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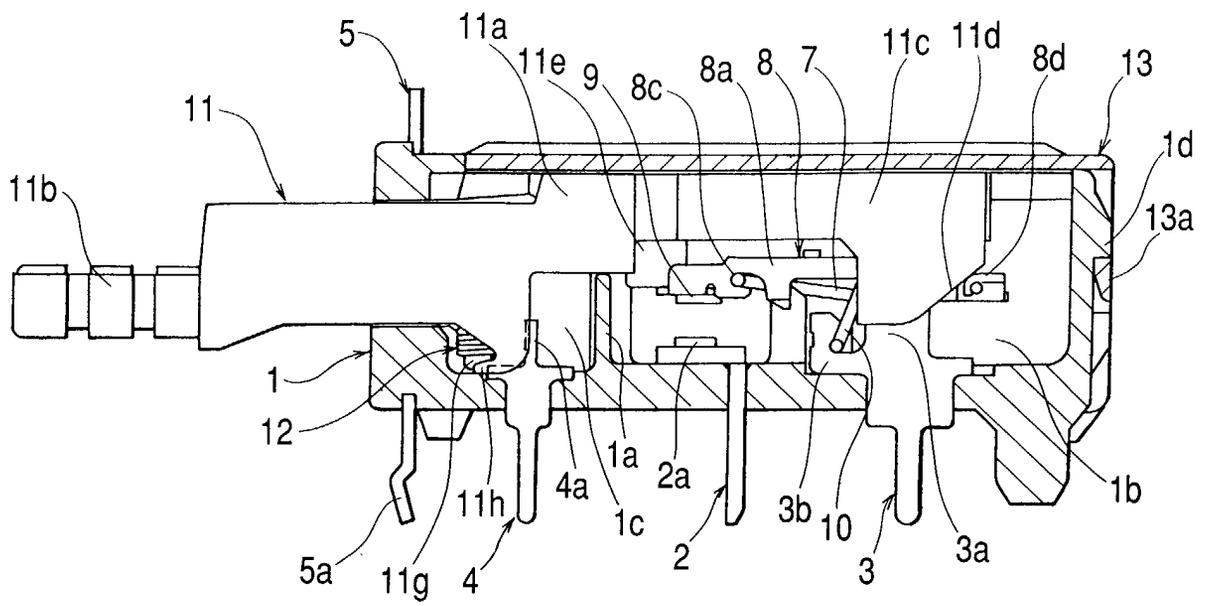
(54) Switch device

(57) The switch device is provided with a first switch comprising a first fixed side contact, a conductor plate having a first movable side contact brought into or out of contact with the first fixed side contact, and a spring member for slidably supporting the conductor plate onto a central terminal; a second switch comprising a second fixed side contact, and a second movable side contact brought into or out of contact with the second fixed side contact; a sliding member for displacing the first movable side contact and the second movable side contact; and a case with the first switch and the second switch built into it, wherein the second movable side contact is formed of a twisted coil spring having arms in contact with a pair of fixed terminals.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the invention

[0001] The present invention relates to a switch device for use as a power switch provided with a detection switch for an electronic device, and more particularly to the structure of a built-in type switch device whose detection switch is housed in the same case as the power switch.

2. Description of the Prior art

[0002] Known structures of a detection switch include an external type switch device formed by connecting and fixing a ready-made detection switch to the fore or rear part of a power switch with a linking member and a built-in type switch device formed by building the switch of a ready-made detection switch into the main case of a power switch.

[0003] In the external type switch device, suppression by a sliding member linked to the manipulating section of the power switch is made possible by using a ready-made detection switch and partially altering the shape of a manipulating lever, which constitutes the manipulating section of the detection switch. The linking structure by the linking member enables, when the manipulating section of the power switch is pressed, the detection switch also is to be manipulated. In this structure, the detection switch and the power switch are independent of each other, and each is formed in an individual case.

[0004] The built-in type switch device is formed by depriving a ready-made detection switch of its manipulating lever and case part to take out the switch and building only this switch into the case of the power switch. Changing over of the detection switch is made possible by partially altering the shape of the case of the power switch and, as required, that of the sliding member which serves as the manipulating section. In this case the detection switch and the power switch are housed in the same case, and the use of a linking member is dispensed with.

[0005] However, regarding the above-described structures of the detection switch-equipped power switches according to the prior art, the external type switch device involves problems in the strength of the fitting portion of the detection switch, in the accuracy of the turning-on position, and in cost on account of the increased number of parts use and assembling complexity because a ready-made detection switch is linked to the fore or rear part of the power switch with a linking member or the like.

[0006] Both the external type and the built-in type inevitably tend to be bigger in external size on account of a problem with the shifting stroke of the sliding member and the safety requirement to ensure a certain insulating distance.

SUMMARY OF THE INVENTION

[0007] Therefore, an object of the present invention is to solve the problems noted above, and provide a switch device structure permitting simplification of the detection switch, reduction in size, greater assembling ease and a cost saving as well as improvements in accuracy of a turning-on position and fitting strength by using a twisted coil spring for a movable contact.

