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(71) Applicant: **ALPS ELECTRIC CO., LTD.**
Tokyo 145-8501 (JP)

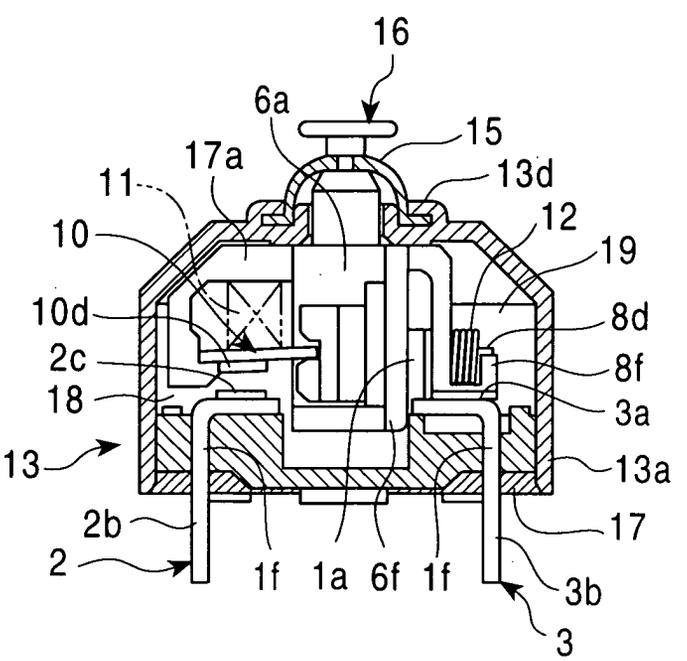
(72) Inventor: **Nagano, Tomoyasu**
Ota-ku, Tokyo 145-8501 (JP)

(74) Representative: **Klunker . Schmitt-Nilson . Hirsch**
Winzererstrasse 106
80797 München (DE)

(54) Power-supply switch device with detection switch

(57) On a bottom wall of a switch device of the present invention, a first fixed terminal with which a first movable contact point can be brought into contact, and a second fixed terminal with which a second movable contact point can be brought into contact are disposed. A housing section of a cover member is divided into first and second housing sections by a dividing wall. The first movable contact point and the first fixed terminal form a first switch section, and the second movable contact point and the second fixed terminal form a second switch section. The first switch section is disposed in the first housing section of the housing section, and the second switch section is disposed in the second housing section thereof. Thus, the size of the switch device can be reduced.

FIG. 8



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a switch device for an electronic apparatus, used as a power-supply switch having a detection switch and, more particularly, relates to the configuration of an integrated-type switch device, in which a detection switch section and a power-supply switch section are housed in the same case.

2. Description of the Related Art

[0002] Known configurations of conventional power-supply switch devices with detection switches include an external-type switch device, which is formed in such a manner that an conventional detection switch is connected and fixed to the front portion or the back portion of a power-supply switch by using a coupling member, and an integrated-type switch device, which is formed in such a manner that a switch section of an conventional detection switch is incorporated in a case of the main unit of a power-supply switch.

[0003] The above-described external-type switch device is configured in such a manner that the conventional detection switch is used in its current form, except that the shape of an operation lever, which serves as the operation section of the detection switch, is partly changed to allow a pressing operation to be performed on a sliding member, which is connected to the operation section of the power-supply switch, and the detection switch is coupled thereto by a coupling member so that, when the operation section of the power-supply switch is pressed, the detection switch is also operated simultaneously.

[0004] In this case, the power-supply switch section and the detection switch section are formed independently in such a manner that they are housed in individual cases, and are disposed one behind the other in a direction parallel to the direction of the pressing operation.

[0005] The integrated-type switch device is formed in such a manner that the operation lever and the case are removed from the conventional detection switch, the switch section is taken out, and only this switch section is integrated within the case of the power-supply switch. By partly changing the shape of the case on the power-supply side and the sliding member which serves as an operation section as necessary, switching of the detection switch is made possible.

[0006] In this case, the power-supply switch section and the detection switch section are integrated within the same case, and they can be operated without using a coupling member. The power-supply switch section and the detection switch section are disposed one behind the other in a direction parallel to the direction of the pressing operation.

[0007] However, in a conventional power-supply switch with a detection switch having a configuration such as those described above, since, in the external-type switch device, the conventional detection switch is coupled before or after the power-supply switch by a coupling member, etc., there are problems with the strength of a mounting section for the detection switch section, and a variation in the ON detection position due to dimensional variations when it is provided externally. Furthermore, there is a problem in that the cost is increased due to a decrease in the ease of assembly as a result of the increased number of parts.

[0008] Furthermore, in both the external type and the integrated type, since the power-supply switch and the detection switch are disposed one behind the other in a direction parallel to the direction of the pressing operation of the operation section, the depth dimension increases. This causes a problem in that an apparatus such as a washing machine, in which a conventional-switch device is incorporated, becomes enlarged.

SUMMARY OF THE INVENTION

[0009] The present invention has been made in view of the above-described problems. An object of the present invention is to provide a switch device whose size can be reduced, whose ease of assembly can be improved, and which is water-proof.

[0010] To achieve the above-mentioned object, in one aspect, the present invention provides a switch device comprising: a cover member for covering a housing section of the interior thereof with a bottom wall disposed in the lower portion; and

a sliding member by which an operation section, housed inside the housing section and protruding outward from the cover member, can be pressed,

wherein the bottom wall has a dividing wall for dividing the housing section into first and second housing sections,

the sliding member has a support wall which can slide along the dividing walls by pressing the operation section, a first contact-point support section being formed in the first housing section with the support wall being sandwiched in between, a second contact-point support section being formed in the second housing section, a first movable contact point being disposed in the first contact-point support section, and a second movable contact point being disposed in the second contact-point support section,

the bottom wall has a first fixed terminal with which the first movable contact point, which is disposed in the first housing section, can be brought into contact, and a second fixed terminal with which the second movable contact point, which is disposed in the second housing section, can be brought into contact, and

the first movable contact point and the first fixed terminal form a first switch section, the second movable contact point and the second fixed terminal form a second switch section, and the first and second switch sec-

tions are disposed in parallel in a direction intersecting at right angles to the direction in which the operation section is pressed.

[0011] The first movable contact point that is supported on the first contact-point support section of the sliding member may be formed in the shape of a rectangular plate, one side thereof being supported on the support wall side of the sliding member, and the other side being supported in a vertically movable manner on a wall member formed on a side opposing the support wall.

