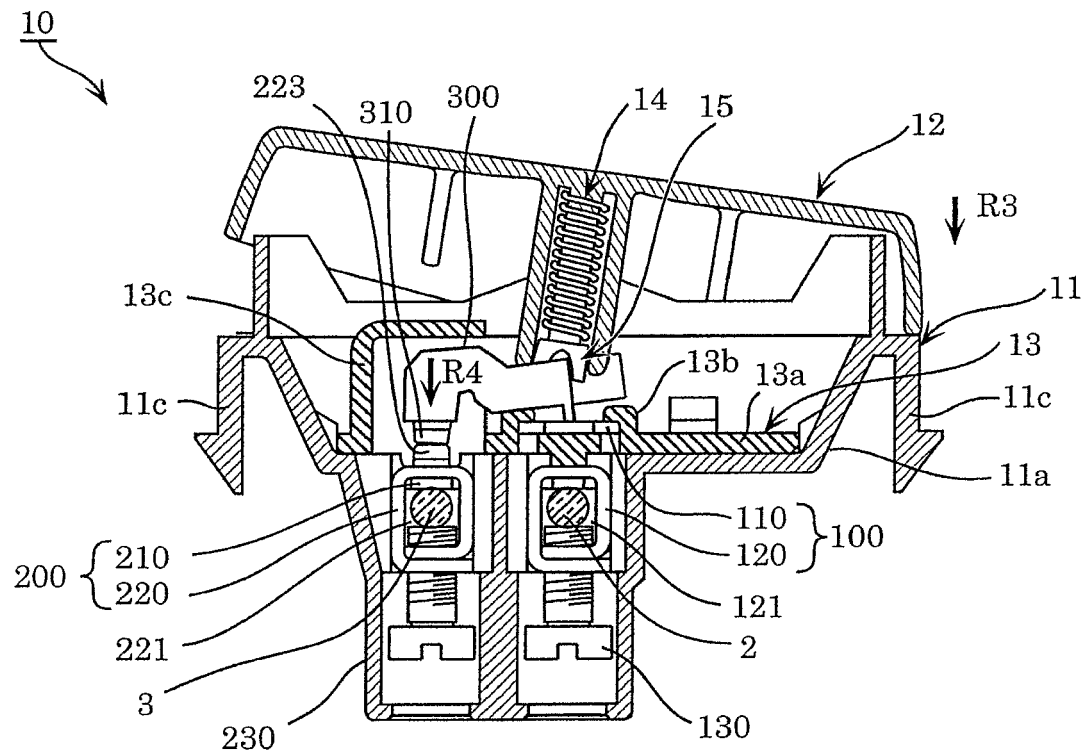


FIG. 13A

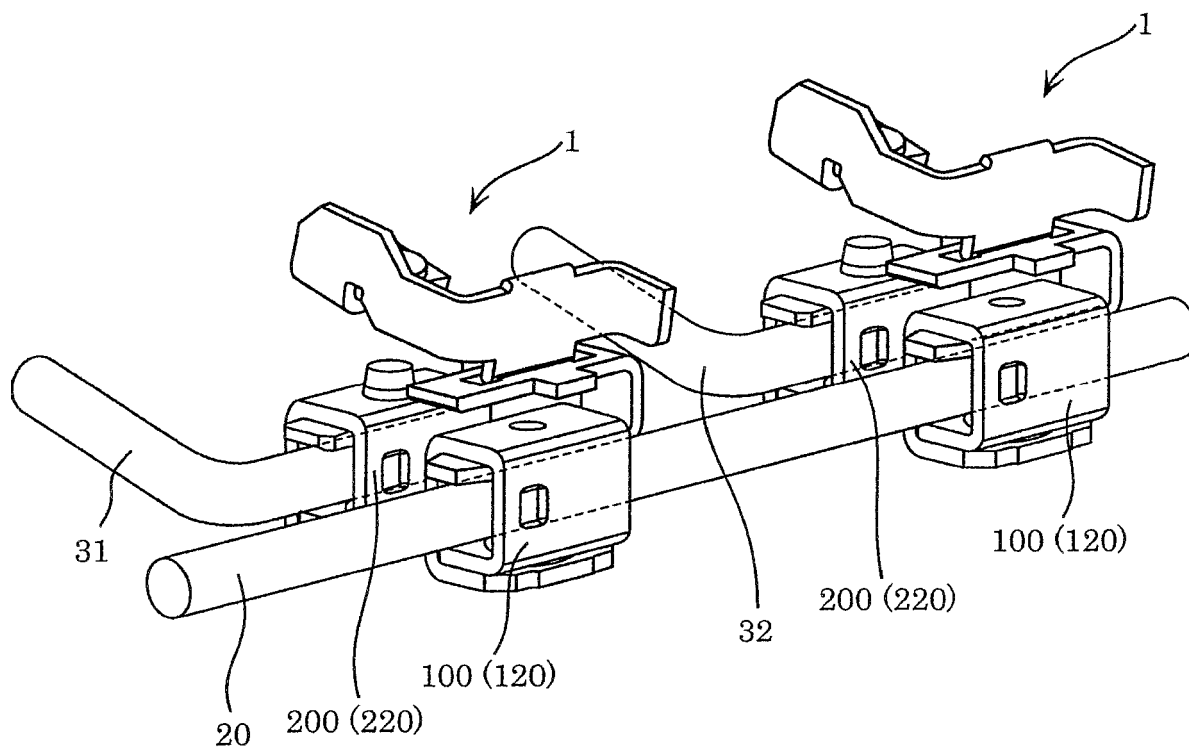