[0008] In order to solve the problems noted above, according to a first aspect of the invention, there is provided a switch device having a configuration provided with a first fixed side contact; a conductor plate having a first movable side contact brought into and out of contact with the first fixed side contact; a central terminal supporting the conductor plate; a first switch comprising a spring member arranged between the conductor plate and the central terminal in a bent form and swingably supporting the conductor plate onto the central terminal; a second switch comprising a second fixed side contact and a second movable side contact brought into and out of contact with the second fixed side contact; a sliding member for bringing the first movable side contact into and out of contact with the first fixed side contact by displacing the conductor plate in a direction substantially normal to the sliding direction by springiness of the spring member, and displacing the second movable side contact to bring it into and out of contact with the second fixed side contact; and a case for shiftably holding the sliding member in its protruding position and locked position and having the first switch and the second switch built into it, wherein the second fixed side contact comprises a pair of fixed terminals arranged opposite each other in the case, and the second movable side contact comprises a twisted coil spring having a pair of arms brought into contact with the fixed terminals.

[0009] According to a second aspect of the invention, there is provided a configuration in which the pair of fixed terminals are arranged toward an inner bottom face of the case, and the second movable side contact is arranged toward an under side of the sliding member, opposite a face of locking means formed toward a top face of the sliding member of the case.

[0010] - According to a third aspect of the invention, there is provided a configuration in which a guide comprises a stub and a pair of hook-shaped holders with the guide between them are formed toward the under side of the sliding member; a wound portion of the second movable side contact, comprising a twisted coil spring, is engaged with the guide; and the pair of arms are kept in elastic contact with the holders.

[0011] According to a fourth aspect of the invention, there is provided a configuration in which a partition wall is formed between the first switch and the second switch on an inner bottom of the case.

[0012] According to a fifth aspect of the invention, there is provided a configuration in which the first switch is a power switch for changing over an A.C. power source on a primary side and the second switch is a power switch for changing over a D.C. power source on a secondary side.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 shows a vertical section of a switch device, which is an embodiment of the present invention, when it is off;

Fig. 2 shows a plan of the same switch device according to the invention when it is off in a state in which its cover and sliding member are partially broken;

Fig. 3 shows a vertical section of the switch device according to the invention when its detection switch is on;

Fig. 4 shows a plan of the same switch device according to the invention when it is on in a state in which its cover and sliding member are partially broken;

Fig. 5 shows a vertical section of the switch device according to the invention when its detection switch and power switch are on;

Fig. 6 shows a plan of the same switch device according to the invention when its detection switch and power switch are on in a state in which its cover and sliding member are partially broken; and

Fig. 7 shows a partial perspective view of a state of engagement between a movable side contact and the sliding member of the detection switch according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] A switch device, which is a preferred embodiment of the present invention, will be described below with reference to Fig. 1 through Fig. 7. Fig. 1 shows a vertical section of the switch device when it is off; Fig. 2 shows a plan of the same switch device in a state in which its cover and sliding member are partially broken; Fig. 3 shows a vertical section of the switch device when its detection switch is on; Fig. 4 shows a plan of the same switch device in a state in which its cover and sliding member are partially broken; Fig. 5 shows a vertical section of the switch device when its detection switch and power switch are on; Fig. 6 shows a plan of the same switch in a state in which its cover and sliding member are partially broken; and Fig. 7 shows a partial perspective view of a state of engagement between a movable side contact and the sliding member of the detection switch.

[0015] Referring to the figures, a case 1 is formed of an insulator, such as synthetic resin, in a box shape whose top face is open. In the opening of this case 1 are formed a first accommodating section 1b positioned backward and a second accommodating section 1c positioned forward, separated from each other by a partition wall 1a. On the inner bottom face of the first accommodating section 1b are arranged a peripheral terminal 2 consisting of a conducting metal plate and having on its top face a first fixed side contact 2a and, adjacent to this peripheral terminal 2, a central terminal 3 also consisting of a conducting metal plate. On the inner bottom face of the second accommodating section 1c are arranged, opposite each other, fixed terminals 4 and 4, also consisting of conducting metal plates, and the tips of these fixed terminals 4 and 4 constitute second fixed side contacts 4a and 4a.

[0016] In the first and second accommodating sections 1b and 1c is housed and slidably arranged a sliding member 11 to be described in more detail afterwards. Toward the fore tip of the case 1 is fitted a frame 5 having a fitting leg 5a for fitting to a circuit board or the like and consisting of a metal plate, and toward its rear tip is formed a fitting stub 1d to which is fitted a cover 13 to be described in more detail afterwards. Toward the fore tip of the case 1 is provided a shaft hole 1e for bearing one end of a lock pin (not shown), which locks the sliding member 11 in its pressed-in position by the engagement of its other end with a lock cam (not shown) of the sliding member 11 to be described in more detail afterwards. Farther out toward the tip than this shaft hole 1e extends a return spring hook If for hooking on one end of a return spring 6 to energize the sliding member 11, to be described in more detail afterwards, toward its returned position.

[0017] On the central terminal 3 stand a supporting arm engaging stub 3a for engaging a supporting arm 7 to be described in more detail afterwards and a spring engaging stub 3b for engaging an inverting coil spring 10 to be described in more detail afterwards, and with these engaging stubs 3a and 3b are to be engaged the supporting arm 7 to be described in more detail afterwards and one end of the inverting coil spring 10. These engaging stubs are formed in an arcwise shape matching the respective wire diameters of the supporting arm 7 to be described in more detail below and of the inverting coil spring 10.