[0012] A pair of the first fixed terminals may be provided with a predetermined space in between on the bottom wall on the first housing section side, and when the sliding member is pressed, the other side of the first movable contact point is brought into contact with the pair of the first fixed terminals.

[0013] The second movable contact point may comprise a twisted coil spring having a wound section in which a line spring is wound in the form of a coil and having formed therein a pair of arm sections which extend outward at predetermined open angles from this wound section.

[0014] A pair of the second fixed terminals may be provided with a predetermined space in between on the bottom wall on the second housing section side, and when the sliding member is pressed, the pair of arm sections are brought into contact with the pair of the second fixed terminals.

[0015] The first and second fixed terminals may have contact points with which the first and second movable contact points can be brought into contact, and terminal parts which extend toward one side from these contact points, these terminal parts may be mounted on the bottom wall, and the tips of the terminal parts may be guided out externally from the bottom wall.

[0016] Preferably, the dividing wall of the bottom wall has formed therein a guide section for slidably supporting the sliding member along the dividing wall.

[0017] A first coil spring may be provided between the sliding member and the bottom wall, and when the pressing of the sliding member is released, the sliding member may automatically return to its initial state before the pressing due to the action of the first coil spring.

[0018] Preferably, the sliding member has formed therein a sliding surface having a step difference which is inclined in a direction parallel to the pressing direction, a plate spring which can be brought into pressure contact with this sliding surface is disposed on the bottom wall, and when the sliding member is pressed, as a result of the plate spring being elastically deformed due to the step difference, the pressure pressing force for the pressing operation may be varied.

[0019] The cover member and the bottom wall may be formed as separate elements, and the cover member may be formed such that the lower portion of the housing section is opened, the opened lower portion of the housing section is covered by the bottom wall, a clearance portion between the bottom wall and the cover member is sealed by a sealing material, and the lower portion of the housing section is hermetically sealed.

[0020] The sealing material may also be coated around the first and second fixed terminals mounted on the bottom wall.

[0021] A dome-shaped rubber member may be disposed on the operation section of the sliding member which protrudes outward from the cover member, and the upper portion of the housing section may be hermetically sealed by this rubber member.

[0022] A driving bar may be disposed on the rubber member, and this driving bar may be fixed to the operation section of the sliding member via a press-fit hole formed in the rubber member.

[0023] As described in the foregoing, in the switch device of the present invention, since the first and second switch sections are disposed in parallel in a direction intersecting at right angles to the direction of the pressing operation of the operation section, the depth dimension can be reduced, and thus a small switch device can be provided.

[0024] The first movable contact point is formed in the shape of a rectangular plate, one side thereof is supported on the support wall side of the sliding member, and the other side is supported in a vertically movable manner on the wall member formed on a side opposite to the support wall. Therefore, after the first movable contact point is brought into contact with the first fixed terminal, the sliding member can slide, and the stroke of the sliding member can be made to be an overstroke.

[0025] A pair of first fixed terminals is disposed with a predetermined spacing in between on the bottom wall on the first housing section side, and when the sliding member is pressed, the other side of the first movable contact point is brought into contact with the first fixed terminal. As a result, the pair of first fixed terminals and one first movable contact point can form a first switch section, and thus a switch device which has a simple configuration and which has a small number of parts can be provided.

[0026] The second movable contact point is formed of a twisted coil spring, which has a wound section in which a line spring is wound in the form of a coil and which has formed therein a pair of arm sections which extend outward at a predetermined open angle from this wound section. Therefore, after the pair of arm sections is brought into contact with the first fixed terminals, the sliding member can slide, and the stroke of the sliding member can be made to be an overstroke.

[0027] A pair of second fixed terminals is disposed with a predetermined spacing in between on the bottom wall in the second housing section, and when the sliding member is pressed, a pair of arm sections is brought into contact with the pair of second fixed terminals. Therefore, the pair of second fixed terminals and the second movable contact point formed of one twisted coil spring can form a second switch section, and thus a switch device which has a simple configuration and

which has a small number of parts can be provided.

[0028] The first and second fixed terminals have contact-point parts with which first and second movable contact points can be brought into contact, and terminal parts which extend toward one side from these contact-point parts. These terminal parts are mounted on the bottom wall, and the tips of these terminal parts are guided out externally from the bottom wall. Therefore, the terminal parts which are guided out externally from the bottom wall can be mounted on a substrate, etc., on the device side by soldering, etc., and thus a switch device which can easily be mounted on the device side can be provided.

[0029] Since the dividing wall of the bottom wall has formed therein a guide section for slidably supporting the sliding member along the dividing wall, the sliding member can smoothly slide, and a switch device having ease of operation can be provided.

[0030] A first coil spring is disposed between the sliding member and the bottom wall, and when the pressing operation of the sliding member is released, the sliding member automatically returns its initial state before the pressing operation due to the action of the first coil spring. Therefore, a switch device having greater ease of operation can be provided.

[0031] In the sliding member, a sliding surface having an inclined step-difference section in a direction parallel to the direction of the pressing operation is formed, a plate spring which can be brought into contact with this sliding surface is disposed on the bottom wall side, and when the sliding member is pressed, as a result of the plate spring being elastically deformed due to the step-difference section, the pressure pressing force for the pressing operation is varied. Therefore, it is possible to feel tactile feeling as a result of a variation in the pressure pressing force, and a switch device having ease of operation can be provided.

[0032] The cover member and the bottom wall are formed as separate elements, and the cover member is formed such that the lower portion of the housing section is opened, the opened lower portion of the housing section is covered by the bottom wall, the clearance portion between the bottom wall and the cover member is sealed by a sealing material, and the lower portion of the housing section is hermetically sealed. Therefore, it is possible to prevent a liquid, such as water, intruding from the bottom wall side.

[0033] Since the sealing material is also coated around the first and second fixed terminals mounted on the bottom wall, it is possible to further ensure the water-proof construction on the bottom wall side.

[0034] A dome-shaped rubber member is disposed above the operation section of the sliding member which protrudes externally from the cover member, and the upper portion of the housing section is hermetically sealed by this rubber member. Therefore, it is also possible to prevent a liquid such as water from intruding from above the cover member, and thus a switch device having a reliable water-proof construction can be provided.