FIG. 13B

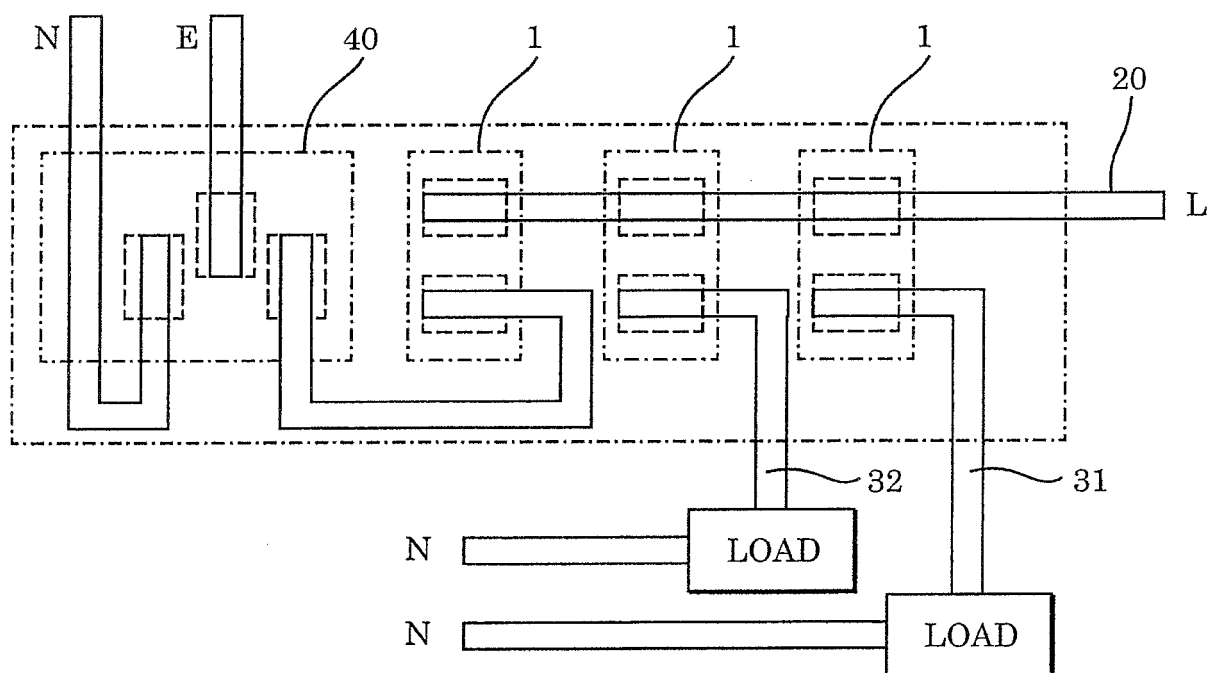


FIG. 14