[0018] The supporting arm 7 is formed of a conducting round wire having springiness in a substantially U shape, an engaging shaft to be engaged with the supporting arm engaging stub 3a, a pair of arm pieces extending from this engaging shaft and arranged opposite each other in a flexible way. The tips of these arm pieces engage with engaging holes 8c provided on side walls 8a of a conductor plate 8 to be described in more detail afterwards to be able to rotate together with the conductor plate 8.

[0019] The conductor plate 8, similarly consisting of a conducting metal plate, has on its sides the side walls

8a opposite each other, and at the center of this conductor plate 8 is provided a window hole 8b. The side walls 8a are provided with the pair of engaging holes 8c, and the supporting arm 7 rotatably engage with these engaging holes 8c. Into the window hole 8b is fitted the supporting arm 7 with play, and the supporting arm engaging stub 3a and the inverting coil spring 10 to be described in more detail afterwards are also to be fitted with play.

[0020] To one end of the conductor plate 8 is fixed a first movable side contact 9. At that end of the conductor plate 8 where the first movable side contact 9 is fixed are formed the engaging holes 8c to engage the supporting arm 7, and with the other end is engaged the inverting coil spring 10 to be described in more detail afterwards to permit movable fitting to the central terminal 3. At the other end is provided a contact portion 8d consisting of an arcwise face and displacing the conductor plate 8 in a direction substantially normal to the sliding direction in contact with an operating face portion 11d of the sliding member 11 to be described in more detail afterwards.

[0021] The inverting coil spring 10, formed by winding a conducting springy round wire in a coiled shape, has a pair of spring pieces, of which one is engaged with the spring engaging stub 3b of the central terminal 3 and the other is engaged with the other end of the conductor plate 8. The inverting coil spring 10 is arranged in a bent shape between the central terminal 3 and the conductor plate 8, and the conductor plate 8 is energized by the energizing force of the inverting coil spring 10 in the direction reverse to the position where the first fixed side contact 2a is arranged (the inner bottom face side of the first accommodating section 1b).

[0022] The first movable side contact 9 fixed to one end of the conductor plate 8 is arranged opposite and detachable from the first fixed side contact 2a provided on the peripheral terminal 2, and in this case the central terminal 3, the inverting coil spring 10, the supporting arm 7, the conductor plate 8 and the peripheral terminal 2 constitute a power switch for changing over the A.C. power source on the primary side, which is a first switch.

[0023] The sliding member 11, formed of an insulator such as synthetic resin, is provided with a base 11a arranged on the first accommodating section 1b of the case 1 and a manipulating section lib extending at the tip of this base 11a. The base 11a is provided with a conductor plate accommodating section 11c for accommodating the conductor plate 8 and the supporting arm 7 among others, and in this conductor plate accommodating section 11c is formed the operating face portion lid, consisting of an inclined face, for displacing the conductor plate 8 in a direction substantially normal to the sliding direction in sliding contact with the contact portion 8d of the conductor plate 8. On the top face of the conductor plate accommodating section 11c is provided a stub 11e for regulating the position of the conductor plate 8 in contact with the tip of the conductor plate 8.

[0024] With the tip of the base 11a is in sliding contact the aforementioned lock pin (not shown) to form the lock cam (not shown) for locking the sliding member 11 in its pressed-in position. Further the manipulating section 11b is provided with a return spring accommodating section 11f for accommodating the return spring 6 to energize the sliding member 11 toward its returned position.

[0025] On the under face of the sliding member 11, opposite the face on which the lock cam is formed, there is formed a guide 11g consisting of a columnar stub, and a pair of hook-shaped holders 11h and 11h with this guide 11g between them. With this guide 11g is engaged a wound portion 12a of a second movable side contact 12, consisting of a twisted coil spring formed by winding a conducting springy round wire in a coiled shape, and a pair of arms 12b and 12b extending from this wound portion 12a are fitted to the holders 11h and 11h in elastic contact.

[0026] The pair of arms 12b and 12b are arranged opposite each other to be detachable from the second fixed side contacts 4a and 4a provided at the tips of the pair of fixed terminals 4 and 4 arranged toward the inner bottom face of the second accommodating section 1c. In this case, the second movable side contact 12 consisting of a twisted coil spring and the second fixed side contacts 4a and 4a provided at the tips of the pair of fixed terminals 4 and 4 constitute a power switch for changing over the D.C. power source on the secondary side, which is a second switch. The power switch and the detection switch are formed in a state of being separated from each other by the partition wall 1a provided toward the inner bottom of the case 1.

[0027] The formation of the partition wall 1a between the power switch and the detection switch as described above prevents any arc or the like arising in the power switch on the primary side from affecting the detection switch on the secondary side, resulting in enhanced reliability of the switch.

[0028] The cover 13, formed of an insulator such as synthetic resin in a rectangular shape, is fitted, by a fitting arm 13a to be engaged with the fitting stub 1d toward the rear end of the case 1 and the frame 5 fitted toward the fore tip of the case 1, to the open first and second accommodating sections 1b and 1c of the case 1 so as to cover them.