[0035] A driving bar is disposed on the rubber member, and the driving bar is fixed to the operation section of the sliding member via a press-fit hole formed in the rubber member. Therefore, by pressing the driving bar, the sliding member can slide, and a switch device having ease of operation can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

Fig. 1 is a perspective view of a switch device according to an embodiment of the present invention;
Fig. 2 is an exploded perspective view of the switch device according to the embodiment of the present invention;
Fig. 3 is a top plan view of a sliding member according to the embodiment of the present invention;
Fig. 4 is a front view of the sliding member according to the present invention;
Fig. 5 is a bottom view of the sliding member of Fig. 4;
Fig. 6 is a sectional view taken along the line VI-VI in Fig. 5;
Fig. 7 is a right side view of the sliding member of Fig. 4; and
Fig. 8 is a sectional view showing the essential portion of the switch device according to the embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0037] The preferred embodiment of the present invention will now be described below with reference to Figs. 1 to 6. Fig. 1 is a perspective view of a switch device according to an embodiment of the present invention. Fig. 2 is an exploded perspective view of the switch device. Fig. 3 is a top plan view of a sliding member according to the present invention. Fig. 4 is a front view of the sliding member according to the present invention. Fig. 5 is a bottom view of the sliding member of Fig. 4. Fig. 6 is a sectional view taken along the line VI-VI in Fig. 5. Fig. 7 is a right side view of the sliding member of Fig. 4. Fig. 8 is a sectional view showing the essential portion of the switch device of the present invention.

[0038] As shown in Fig. 2, the switch device of the present invention has a bottom wall 1 substantially in the shape of a rectangle disposed in the lowest portion thereof. This bottom wall 1 is made of an insulating material, such as a resin material, and can cover the opened lower portion of a housing section 14 inside a cover member 13 (to be described later).

[0039] In nearly the central portion of the bottom wall 1, a dividing wall 1a which divides the housing section 14 inside the cover member 13 (to be described later) into two portions is arranged in a standing condition at a predetermined height. Furthermore, guide sections

1b, formed of a groove in the shape of a letter U, are formed so as to oppose each other in the corresponding end portions before and after the dividing wall 1a, so that these guide sections 1b allow a sliding member 6 (to be described later) to be slidably guided.

[0040] At the left side of the figure, in the vicinity of the central portion of the dividing wall 1a, a bar-shaped spring support section 1c, formed in an oval shape, is arranged in a standing condition at a height lower than that of the dividing wall 1a. Furthermore, in the central portion of the dividing wall 1a, a cut-out groove 1d having a predetermined width dimension is formed.

[0041] Furthermore, the bottom wall 1 is formed such that a pair of first fixed terminals 2 and a pair of second fixed terminals 3 formed by bending a metal plate are press-fitted and are integrated.

[0042] The first fixed terminal 2 has a contact-point part 2a which is exposed from the top surface of the bottom wall 1, and a terminal part 2b which is bent substantially in the shape of a letter L from this contact-point part 2a and which extends toward the lower side in the figure. The second fixed terminal 3 has a contact-point part 3a which is exposed from the top surface of the bottom wall 1, and a terminal part 3b which is bent substantially in the shape of a letter L from this contact-point part 3a and which extends toward the lower side in the figure. The terminal parts 2b and 3b are press-fitted to press-fit holes 1f formed in the bottom wall 1, and the tips of the terminal parts 2b and 3b protrude externally from the rear surface of the bottom wall 1.

[0043] Furthermore, each contact-point member 2c for ensuring the conduction with a first movable contact point 10 (to be described later) formed of a conduction plate is fixed to the contact-point part 2a of the first fixed terminal 2 by crimping, press-fitting, etc.

[0044] A plate spring 4 and a first coil spring 5 can be placed in the bar-shaped spring support section 1c of the bottom wall 1. As shown in Fig. 2, the plate spring 4 comprises a base section 4b having formed in its central portion an oval-shaped support hole 4a, which can be connected to the spring support section 1c, and a pair of arm sections 4c such that both end portions of this base section 4b are bent upward in such a manner as to oppose each other, and sliding sections 4d which protrude inward in the shape of an arc in such a manner as to oppose each other are formed in the tips of the arm sections 4c.

[0045] The spacing dimension of the opposing arm sections 4c is such that the dimension on the sliding section 4d side is smaller than that on the base section 4b side.

[0046] When the oval-shaped support hole 4a is connected to the oval-shaped spring support section 1c, the plate spring 4 can be placed by being positioned in place at a predetermined position on the top surface of the bottom wall 1.

[0047] The first coil spring 5 formed of a compression coil spring can be placed in the spring support section 1c which protrudes upward from the support hole 4a of the plate spring 4 placed on the top surface of the bottom wall 1.

[0048] Furthermore, a sliding member 6, made of an insulation material such as a resin material, is slidably guided along the dividing wall 1a in the vertical direction in the figure by the bar-shaped guide sections 1b formed in both end portions of the dividing wall 1a.

[0049] The sliding member 6 will now be described with reference to Figs. 3 to 7. As shown in the front view of Fig. 4, the sliding member 6 is formed such that a support wall 6a having a predetermined thickness is formed in nearly the central portion and that a bar-shaped operation section 6b which protrudes upward from the top surface of the support wall 6a is formed at a predetermined height. A press-fit hole 6c to which a driving bar 16 (to be described later) can be press-fitted is formed at a predetermined hole diameter and depth in the operation section 6b.

[0050] Furthermore, plate-shaped guide sections 6f are formed so as to protrude correspondingly from one end surface 6d on the upper side and the other end surface 6e on the lower side in the vertical direction, shown in Fig. 3, and these guide sections 6f can be slidably guided along the guide sections 1b of the bottom wall 1.

[0051] At the left side of the support wall 6a shown in Fig. 4, a first contact-point support section 7 that can support a first movable contact point 10 (to be described later) is formed. This first contact-point support section 7 has formed therein a wall member 7a which extends in a roof form from the upper portion of the support wall 6a at the left side in the figure, and its interior is hollow. Furthermore, the first contact-point support section 7 has formed therein a pair of first and second support protrusions 7b and 7c that can support a fulcrum section 10b of the first movable contact point 10 (to be described later) on the corresponding end surfaces 6d and 6e of the support wall 6a on which the guide section 6f is formed.

[0052] The first and second support protrusions 7b and 7c, as shown in Fig. 4, are formed with a clearance of a predetermined spacing in between, and the fulcrum section 10b of the first movable contact point 10 (to be described later) can be supported in this clearance portion.