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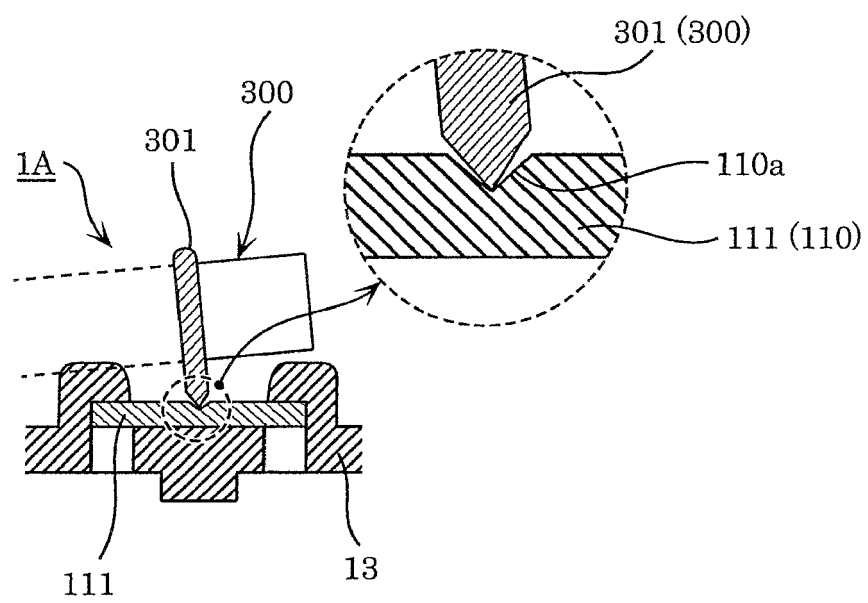