[0029] When the contact mechanism for the first switch of the above-described switch device, first the conductor plate 8 should be fitted to the central terminal 3 arranged toward the inner bottom face of the case 1. In this process, as the supporting arm 7 is engaged with the conductor plate 8 being elastically energized, the conductor plate 8 and the supporting arm 7 are integrated into a single component, the conductor plate 8 can be easily built into the central terminal 3 merely by fitting the supporting arm engaging stub 3a of the central terminal 3 into the window hole 8b of the conductor plate 8 with play and incorporating the supporting arm 7 into the supporting arm engaging stub 3a. Then, the guided

insertion of the supporting arm engaging stub 3a into the window of the conductor plate 8 serves to position it. From this state, with the inverting coil spring 10 being kept fitted in the window hole 8b of the conductor plate 8 with play, the assembling of the first switch is completed by engaging the inverting coil spring 10 in a bent state between the other end of the conductor plate 8 and the spring engaging stub 3b of the central terminal 3.

[0030] At this time, the conductor plate 8 is placed by the energizing force of the inverting coil spring 10 in a state of being energized in the direction reverse to the direction in which the peripheral terminal 2 of the first accommodating section 1a is arranged, and the upper end face side onto which the first movable side contact 9 is fixed is in contact with the stub 11e of the sliding member 11, and the coming into contact of the contact portion 8d on the other end face side with the operating face portion 11d causes the conductor plate 8 to be arranged substantially in parallel to the first accommodating section 1b in a state in which the first movable side contact 9 and the first fixed side contact 2a keep a certain distance between them.

[0031] On the under side opposite the face on which the lock cam of the sliding member 11 is formed, there are formed the guide 11g consisting of a columnar stub and the pair of hook-shaped holders 11h and 11h opposite each other with this guide 11g between them, the wound portion 12a of the second movable side contact 12, consisting of a twisted coil spring, is engaged with this guide 11g, and the pair of arms 12b and 12b extended from this wound portion 12a are fitted to the holders 11h and 11h in elastic contact. When the sliding member 11 is accommodated in the first and second accommodating sections 1b and 1c, the arrangement of the pair of arms 12b and 12b opposite each other in a state of keeping a certain distance from the second fixed side contacts 4a and 4a provided at the tips of the pair of fixed terminals 4 and 4 arranged toward the inner bottom face of the second accommodating section 1c results in the constitution of the second switch.

[0032] In this case, the fitting of the pair of arms 12b and 12b of the second movable side contact 12 to the holders 11h and 11h of the sliding member 11 in elastic contact as shown in Fig. 7 facilitates integration and assembly. Moreover, pre-tension applied to the pair of arms 12b and 12b makes it easy to secure a sufficient contact pressure at the time of being turned on.

[0033] Next, the operation of the above-described switch device will be explained with reference to Fig. 1 through Fig. 6.

[0034] As shown in Fig. 1 and Fig. 2, in the initial state, the conductor plate 8 is off contact in a state in which the first movable side contact 9 is separated from the first fixed side contact 2a at a certain distance. In this state, the conductor plate 8 is energized by the energizing force of the inverting coil spring 10 in the direction reverse to the peripheral terminal 2 and the first fixed side contact 2a (upward). The second movable side contact 12 and the second fixed side contact 4a are also separated from each other at a certain distance, resulting in an contact-off state.

[0035] When the manipulating section 11b of the sliding member 11 is pressed in from this state against the energizing force of the return spring 6, the second movable side contact 12 engaged with the guide 11g of the sliding member 11 is shifted backward together as shown in Fig. 3 and Fig. 4, and the second movable side contact 12 comes into contact with the second fixed side contact 4a, resulting in a contact-on state. Although the operating face portion lid of the sliding member 11 then suppresses the contact portion 8d of the conductor plate 8, the first movable side contact 9 and the first fixed side contact 2a are still separated from each other, resulting in a contact-off state.

[0036] When the manipulating section 11b of the sliding member 11 is further pressed in from this state, the operating face portion 11d of the sliding member 11 further suppresses the contact portion 8d of the conductor plate 8 as shown in Fig. 5 and Fig. 6, and the contact portion 8d side of the conductor plate 8 is pressed down toward the inner bottom face of the first accommodating section 1b against the energizing force of the inverting coil spring 10. Then, after the point where the inverting coil spring 10 and the conductor plate 8 overlaps the engaging portion between the supporting arm 7 and the central terminal 3 (the engaging portion of the supporting arm engaging stub 3a), the direction of the energizing force of the inverting coil spring 10 is inverted downward, and the conductor plate 8 self-travels toward the inner bottom face of the first accommodating section 1b to bring the first movable side contact 9 into contact with the first fixed side contact 2a, resulting in a contact-on state.

[0037] Then, the second movable side contact 12 shifts farther backward, but the arms 12b and 12b are flexed by their own elasticity in a state of being in contact with the second fixed side contact 4a, and the flexure causes them to remain in sliding contact with the second fixed side contact 4a to keep the contact-on state. By forming the second movable side contact 12 of a twisted coil spring as described above, the contact-on state can be held in a long stroke, and the sliding contact serves to stabilize the contact portions. Then, the sliding member 11 is locked into the pressed-in position by the synergy of the lock pin and the lock cam (neither shown).