[0053] Furthermore, the first contact-point support section 7 has formed therein a hook-shaped stopper section 7d on the lower side of the wall member 7a on a side opposing the support wall 6a. This stopper section 7d is protrusively formed toward the inside, which is in the direction of the support wall 6a, from the lower inner surface of the wall member 7a.

[0054] On the ceiling surface of the wall member 7a which is a constituent of the first contact-point support section 7, a spring support hole 7e that can support a second coil spring 11 (to be described later) is formed nearly in the form of a rectangle at a predetermined depth.

[0055] Furthermore, as shown in Fig. 4, on the right side of the support wall 6a, a second contact-point support section 8 that can support the second coil spring 11 (to be described later) is formed.

[0056] In the second contact-point support section 8, a spring support section 8a nearly in the shape of a letter L is formed on the right side in the figure from the upper portion of the support wall 6a, and a guide groove 8b having a predetermined width dimension is formed between the spring support section 8a and the support wall 6a.

[0057] Furthermore, on the upper side of the guide groove 8b, an engagement section 8c that can slide by being engaged with the cut-out groove 1d formed in the dividing wall 1a of the bottom wall 1 is formed.

[0058] Furthermore, on the lower side of the spring support section 8a, a bar-shaped contact-point support section 8d that can support a wound section 11a of the second coil spring 11 (to be described later) formed of a twisted coil spring is protrusively formed. Furthermore, as shown in Fig. 3, in the sliding member 6, a pair of spring latching sections 8e and 8f whose protrusion dimensions from the spring support section 8a differ from each other is formed above and below the contact-point support section 8d.

[0059] As shown in Fig. 4, the tip of each of the spring latching sections 8e and 8f is formed in the shape of a hook, so that an arm section 11b of the second coil second coil spring 11 (to be described later) formed of a twisted coil spring can be latched.

[0060] Furthermore, on the lower surface side of the sliding member 6 shown in the bottom view of Fig. 5, in nearly the central portion of the support wall 6a, a spring support hole 6g having a predetermined hole diameter dimension is formed. The depth of this spring support hole 6g is formed up to near the ceiling surface of the wall member 7a of the first contact-point support section 7, as shown in Fig. 6.

[0061] Furthermore, plate spring housing sections 9 that can house the arm section 4c of the plate spring 4 are formed at a predetermined depth above and below the spring support hole 6g formed in the support wall 6a shown in Fig. 5.

[0062] As shown in Fig. 7, this plate spring housing section 9 has formed therein first sliding surfaces 9a which oppose at a predetermined width dimension on the lower side and second sliding surfaces 9b which oppose at a width dimension wider than the width dimension on the first sliding surface 9a side, with step-difference sections 9c which connect the first sliding surface 9a to the second sliding surface 9b being formed in an inclined manner.

[0063] As shown in Fig. 7, when the arm section 4c of the plate spring 4, indicated by an alternate long and two short dashes line, is housed in the plate spring housing section 9, each of the sliding sections 4d and 4d of the plate spring 4 is brought into pressure contact with the first sliding surface 9a. In this state, when the sliding member 6 is lowered downward by being pressed, the sliding section 4d rides on the step-difference section 9c, and the plate spring 4 is deformed elastically. At this time, the operation force for pressing the sliding member 6 varies, and the operator is able to feel tactile feeling due to the variation of this operation force.

[0064] Furthermore, the first movable contact point 10 nearly in the shape of a rectangular flat plate can be supported on the first contact-point support section 7 of the sliding member 6. This first movable contact point 10 is formed of a conductive member, such as a metal plate. As shown in Fig. 2, the first movable contact point 10 has a base section 10a nearly in the shape of a rectangular flat plate, and a pair of fulcrum sections 10b in the shape of a tongue, which protrude toward one side from both end portions along the longitudinal direction of the base section 10a is formed.

[0065] Each of the fulcrum sections 10b and 10b can be supported between the first support protrusion 7b and the second support protrusion 7c of the sliding member 6.

[0066] In the first movable contact point 10, a spring receiving section 10c in the shape of a circle having a predetermined depth is formed in nearly the central portion of the base section 10a thereof. Furthermore, in the base section 10a in the vicinity of the pair of fulcrum sections 10b, contact-point parts 10d in the shape of a circle are formed on the lower side in the figure.

[0067] Furthermore, the other side 10e of the base section 10a on a side opposite to the side where the fulcrum section 10b is formed can be supported on the stopper section 7d of the sliding member 6.

[0068] In the spring receiving section 10c of the first movable contact point 10, a second coil spring 11 formed of a compression coil spring, shown in Fig. 2, is positioned. The upper end portion of the second coil spring 11 is supported in the spring support hole 7e formed in the ceiling surface of the wall member 7a of the sliding member 6, so that the first movable contact point 10 is elastically urged toward the lower side.

[0069] In the first movable contact point 10 which is elastically urged by such a second coil spring 11, the fulcrum section 10b is supported between the first support protrusion 7b and the second support protrusion 7c. The other side 10e of the base section 10a on a side opposite to the fulcrum section 10b is supported on the first support protrusion 7b in the shape of a hook, and is held by the sliding member 6.

[0070] The first movable contact point 10 and the pair of first fixed terminals 2 form a first switch section, which is a power-supply switch. When the sliding member 6 is pressed and is lowered, the pair of contact-point parts 10d and 10d of the first movable contact point 10 are brought into contact with the corresponding contact-point members 2c and 2c of the first fixed terminal 2.

[0071] As a result of the above, the pair of first fixed terminals 2 and 2 conduct via the first movable contact point 10, causing the first switch section to be turned on.

[0072] Furthermore, on the second contact-point support section 8 of the sliding member 6, a second movable contact point 12 formed of a twisted coil spring is supported. As shown in Fig. 2, the second movable contact point 12 has a wound section 12a in which a line spring formed of a piano line or the like is wound a plurality of times, and two arm sections 12b and 12b which extend outward in a straight line at a predetermined open angle a from this wound section 12a are formed.

[0073] In the second movable contact point 12, the wound section 12a is supported on the contact-point support section 8d of the second contact-point support section 8, and one of the arm sections 12b is latched to one of the spring latching sections 8e, and the other arm section 12b is latched to the other spring latching section 8f.

[0074] Then, the second movable contact point 12 and the pair of second fixed terminals 3 form a second switch section, which is a detection switch. When the second movable contact point 12 is lowered by pressing the sliding member 6, the two arm sections 12b and 12b are brought into contact with the pair of second fixed terminals 3.

