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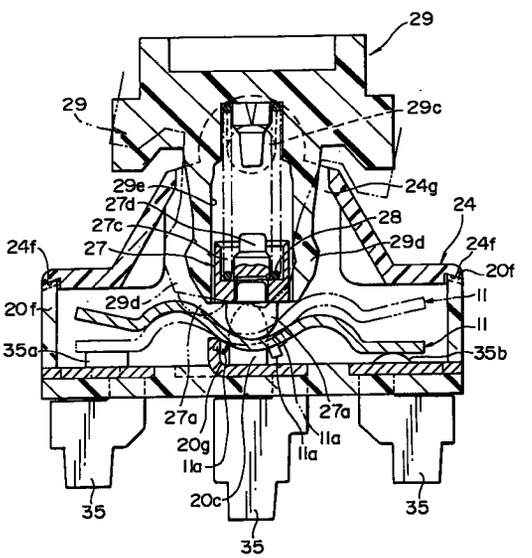
(54) Switch device

(57) A switch device capable of being formed into a sliding type or a sliding type by the interchange of a minimum number of components as a result of increasing the number of common components. The switch device includes common switch structure components which include first and secondary stationary contacts accommodated in a base, a first movable contact member rockably disposed to contact the first stationary contacts, a second movable contact member 12 capable of contacting the second stationary contacts, and an actuating member elastically held by the first and second movable contact members. A seesaw switch structure selection components and a sliding switch structure selection components are selectively mountable to the base. The seesaw switch structure selection components include a first cover case mountable to the base and a lever rotatably mounted to the first cover case. The sliding switch structure selection components include a second case mountable to the base and a sliding member 42 slidably inserted into the second cover case.

FIG. 3



EP 0 794 544 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a switch device performing switching operations by a seesaw type movable contact.

2. Description of the Related Art

The so-called seesaw type switch device is one in which a movable contact rocks upon a fulcrum as center to contact with and separate from a stationary contact. Such a switch device is used extensively as, for example, a power supply switch for turning on and off the power supply of a motor or the like, since it allows the flow of a large amount of current.

A convention example of such a switch device is described, with reference to Figs. 7 and 8.

Fig. 7 is an exploded, perspective view of the conventional switch device, while Fig. 8 is a view illustrating the operating state thereof.

As shown in Fig. 7, shallow, cylindrical base 1 with a bottom has opposing outer side faces which extend upward to form side plates 1a and 1b. A lever 2 is rotatably mounted to the side plates 1a and 1b. The lever 2 is provided with a rotating shaft 3 disposed substantially horizontally at the opposing side faces thereof, and a knob 4 formed at the top face thereof. The lower portion of the lever 2 is forked into two branches, with mounting holes 2a and 2b formed in the bottom faces of the two branched portions, respectively. Actuating rods 6a and 6b are insertably and removably elastically retained in the mounting holes 2a and 2b by coil springs 5a and 5b, respectively.

First stationary contacts 7a and 7b and second stationary contacts 8a and 8b are formed side by side at the bottom of the base 1. Supporting plates 9a and 9b are fixed, respectively, to portions located at substantially the centers of the inside bottom faces of the base 1 between the first stationary contacts 7a and 7b and between the second stationary contacts 8a and 8b. First and second movable contact members 10a and 10b are disposed on the supporting plates 9a and 9b at substantially the centers of the members 10a and 10b. The members 10a and 10b are formed by bending metallic plates such that their side faces are substantially M-shaped. Accordingly, two sets of switch portions are formed, one set being formed by the first stationary contacts 7a and 7b and the first movable contact member 10a, and the other set being formed by the second stationary contacts 8a and 8b and the second movable contact member 10b.

In the conventional switch device with the above-described construction, when the lever 2 whose knob 4 is not operated is in the neutral position, one end of the first movable contact member 10a contacts the first stationary contact 7b, as shown in Fig. 8A. In addition, one end of the second movable contact member 10b contacts the stationary contact 8a. Therefore, both switches are in an off state.