[0038] For unlocking from this state, further suppression of the manipulating section 11b of the sliding member 11 would disengage the lock pin from the lock cam to enable the sliding member 11 to be returned to its initial position by the energizing force of the return spring 6. Then, if the engaging portion between the conductor plate 8 and the inverting coil spring 10 surpasses the engaging portion between the supporting arm 7 and the central terminal 3 (the engaging portion of the supporting arm engaging stub 3a), the direction of the energizing force of the inverting coil spring 10 is inverted up-

ward, the conductor plate 8 self-travels away from the inner bottom face of the first accommodating section 1b to bring the first movable side contact 9 into separation from the first fixed side contact 2a, resulting in a contact-off state, and the second movable side contact 12 also is separated from the second fixed side contacts 4a and 4a into a contact-off state, resulting in a return to the initial state shown in Fig. 1 and Fig. 2.

[0039] The preferred embodiment of the present invention described above permits simplification of the configuration of the detection switch, reduction in size and a cost saving by using the second movable side contact 12 consisting of a twisted coil spring for the movable side contact of the detection switch for changing over the D.C. power source on the secondary side, as well as greater assembling ease because the twisted coil spring is easier to handle and more difficult to deform.

[0040] The configuration in which the contact portions between the power switch for changing over the A.C. power source on the primary side and the detection switch for changing over the D.C. power source on the secondary side are built into the same case 1 and the second movable side contact 12 of the detection switch and the second fixed side contact 4a are formed on the under side, opposite the top side on which the lock cam of the sliding member 11, which is shiftably accommodated in this case 1, has made it possible to reduce the external size of the switch device by effectively utilizing otherwise dead space toward the under side of the sliding member 11 with a corresponding saving in cost. At the same time, building the detection switch into the same case also contributes to enhancing the strength of the fitting portion and the accuracy of the turning-on position.

[0041] Although the fixed terminals 4 and the second fixed side contact 4a of the detection switch are supposed to be formed of conductor metal plates in the configuration of the embodiment of the invention described above, they may as well be formed of conductor wires instead, and this would serve to reduce the material cost, resulting in a further saving in the overall cost.

[0042] The configuration in which the second movable side contact 12, consisting of a twisted coil spring, of the detection switch is engaged with the guide 11g formed on the under face side of the sliding member 11 can be replaced with another in which the guide 11g is formed toward the inner bottom face of the second accommodating section 1c of the case 1 and the second movable side contact 12 is engaged with it. This alternative configuration, too, can obviously provide the same advantages as the configuration described above.

[0043] As hitherto described, the configuration of the switch device according to the present invention is provided with a first fixed side contact; a conductor plate having a first movable side contact brought into and out of contact with this first fixed side contact; a central terminal supporting this conductor plate; a first switch comprising a spring member arranged between the conductor plate and the central terminal in a bent form and swingably supporting the conductor plate onto the central terminal; a second switch comprising a second fixed side contact and a second movable side contact brought into and out of contact with this second fixed side contact; a sliding member for bringing the first movable side contact into and out of contact with the first fixed side contact by displacing the conductor plate in a direction substantially normal to the sliding direction by the springiness of the spring member, and displacing the second movable side contact to bring it into and out of contact with the second fixed side contact; and a case for shiftably holding this sliding member in its protruding position and locked position and having the first switch and the second switch built into it, wherein the second fixed side contact comprises a pair of fixed terminals arranged opposite each other in the case, and the second movable side contact comprises a twisted coil spring having a pair of arms brought into contact with the fixed terminals, therefore the configuration of the detection switch can be simplified and reduced in size and accordingly in cost, and moreover, as the twisted coil spring is easy to handle and difficult to deform, the assembling ease is enhanced. Furthermore, the contact-on state can be held in a long stroke, and the sliding contact serves to stabilize the contact portions.

[0044] Also, as the pair of fixed terminals are arranged toward the inner bottom face of the case, and the second movable side contact is arranged toward the under side of the sliding member, opposite the face of a locking means formed toward the top face of the sliding member of the case, it is made possible to reduce the external size of the switch device by effectively utilizing otherwise dead space toward the under side of the sliding member with a corresponding saving in cost. At the same time, building the detection switch into the same case also contributes to enhancing the strength of the fitting portion and the accuracy of the turning-on position.

[0045] Also, as a guide consisting of a stub and a pair of hook-shaped holders with this guide between them are formed toward the under side of the sliding member; a wound portion of the second movable side contact, consisting of a twisted coil spring, is engaged with the guide; and the pair of arms are kept in elastic contact with the holders, integration is facilitated and so is assembly. Moreover, pre-tension applied to the pair of arms makes it easy to secure a sufficient contact pressure at the time of being turned on.

[0046] Also, as a partition wall is formed between the first switch and the second switch on the inner bottom of the case, any arc or the like arising in the power switch on the primary side is prevented from affecting the detection switch on the secondary side, resulting in enhanced reliability of the switch.