[0075] As a result, the pair of the second fixed terminals 3 and 3 conduct via the second movable contact point 12, causing the second switch section to be turned on.

[0076] A cover member 13 for covering the upper portion of the bottom wall 1 is disposed above the bottom wall 1. The periphery of this cover member 13 is surrounded by an outer peripheral wall 13a, the upper portion thereof is covered by a ceiling section 13b, and a hollow housing section 14 capable of housing the sliding member 6, etc., is formed inside the cover member 13.

[0077] The lower portion of the hollow section 14 is opened, and the bottom wall 1 can be fitted to this opened lower portion.

[0078] Furthermore, in the cover member 13, an arc-shaped groove section 13c for mounting a rubber member 15 (to be described later) is formed in the central portion of the ceiling section 13b of the upper portion, and a crimping section 13d in the shape of a wall having a predetermined thickness is protrusively formed at a predetermined height in the outer periphery of the groove section 13c.

[0079] At the inner side of the arc-shaped groove section 13c, a through hole 13e through which the operation section 6b of the sliding member 6 can be inserted is formed at a predetermined hole diameter.

[0080] Furthermore, in the groove section 13c of the ceiling section 13b, as shown in Fig. 2, a dome-shaped rubber member 15 whose interior is hollow is disposed. This rubber member 15 is formed of a dome-shaped outer peripheral wall 15a, and a jaw section 15b having a predetermined thickness, formed in the outer peripheral portion of the lower portion of the outer peripheral wall 15a. In the vertex portion of the dome-shaped outer peripheral wall 15a, a press-fit hole 15c to which the driving bar 16 (to be described later) can be press-fitted is formed in such a manner as to go through.

[0081] Such a rubber member 15 is integrated with the cover member 13 in such a manner that the crimping section 13d is crimped so that, in a state in which the jaw section 15b is positioned in the groove section 13c, the crimping section 13d is put down inward.

[0082] The driving bar 16 is formed of a disc-shaped operation section 16a, and a bar-shaped press-fit section 19b which can be press-fitted to the press-fit hole 15c of the rubber member 15 and the press-fit hole 6c of the sliding member 6, and the driving bar 16 being formed in the shape of a top.

[0083] For assembling the switch device of the present invention configured as described above, first, the terminal parts 2b and 3b of the corresponding first and second fixed terminals 2 and 3 are press-fitted to the bottom wall 1. Then, the plate spring 4 is placed by being connected to the spring support section 1c of the bottom wall 1, and the first coil spring 5 is placed by being connected onto the upper portion of the base section 4b of the plate spring 4.

[0084] Furthermore, the sliding member 6 supports the first movable contact point 10 on the first contact-point support section 7, and both end portions of the second coil spring 11 are placed in the spring receiving section 10c of the first movable contact point 10 and the spring support hole 7e of the sliding member 6.

[0085] Then, in the first movable contact point 10, the other side 10e is supported on the stopper section 7d with the fulcrum section 10b positioned between the first support protrusions 7c and 7d being a fulcrum, and is placed in the sliding member 6.

[0086] Furthermore, the second movable contact point 12 formed of a twisted coil spring is placed in the second contact-point support section 8 of the sliding member 6.

[0087] For such a sliding member 6 having placed therein the first movable contact point 10 and the second movable contact point 12, in a state in which the guide section 6f which protrudes from the two end surfaces 6d and 6e of the support wall 6a is fitted to the guide section 1b of the bottom wall 1, the cover member 13 to which the rubber member 15 is crimped is covered from above, and the bottom wall 1 is press-fitted to the opened lower portion of the cover member 13, thereby causing the bottom wall 1 to be temporarily locked to the cover member 13.

[0088] Then, the operation section 6b of the sliding member 6 protrudes upward from the through hole 13e of the cover member 13, and is positioned inside the dome-shaped outer peripheral wall 15a of the rubber member 15.

[0089] Next, by press-fitting a press-fit section 16b of the driving bar 16 to the press-fit hole 15c of the rubber member 15 and the press-fit hole 6c of the sliding member 6, the upper portion of the housing section 14 inside the cover member 13 is hermetically sealed.

[0090] For this reason, intrusion of water, etc., from the upper portion of the cover member 13 to the housing section 14 can be prevented.

[0091] Furthermore, as shown in Fig. 8, as a result of sealing using a sealing material 17 the clearance between the outer peripheral section of the bottom wall 1 and the outer peripheral wall of the cover member 13, the clearance between the first fixed terminal 2 and the press-fit hole 1f of the bottom wall 1, and the clearance between the second fixed terminal 3 and the press-fit hole 1f of the bottom wall 1, the lower portion of the housing section 14 inside the cover member 13 is hermetically sealed, and thus intrusion of water, etc., from the bottom wall 1 side can be prevented.

[0092] In the switch device of the present invention assembled as described above, as shown in Fig. 8, the housing section 14 inside the cover member 13 is divided into two portions by the dividing wall 1a of the bottom wall 1, a first housing section 18 is formed at the left side in the figure, and a second housing section 19 is formed at the right side in the figure.

[0093] Then, a first switch section that supports the first movable contact point 10 is formed in the first housing section 18, and a second switch section that supports the second movable contact point 12 is formed in the second housing section 19.

[0094] The operation of the switch device of the present invention configured as described above will now be described. As shown in Fig. 8, in a state in which the sliding member 6 is positioned in the upper portion, and the first and second switch sections are turned off, when the sliding member 6 is lowered by pressing the driving bar 16 downward by the operator, the sliding section 4d of the plate spring 4, positioned on the first sliding surface 9a of the sliding member 6, slides on the inclined step-difference section 9c of the plate spring housing section 9, and the pressure pressing force which is applied to the driving bar 16 increases, this further causes the sliding member 6 to be pressed with pressure downward, and the sliding section 4d is positioned on the second sliding surface 9b. At this time, the operation force for pressing the sliding member 6 is suddenly decreased, and the operator who is pressing the sliding member 6 can feel tactile feeling.

[0095] At the same time as when this tactile feeling is felt, the contact-point parts 10d of the first movable contact point 10 are brought into contact with the contact-point members 2c and 2c of the first fixed terminal 2, and the pair of the first fixed terminals 2 and 2 conduct via the first movable contact point 10, causing the first switch section to be turned on.