FIG. 15

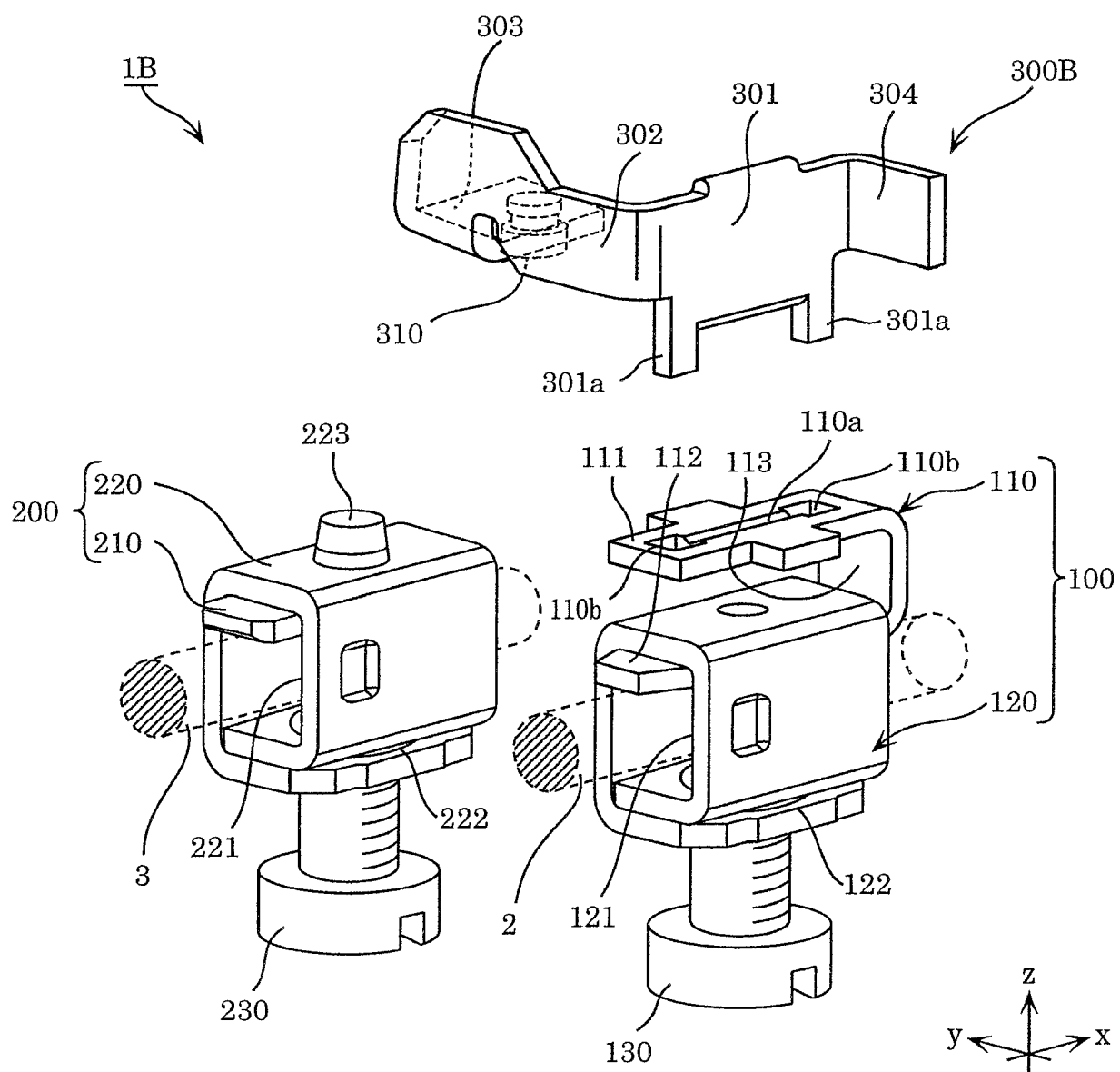


FIG. 16

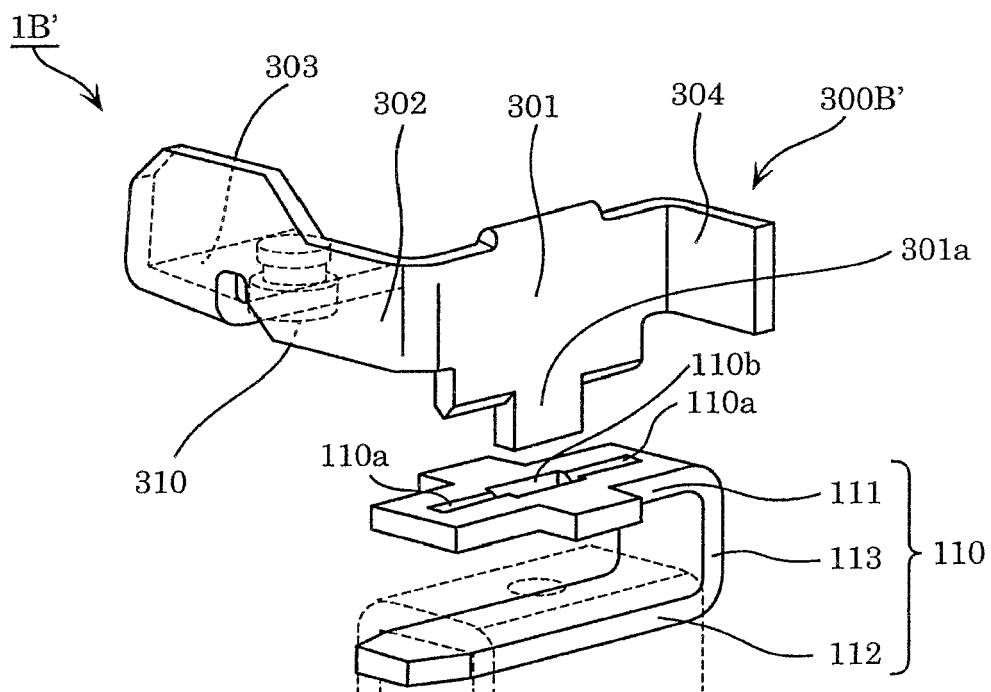