[0047] Also, as the first switch is the power switch for changing over the A.C. power source on the primary side and the second switch is the power switch for

changing over the D.C. power source on the secondary side, there can be provided detection switch-equipped power switches simplified in configuration and reduced in size and cost.

Claims

1. A switch device provided with a first fixed side contact; a conductor plate having a first movable side contact brought into and out of contact with the first fixed side contact; a central terminal supporting the conductor plate; a first switch comprising a spring member arranged between the conductor plate and the central terminal in a bent form and swingably supporting the conductor plate onto the central terminal; a second switch comprising a second fixed side contact and a second movable side contact brought into and out of contact with the second fixed side contact; a sliding member for bringing the first movable side contact into and out of contact with the first fixed side contact by displacing the conductor plate in a direction substantially normal to the sliding direction by springiness of the spring member, and displacing the second movable side contact to bring it into and out of contact with the second fixed side contact; and a case for shiftably holding the sliding member in its protruding position and locked position and having the first switch and the second switch built into it, wherein the second fixed side contact comprises a pair of fixed terminals arranged opposite each other in the case, and wherein the second movable side contact comprises a twisted coil spring having a pair of arms brought into contact with the fixed terminals.

2. The switch device according to Claim 1, wherein the pair of fixed terminals are arranged toward an inner bottom face of the case, and wherein the second movable side contact is arranged toward an under side of the sliding member, opposite a face of locking means formed toward a top face of the sliding member of the case.

3. The switch device according to Claim 1 or 2, wherein a guide comprising a stub and a pair of hook-shaped holders with the guide between them are formed toward the under side of the sliding member, wherein a wound portion of the second movable side contact, comprising a twisted coil spring, is engaged with the guide, wherein and the pair of arms are kept in elastic contact with the holders.

4. The switch device according to any of Claims 1 to 3, wherein a partition wall is formed between the first switch and the second switch on an inner bottom of the case.

5. The switch device according to any of Claims 1 to 4, wherein the first switch is a power switch for changing over an A.C. power source on a primary side and the second switch is a power switch for changing over a D.C. power source on a secondary side.

FIG. 1

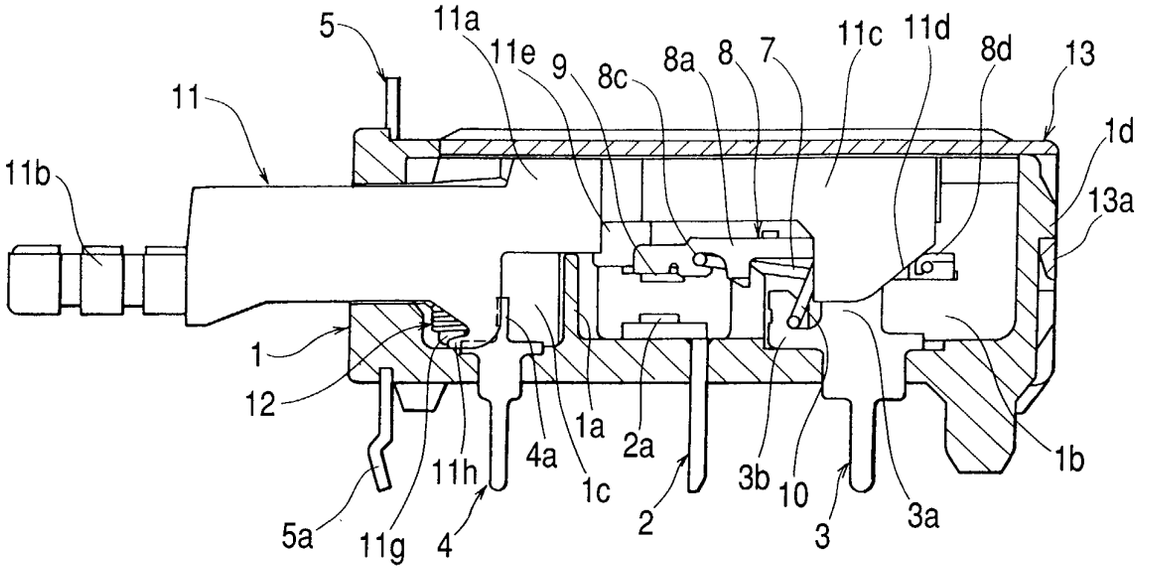
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FIG. 2