[0096] Furthermore, at the same time, the pair of arm sections 12b and 12b which extend from the wound section 12a of the second movable contact point 12 are brought into contact with the contact-point parts 3a and 3a of the second fixed terminal 3, and the pair of the second fixed terminals 3 and 3 conduct via the second movable contact point 12, causing the second switch section to be turned on.

[0097] At this time, when the voltage which is supplied to the first switch section, which is a power-supply switch, is a high voltage, such as 100 V, and even if an arc is generated at the switched-on time, since the section between the first housing section 18 and the second housing section 19 is covered by the dividing wall 1a, the generated arc will not jump into the second housing section 19. For this reason, the second switch section does not cause a contact-point failure.

[0098] In this state in which the first and second switch sections are ON, when the pressing of the driving bar 16 is released, the sliding member 6 is pushed upward by the urging force of the first coil spring 5, and automatically returns to its initial state shown in Fig. 8, causing the first and second switch sections to be turned off.

[0099] In such a switch device of the present invention, the first switch section is disposed in the first housing section 18, and the second switch section is disposed in the second housing section 19, the first housing section 18 and the second housing section 19 being divided by the dividing wall 1a.

[0100] That is, since the first and second switch sections are disposed in parallel in a direction intersecting at right angles to the pressing direction of the operation section 6b, the depth dimension can be decreased.

[0101] In addition, in the switch device of the present invention, since the first movable contact point 10 and the second movable contact point 12 are supported on the sliding member 6, the number of parts can be reduced.

Claims

1. A switch device comprising:

a cover member for covering a housing section of the interior thereof with a bottom wall disposed in the lower portion; and

a sliding member by which an operation section, housed inside said housing section and protruding outward from said cover member, can be pressed,

wherein said bottom wall has a dividing wall for dividing said housing section into first and second housing sections,

said sliding member has a support wall which can slide along said dividing walls by pressing said operation section, a first contact-point support section being formed in said first housing section with the support wall being sandwiched in between, a second contact-point support section being formed in said second housing section, a first movable contact point being disposed in said first contact-point support section, and a second movable contact point being disposed in said second contact-point

support section,

said bottom wall has a first fixed terminal with which said first movable contact point, which is disposed in said first housing section, can be brought into contact, and a second fixed terminal with which said second movable contact point, which is disposed in said second housing section, can be brought into contact, and

said first movable contact point and said first fixed terminal form a first switch section, said second movable contact point and said second fixed terminal form a second switch section, and said first and second switch sections are disposed in parallel in a direction intersecting at right angles to the direction in which said operation section is pressed.

2. A switch device according to Claim 1, wherein the first movable contact point that is supported on said first contact-point support section of said sliding member is formed in the shape of a rectangular plate, one side thereof being supported on said support wall side of said sliding member, and the other side being supported in a vertically movable manner on a wall member formed on a side opposing said support wall.

3. A switch device according to Claim 1 or 2, wherein a pair of said first fixed terminals is provided with a predetermined space therebetween on said bottom wall on said first housing section side, and when said sliding member is pressed, said other side of said first movable contact point is brought into contact with said pair of the first fixed terminals.

4. A switch device according to any of Claims 1 to 3, wherein said second movable contact point comprises a twisted coil spring having a wound section in which a line spring is wound into a coil form and having formed therein a pair of arm sections which extend outward at predetermined open angles from this wound section.

5. A switch device according to any of Claims 1 to 4, wherein a pair of said second fixed terminals is provided with a predetermined space therebetween on said bottom wall in said second housing section, and when said sliding member is pressed, said pair of arm sections are brought into contact with said pair of the second fixed terminals.

6. A switch device according to any of Claims 1 to 5, wherein said first and second fixed terminals have contact points with which said first and second movable contact points can be brought into contact, and terminal parts which extend toward one side from these contact points, these terminal parts are mounted on said bottom wall, and the tips of said terminal parts are guided out externally from said bottom wall.

7. A switch device according to any of Claims 1 to 6, wherein said dividing wall of said bottom wall has formed therein a guide section for slidably supporting said sliding member along said dividing wall.

8. A switch device according to any of Claims 1 to 7, wherein a first coil spring is provided between said sliding member and said bottom wall, and when said pressing of said sliding member is released, said sliding member automatically returns to its initial state before said pressing due to the action of said first coil spring.

9. A switch device according to any of Claims 1 to 8, wherein said sliding member has formed therein a sliding surface having a step difference which is inclined in a direction parallel to said pressing direction, a plate spring which can be brought into pressure contact with this sliding surface is disposed on said bottom wall, and when said sliding member is pressed, since said plate spring is elastically deformed due to said step difference, the pressure pressing force for said pressing operation is varied.

10. A switch device according to any of Claims 1 to 9, wherein said cover member and said bottom wall are formed as separate elements, and said cover member is formed such that the lower portion of said housing section is opened, the lower portion of said opened housing section is covered by said bottom wall, a clearance portion between said bottom wall and said cover member is sealed by a sealing material, and the lower portion of said housing section is hermetically sealed.

11. A switch device according to Claim 10, wherein said sealing material is also coated around said first and second fixed terminals mounted on said bottom wall.

12. A switch device according to any of Claims 1 to 11, wherein a dome-shaped rubber member is disposed on said operation section of said sliding member which protrudes outward from said cover member, and the upper portion of said housing section is hermetically sealed by this rubber member.

13. A switch device according to Claim 12, wherein a driving bar is disposed on said rubber member, and this driving bar is fixed to said operation section of said sliding member via a press-fit hole formed in said rubber member.