When the knob 4 of the lever 2 in the neutral position is rotationally moved counterclockwise, an actuating rod 6a slides on the first movable contact member 10a toward the stationary contact 7a, while the rod 6a compresses the member 10a. When the actuating rod 6a moves over the supporting plate 9a, the first movable contact member 10a rocks clockwise upon the supporting plate 9a as center. As shown in Fig 8B, this causes the other end of the first movable contact member 10a to contact the first stationary contact 7a, and the end which was in contact with the stationary contact 7b to move away therefrom. Consequently, a switching operation is performed by this switch portion. Rotational movement of the lever 2 also causes the actuating rod 6b to slide on the second movable contact member 10b toward the stationary contact 8a. This, however, does not cause the second movable contact member 10b to rock, since the second movable 10b is already in contact with the second stationary contact 8a, so that a switching operation is not performed by this switch portion.

Counterclockwise rotational movement of the lever 2 in the position of Fig. 8A, on the other hand, causes a switching operation to be performed by the other switch portion which has not performed a switching operation, with no switching operations performed by the switch portion which has performed a switching operation.

The above-described conventional switch device performs switching operations by rotational movement of the lever 2 with the knob 4 being tilted, which causes the first movable contact member 10a to rock and come into contact with or separate from the first stationary contacts 7a or 7b, or the second movable contact 10b to rock and come into contact with or separate from the second stationary contacts 8a or 8b.

In other words, the above-described conventional switch device, which is used in various fields, is of the seesaw type which clicks without locking. In such a switch device, when the tilting force of the knob 4 is removed, the first and second movable contact members 10a and 10b cause the actuating rods 6a and 6b, that is the knob 4, to return back to the neutral position.

There is a demand for a cheap switch device suitable for general purpose use. The demanded general purpose switch device is required to be convertible to a sliding switch device which performs change-over operations by horizontal movement of the knob 4, without any changes in the dimensions and form of the device.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a switch device which can be converted from a seesaw type to a sliding type or vice versa by the interchange of a minimum number of components as a

result of increasing the number of common components.

To this end, according to the present invention, there is provided a switch device comprising: common switch structure components including a base, a first stationary contact and a second stationary contact disposed side by side on the base, a first movable contact member rockably disposed above the first stationary contact so as to be capable of contacting the first stationary contact, a second movable contact member rockably disposed above the second stationary contact so as to be capable of contacting the second stationary contact, an elastically held actuating member with one end opposingly contacting the first and second movable contact members to allow the first movable contact or the second movable contact to selectively contact the associated stationary contact, and an elastic member for causing the actuating member to press-contact the top faces of the movable contact members; seesaw switch structure selection components including a seesaw switch cover case mountable to the base, and a key top rotatably mounted to the cover and capable of insertably and removably accommodating the actuating member from the bottom thereof by means of the elastic member; and sliding structure selection components including a slide switch cover case which has an opening at its top portion and is mountable to the base, and a sliding member slidably accommodated in the cover case and the base, capable of insertably and removably accommodating the actuating member from the bottom thereof by means of the elastic member, and having a protrusion at the top portion so as to protrude from the opening of the cover case, wherein the seesaw switch structure selection components or the sliding switch structure selection components are selectively mounted to the base being one of the common switch structure components.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a switch device in an embodiment in accordance with the present invention.

Fig. 2 is an exploded, perspective view of the switch device of Fig. 1.

Fig. 3 is a longitudinal section of the switch device of Fig. 1.

Fig. 4 is a perspective view of a sliding switch device in an embodiment in accordance with the present invention.

Fig. 5 is an exploded, perspective view of the switch device of Fig. 4.

Fig. 6 is a longitudinal side elevational view of the switch device of Fig. 4.

Fig. 7 is an exploded, perspective view of a conventional switch device.

Fig. 8 is a view illustrating the operation of the conventional switch device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A description will now be given of a preferred embodiment of the present invention, with reference to Figs. 1 to 6. Components which are essentially the same as those of the conventional switch device will be given the same reference numerals, and descriptions thereof which overlap will not be given below.

Fig. 1 is a perspective view of a seesaw type switch device in an embodiment in accordance with the present invention. Fig. 2 is an exploded, perspective view of the switch device of Fig. 1. Fig. 3 is a longitudinal section of the switch device of Fig. 1. Fig. 4 is a perspective view of a sliding switch device in the embodiment in accordance with the present invention. Fig. 5 is an exploded, perspective view of the switch device of Fig. 4. Fig. 6 is a longitudinal side elevational view of the switch device of Fig. 4.