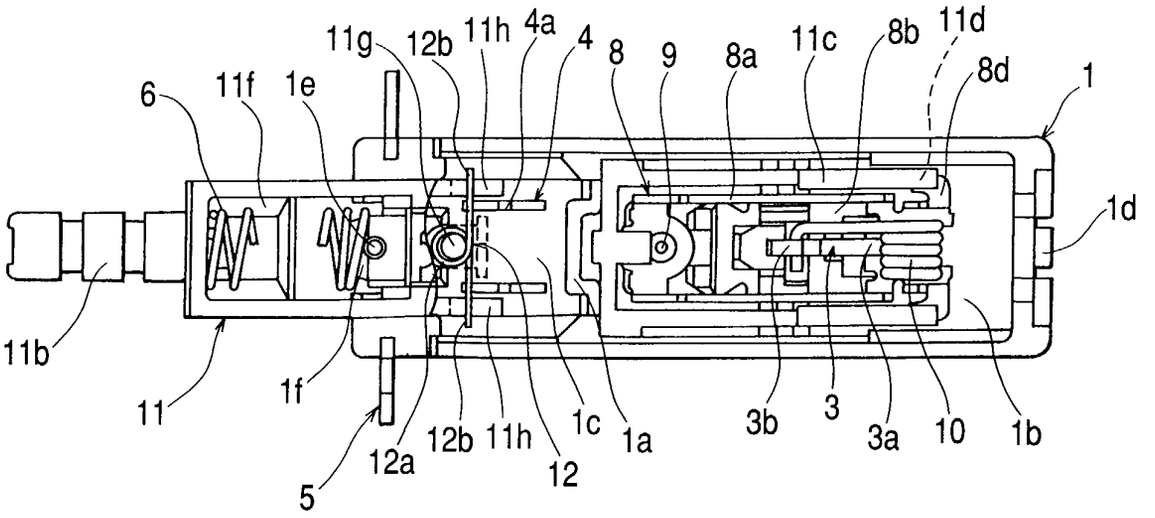
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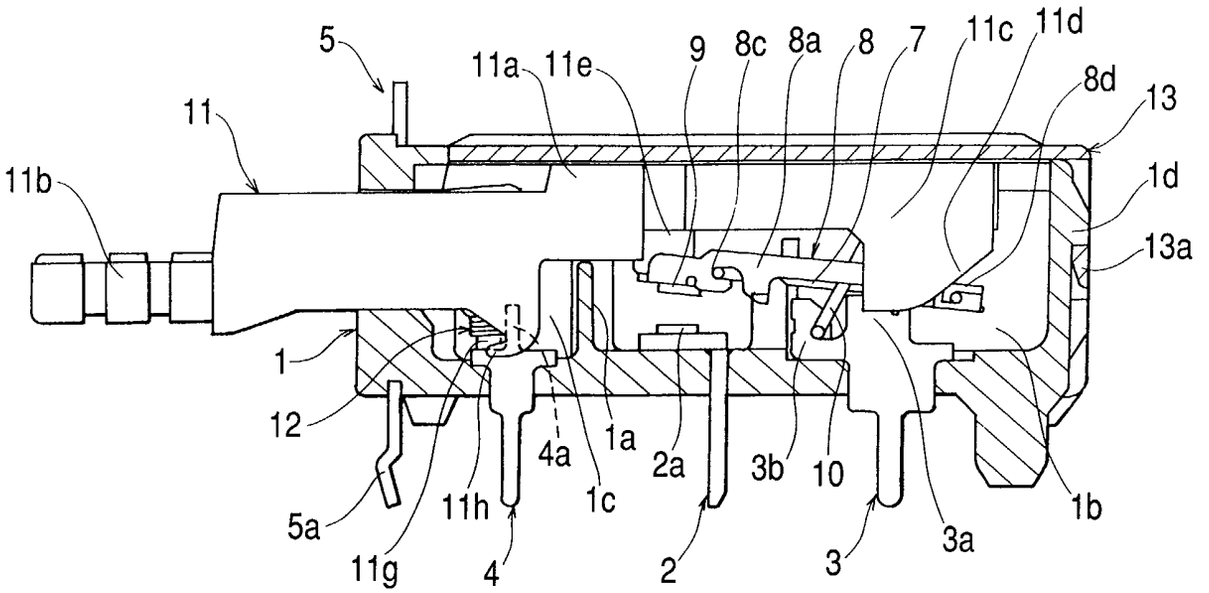
FIG. 3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2a
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3a

FIG. 4

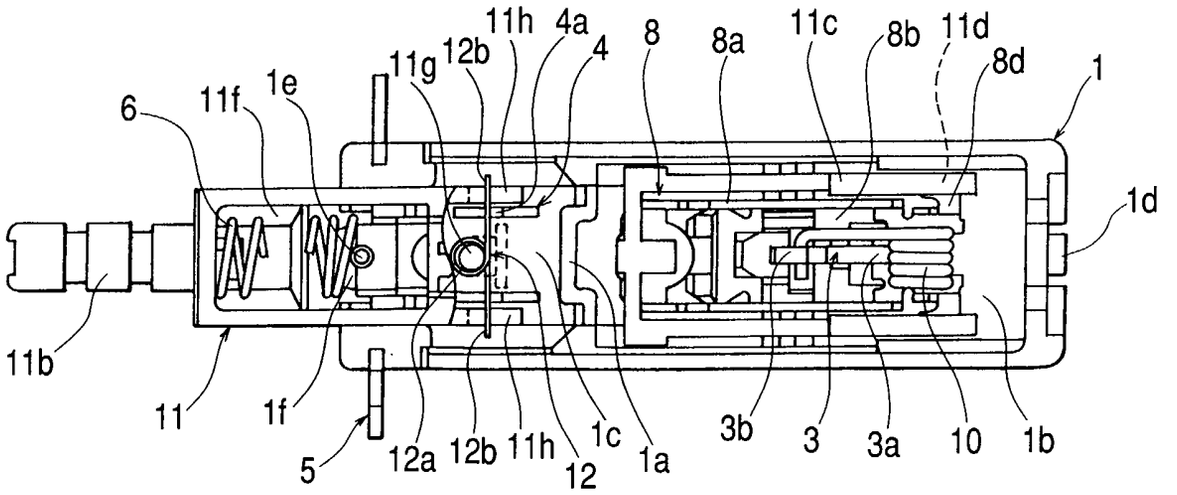
11h
4a
4
8
8a
11c
8b
11d
8d
1
11g
12b
6
11f
1e
1d
11b
11
1f
5
12a
12b
11h
12
1c
1a
3b
3
3a
10
1b