FIG. 17

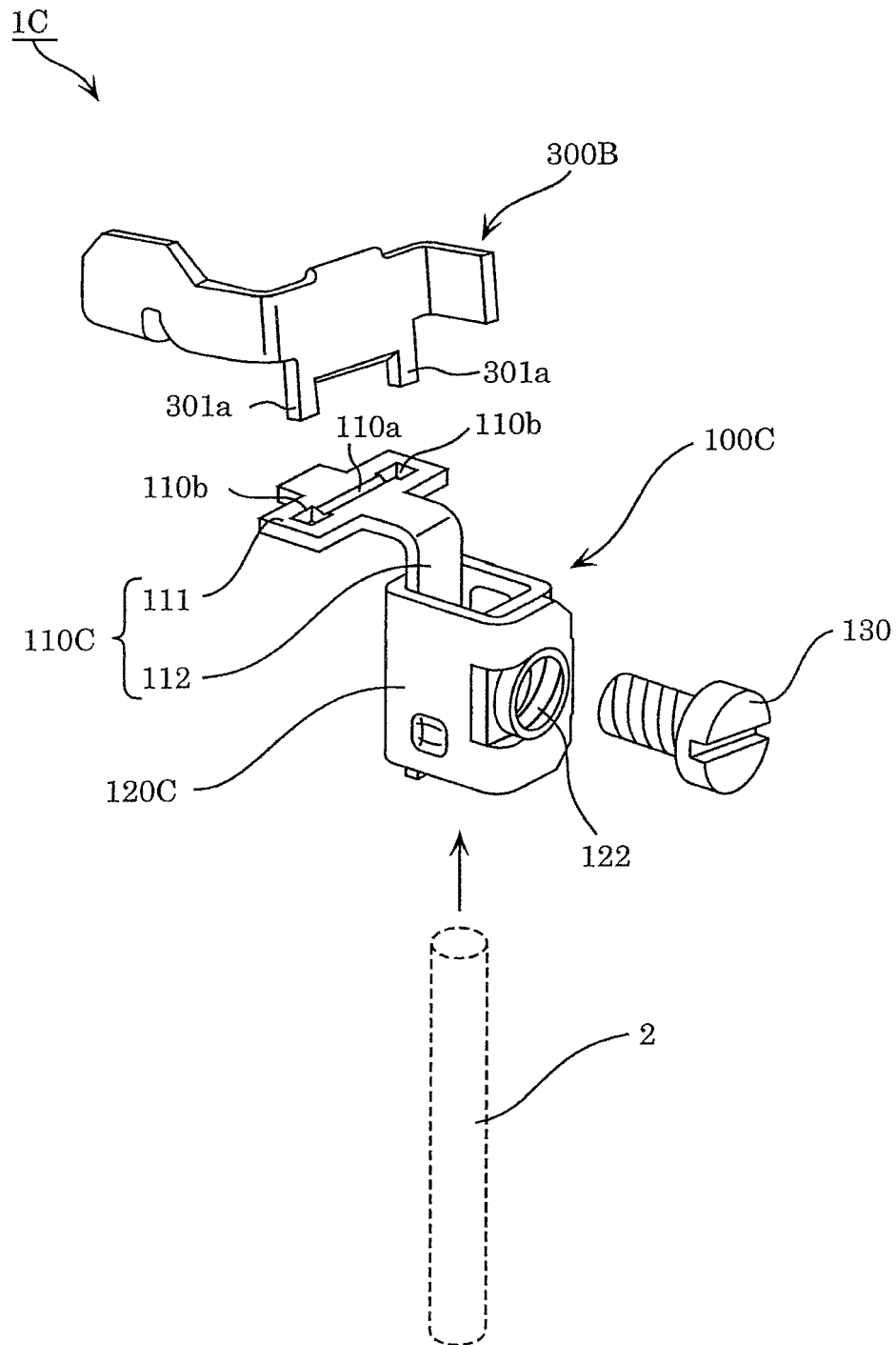


FIG. 18