As shown in Figs. 1 to 3, in the switch device of the present embodiment, a partition wall 20a, formed within and integrally with a base 20, divides the space formed between side plates 1a and 1b into two in order to form accommodating portions 20b for separately accommodating first and second movable contact members 11 and 12, respectively.

Each accommodating portion 20b is provided with a center contact supporting plate 20g, first stationary contacts 35a and 35b, a positioning protrusion 20c having a pointed upper portion and disposed on the opposing side face, and recesses 20d on both sides of the positioning protrusion 20c. The center contact supporting plates 20g support the first and second movable contact members 11 and 12, respectively, at about the center portions thereof. Rocking of the first movable contact member 11 causes one end to come into contact with the first stationary contact 35a or the other end to contact the first stationary contact 35b. Although not shown, the other accommodating portion 20b, as with the conventional switch device, has a center contact supporting plate disposed in the reverse direction, a positioning protrusion 20c, recesses 20d on both sides of the positioning protrusion 20c, and second stationary contacts.

The base 20 has integrally formed therewith engaging protrusions 20e protruding from each side plate, and a positioning protrusion 20f protruding upward from each side plate.

A seesaw switch cover case (hereafter referred to as "the first cover case") 24 is mounted onto the top of the base 20 so as to cover the accommodating portions 20b of the base 20.

The first cover case 24 includes a square box shaped case body 24a with an open bottom, supporting plates 24b extending upwardly from a pair of opposite side faces of the case body 24a, a bearing hole 24c formed in each supporting plate 24b, a tapered guide face 24d extending from each bearing hole 24c to the upper edge of each supporting plate 24b, retainer holes 24e formed in the lower portion of each side face of the

case body 24a, a positioning recess 24f formed in each bottom opening end of the case body 24a and engaging the associated positioning protrusion 20f of the base 20, and an opening 24g formed in the top face of the case body 24a so as to be disposed between the supporting plates 24b. Engagement of the protrusions 20e of the base 20 and their respective retainer holes 24e allows the first cover case 24 to be fitted and secured to the case 20.

An actuating member 27, retained by the lever 29, is rockably inserted into the opening 24g in the case body 24a. Contact ends 27a of the actuating member 27 cause the first and second movable contact members to rock and contact or separate from the stationary contacts.

Contact protrusions 27a and 27b, which contact respectively the first and second movable contact members 11 and 12, protrude from portions near both edges of the bottom end of the sliding member 27. A recess 27c is formed in the upper face of the sliding member 27 in order to insert therein the bottom end of a coil spring 28 which presses the sliding member 27 downward. A protrusion 27d protrudes from the bottom surface of the recess 27 in order to retain the coil spring 28.

The lever 29 includes a knob mounting portion 29a for mounting a knob (not shown) to the top of the lever 29, engaging protrusions 29b formed on a side face of the knob mounting position 29a to engage their respective engaging holes (not shown) of the knob, a supporting shaft 29c which is inserted into the bearing holes 24c of the supporting plates 24b of the first cover case 24, a swinging portion 29d which extends downward from the knob mounting portion 29a, and a sliding member accommodating portion 29e for freely inserting therein and removing therefrom the sliding member 27 from the bottom of the swinging portion 29d by means of the coil spring 28.

The top end of the coil spring 28 contacts and is loaded against the inner bottom face of the sliding member accommodating portion 29e of the lever 29. Therefore, the contact protrusions 27a and 27b of the sliding member 27 are biased downward at all times by the spring force of the coil spring 28 and thereby pushed against the top faces of the first and second movable contact members 11 and 12.