FIG. 1

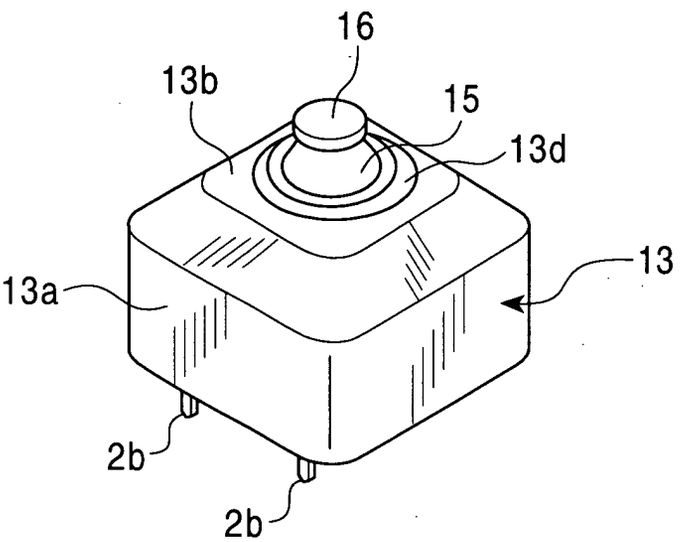

FIG. 2

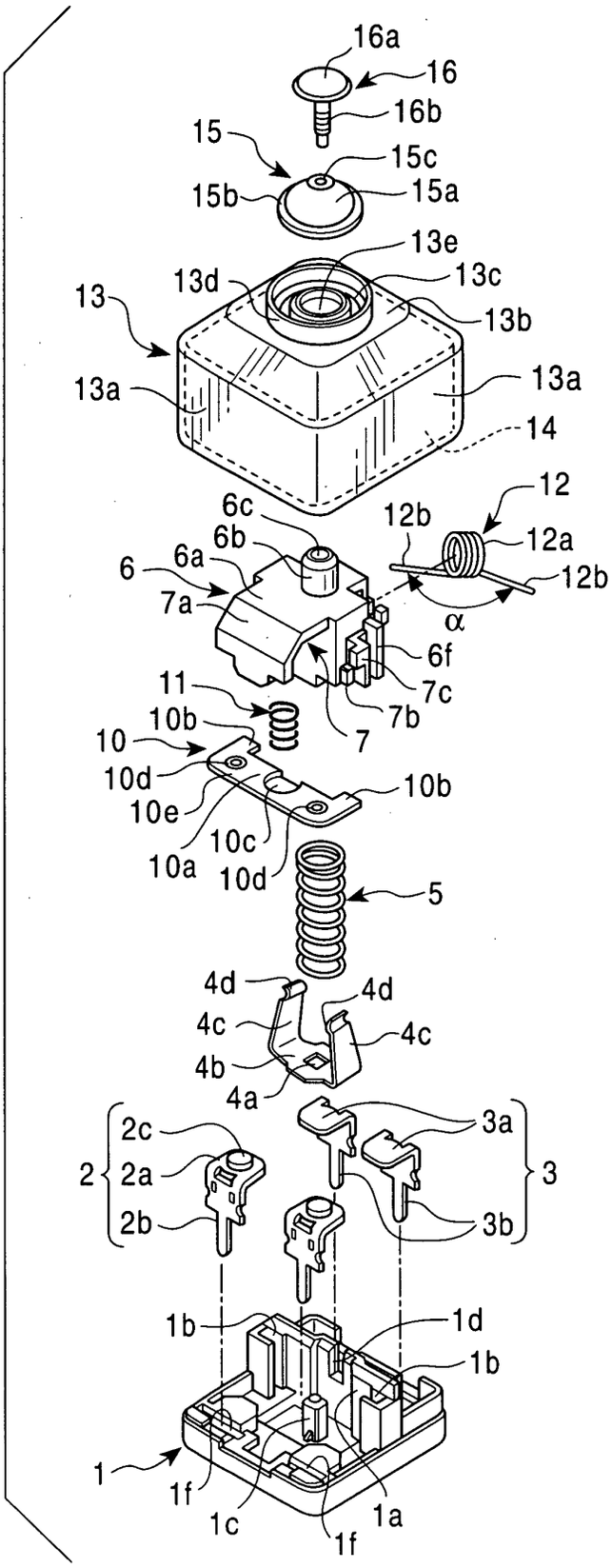
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FIG. 3

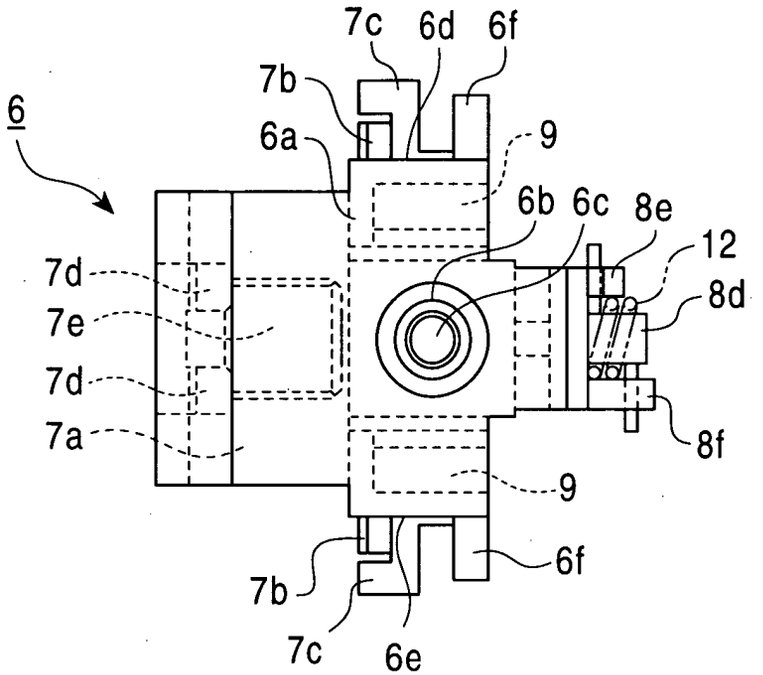
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FIG. 4

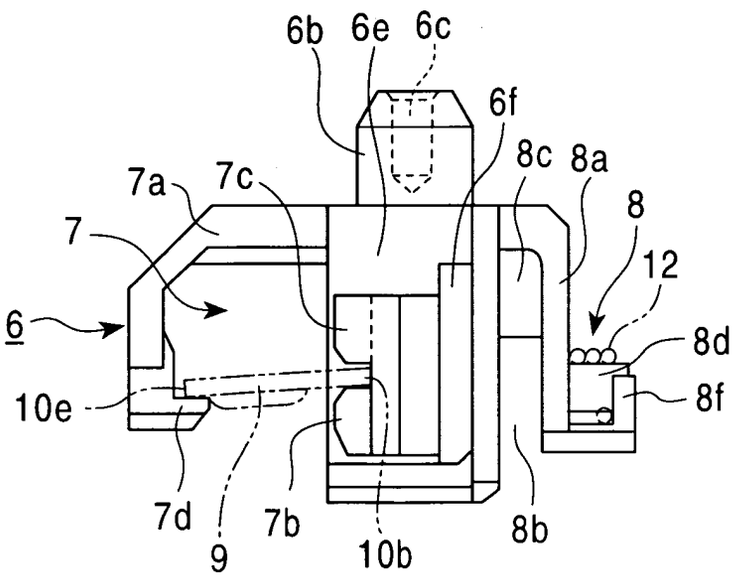
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FIG. 5