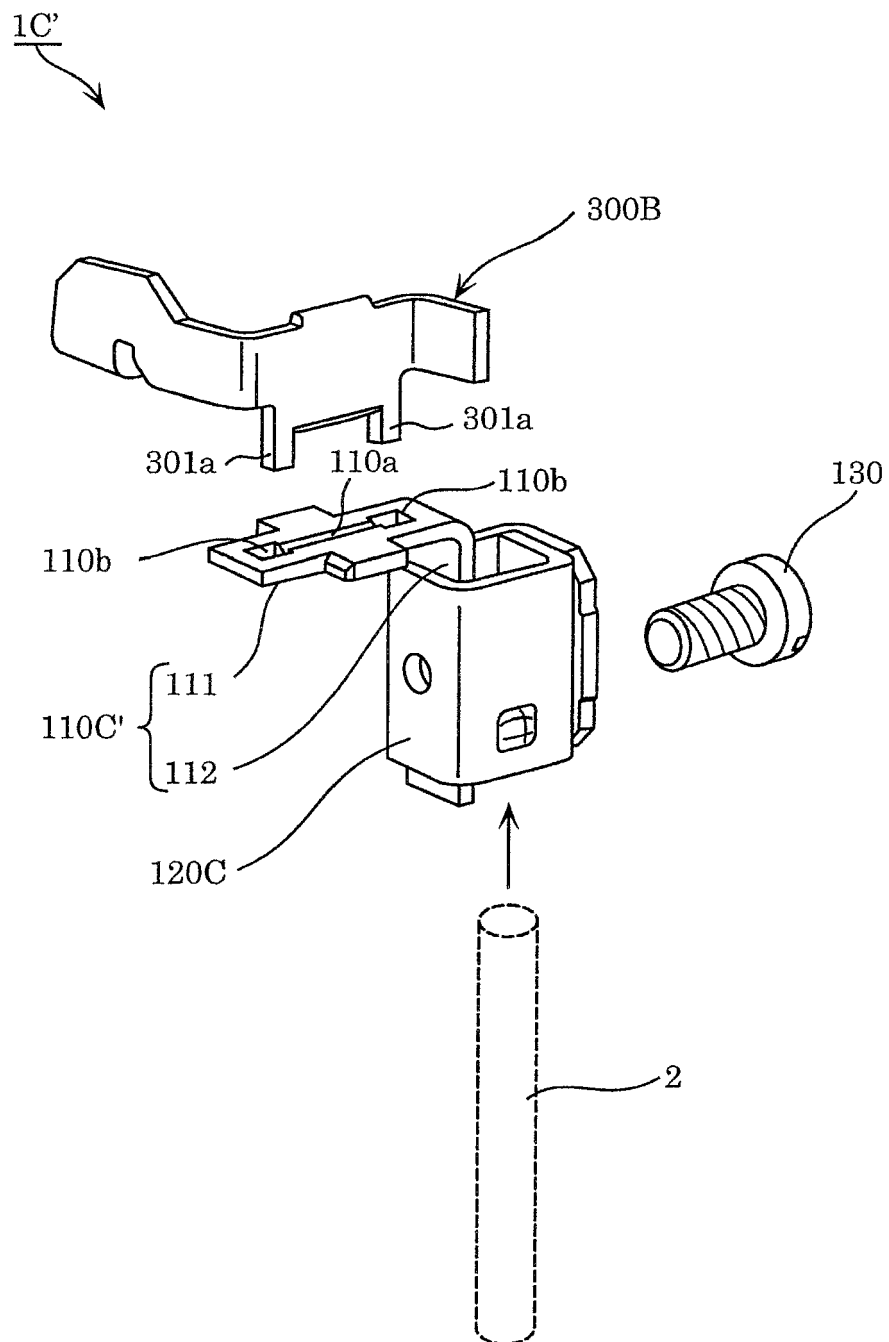


FIG. 19A

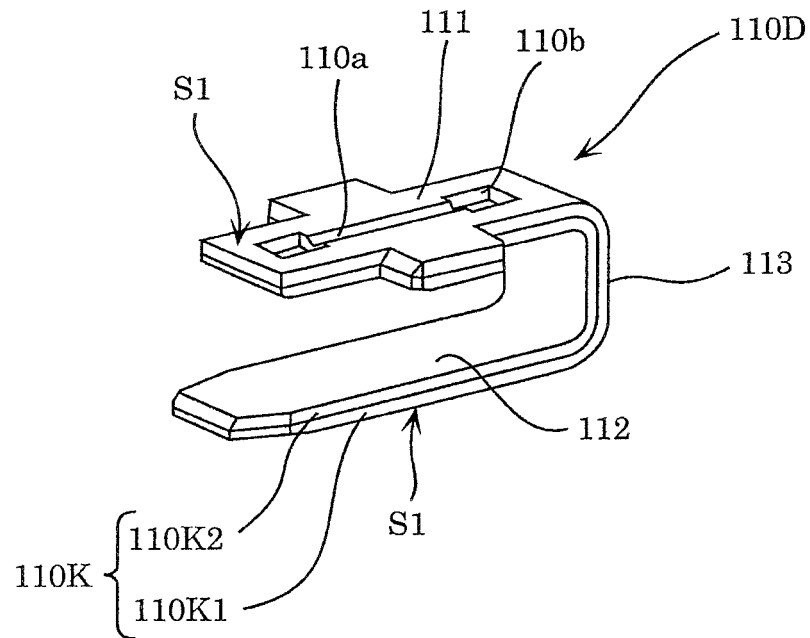


FIG. 19B