FIG. 5

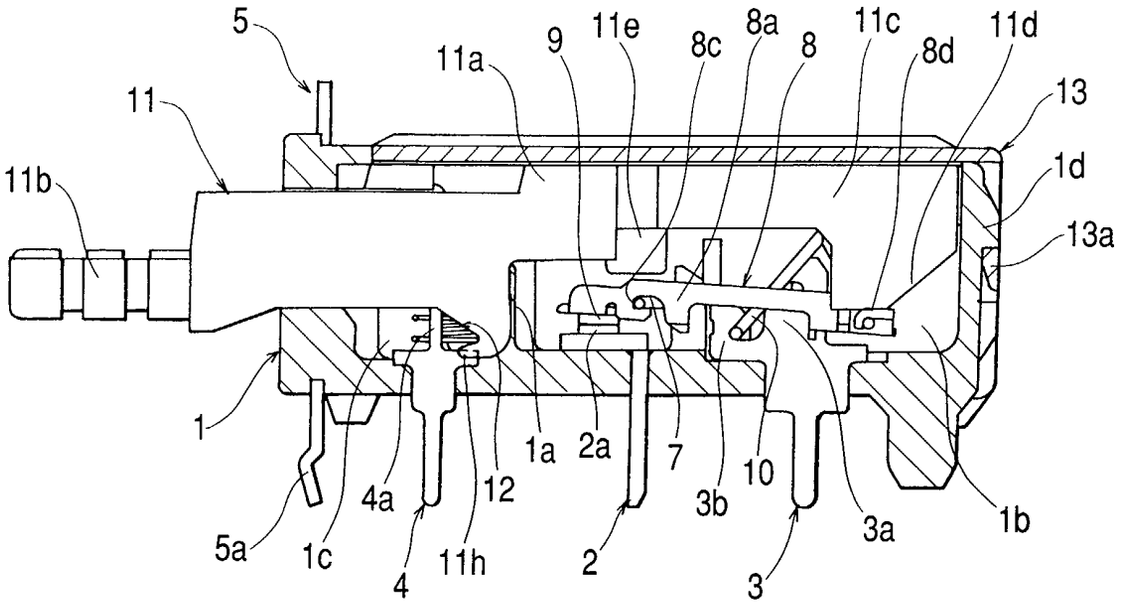
5
11
11b
11a
9
11e
8c
8a
8
11c
8d
11d
13
1d
13a
1
1a
2a
7
10
3b
12
4a
5a
1c
4
11h
2
3
3a
1b

FIG. 6

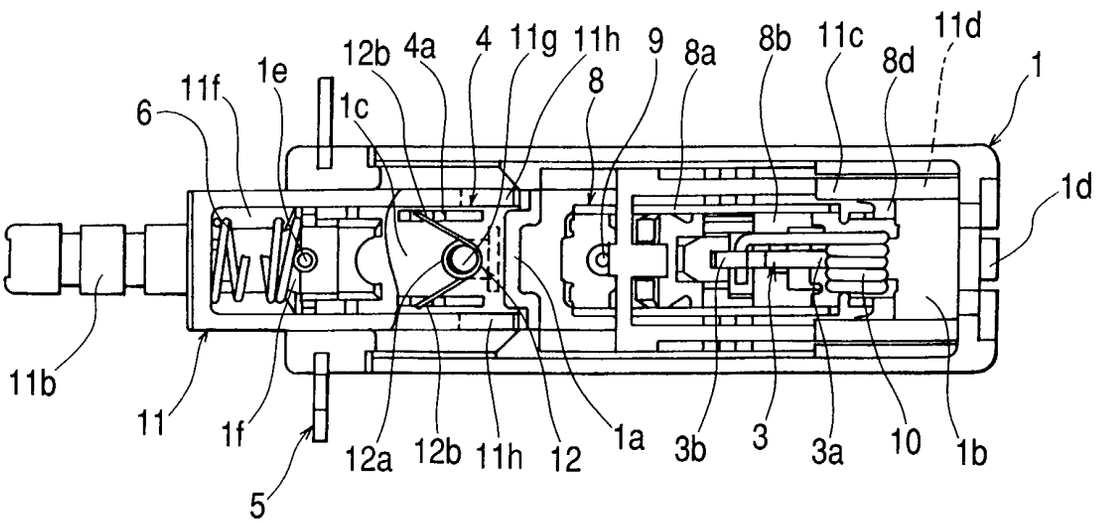
6
11f
1e
12b
4a
4
11g
11h
9
8a
8b
11c
8d
11d
1
1c
8
1d
11b
11
1f
5
12a
12b
11h
12
1a
3b
3
3a
10
1b

FIG. 7