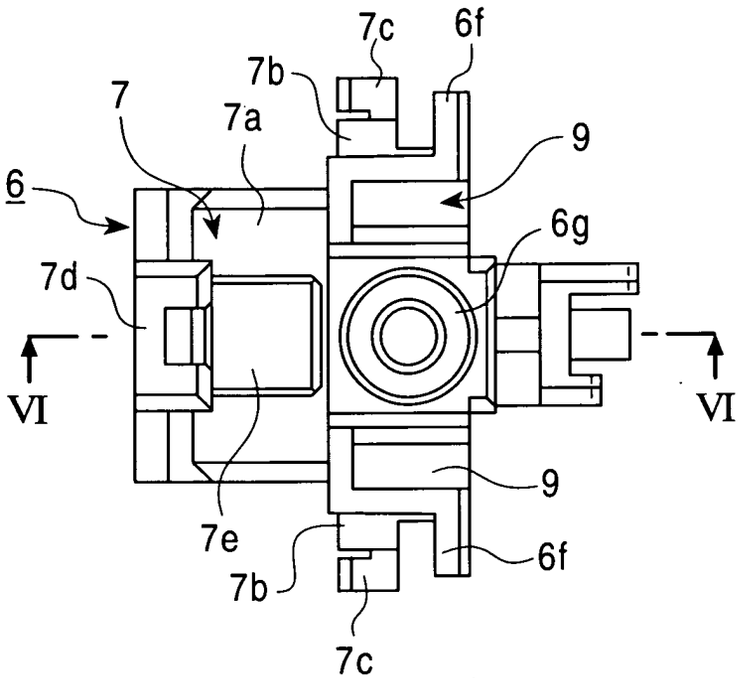
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FIG. 6

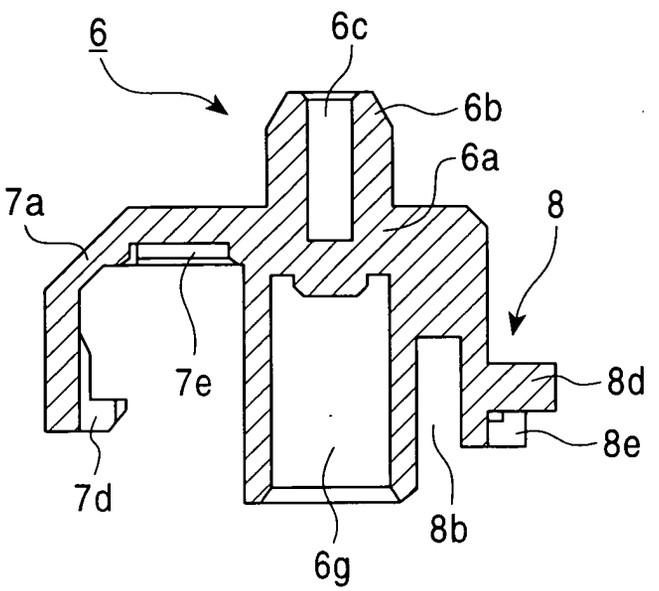
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FIG. 7

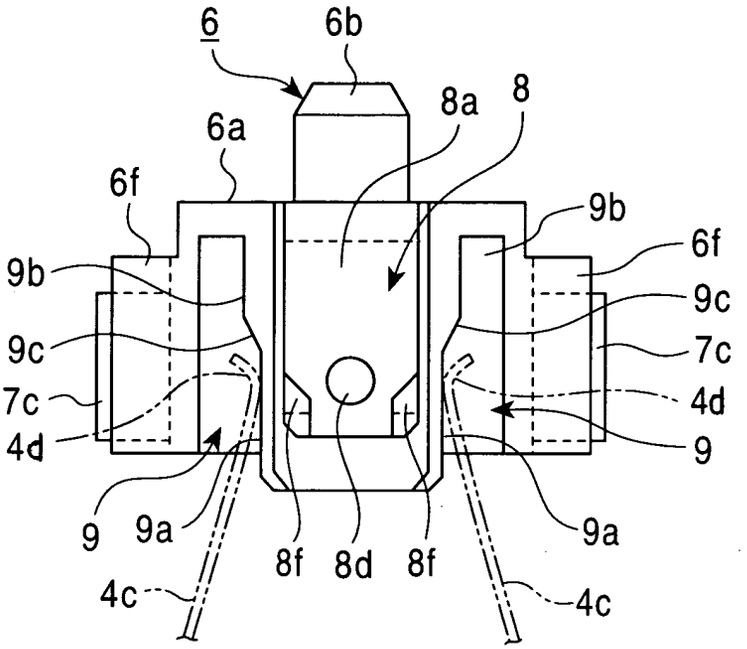
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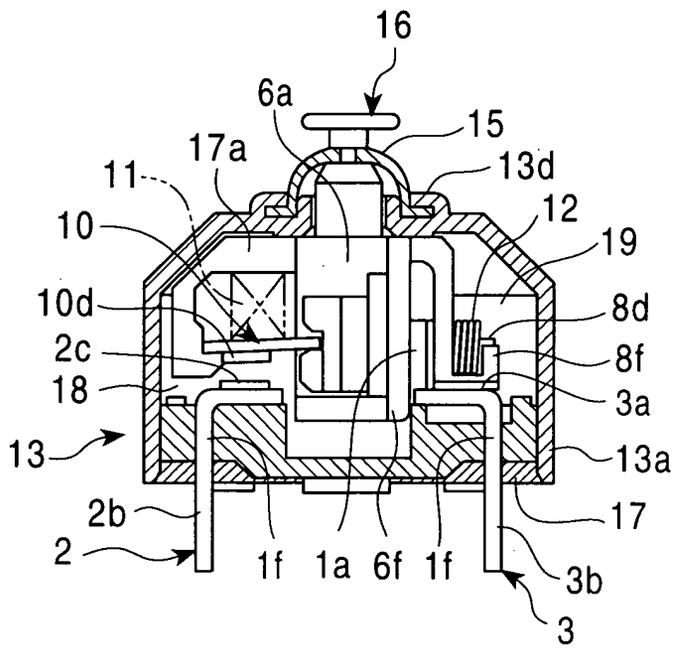
FIG. 8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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 0704

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 September 2003	Ruppert, H

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