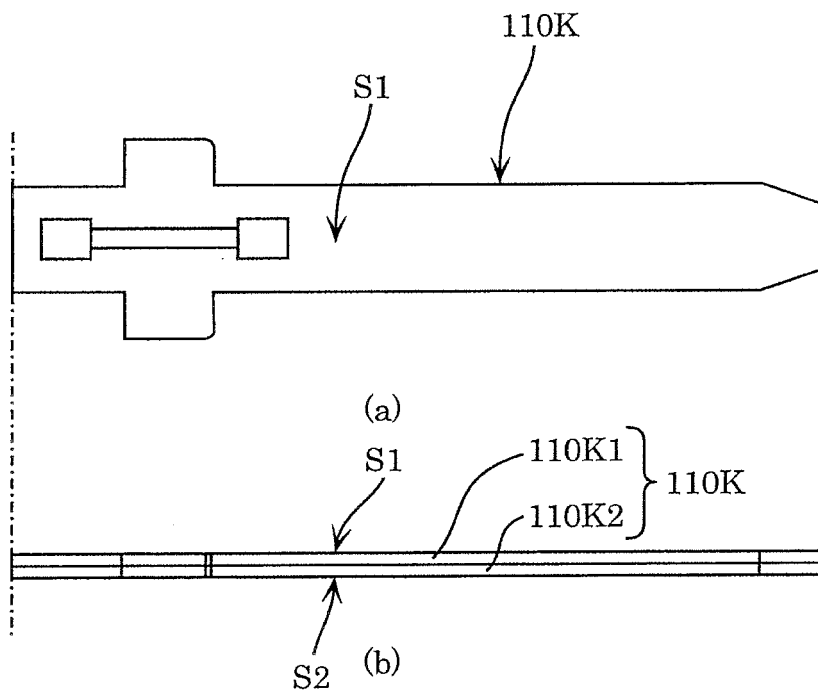
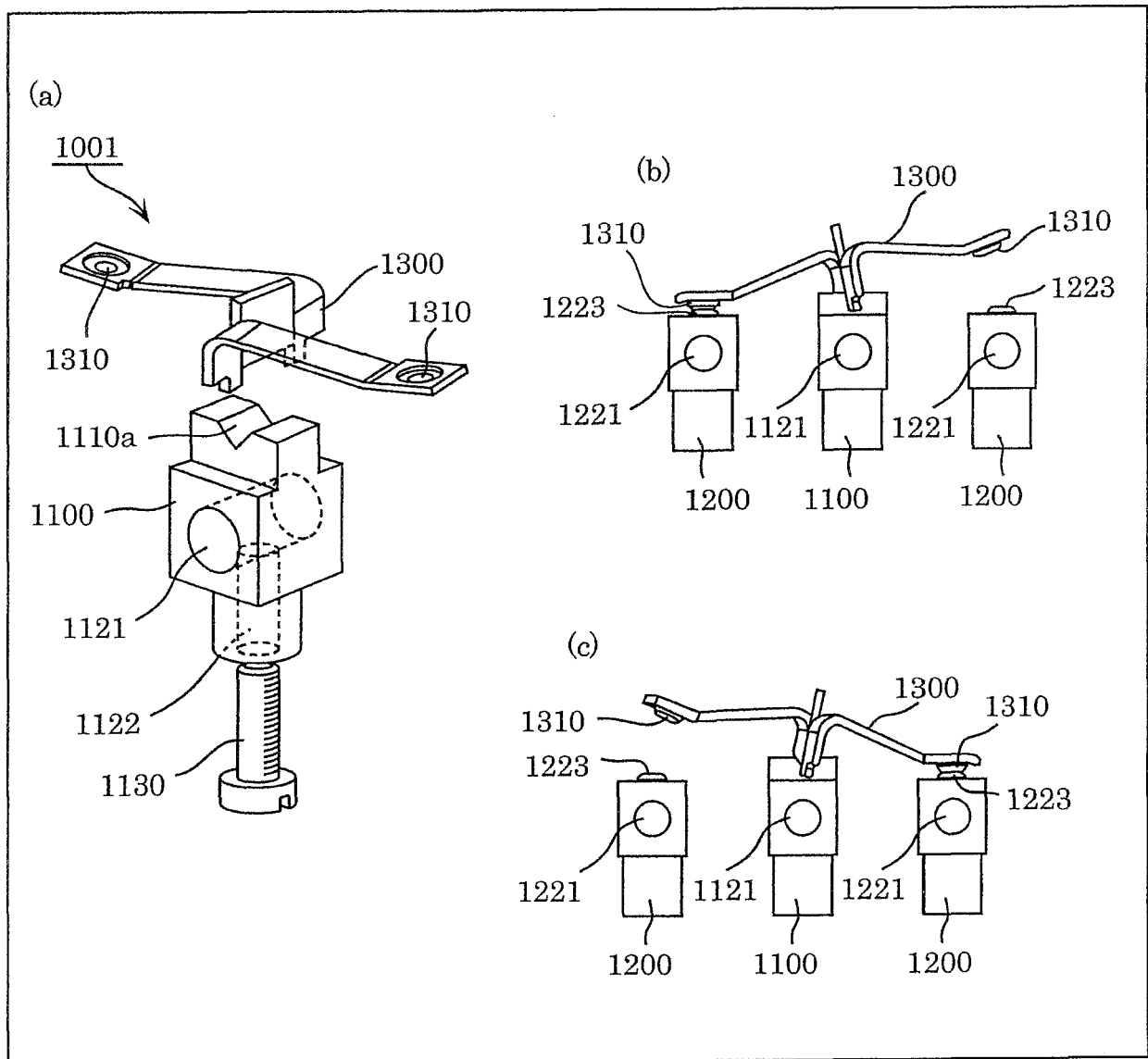


FIG. 20





EUROPEAN SEARCH REPORT

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