The first movable contact member 11 (the second movable contact member 12) has the same form as the above-described conventional movable contact member, except that the first movable contact member 11 (the second movable contact member 12) has bent portions 11a (12a), respectively, and cutout portion 11b (12b). The bent portions 11a (12a) are formed by cutting both center side edges of the movable contact members 11 (the movable contact member 12) such that the cut portions oppose each other. When the first movable contact member 11 (the second movable contact member 12) is accommodated in the accommodating portion 20b (accommodating portion 20b) of the base 20, the positioning protrusion 20c (positioning protrusion 20c) is fitted into the cutout 11b (cutout 12b), and the bent portions 11a (bent portions 12a) are inserted into the recesses 20d. When, for example, the first movable contact member 11 (the second movable contact member 12) rocks, the flat faces (which are not the cut faces) of the bent portions 11a (bent portions 12a) slidably contact the side faces of the positioning protrusion 20c (positioning protrusion 20c), whereby the first movable contact member 11 (the second movable contact member 12) rocks smoothly.

Reference numerals 35 denote leader terminals connected to the center contact supporting plate 20g, the first stationary contact 35a, the first stationary contact 35b, and the second stationary contacts, respectively.

The operation of the seesaw switch device with the above-described construction, which is exactly the same as that of the above-described conventional switch device, will be briefly described below mainly with reference to the operation of the first movable contact member 11.

When the switch device is not operated as shown in Fig. 3, the lever 29, which is in the neutral position, is in the off position. Rotationally moving the lever 29 in the neutral position clockwise causes the contact end 27a of the sliding member 27 to slide on the first movable contact member 11 (illustrated by a solid line in Fig. 3) toward the first stationary contact 35a, while the contact end 27a compresses the member 11. When the contact end 27a of the sliding member 27 slides over the center contact supporting plate 20g, the first movable contact member 11 rocks counterclockwise upon the center contact supporting plate 20g as fulcrum and center, causing the other end of the first movable contact member 11 to contact the first stationary contact 35a and the end in contact with the stationary contact 35b to separate therefrom. Accordingly, the first movable contact member 11 assumes the position indicated by alternate long and short dash lines, as a result of which switching is performed by this switch portion.

Movement of the sliding member 27 also causes the contact end 27b to move on the movable contact member 12 toward the second stationary contact 8a, which, however, does not cause the member 12 to rock, since the member 12 is already in contact with the second stationary contact 8a, as with the conventional example. Therefore, a switching operation is not performed by this switch portion.

When operation of the lever 29 is stopped, the lever 29 returns back to the neutral position of Fig. 3 by the spring force of the coil spring 28, as with the conventional example.

A description will now be given of a sliding switch device which is formed by modifying the construction of the seesaw type switch device.

As shown in Figs. 4 to 6, the sliding switch device is composed of the same components as the seesaw type switch device, except that the sliding switch device has a slide switch cover case (hereinafter referred to as "the

second cover case") 41 instead of the first cover case 24, and a sliding member 42 instead of the lever 29.

The second cover case 41 is a box-shaped case with an open bottom, with a slit-shaped opening 41a formed in the top portion thereof and retainer holes 41b formed in a pair of side faces thereof. The second cover case 41 also has recesses 41c in the bottom ends thereof for fitting therein the positioning protrusions 20f of the base 20. Accordingly, the second cover case 41 is positioned onto and secured to the base 20 by engagement of the protrusions 20e of the base 20 and the retaining holes 41b of the second cover case 41.

The sliding member 42 includes a base 42a having a shorter longitudinal length than that of the second cover case 41, a knob 42b raised from substantially the center of the top face of the base 42a, sliding protrusions 42c protruding from the four corners of the upper face of the base 42a and slidably contacting the inside face of the second cover case 41, sliding protrusions 42d protruding vertically from the side faces of the base 42a and slidably contacting the inside faces of the second cover case 41, a mounting hole 42e (Fig. 6) formed in substantially the center of the bottom of the base 42a for vertically inserting and retaining therein the sliding member 27, a wall 42f formed in the base 42a, and guide protrusions 42g which are formed near both lower end face edges of the wall 42f and slide on the top end face of the partition wall 20a of the base 20.

When the sliding member 42 is accommodated in the base 20 and the second cover case 41, the sliding protrusions 42c of the sliding member 42 slidably contact the inside face of the second cover case 41, the sliding protrusions 42d slidably contact both inside side faces of the second cover case 41, and the guide protrusions 42g slidably contact the top end face of the partition wall 20a of the base 20. Therefore, the sliding member 42 is slidably guided horizontally in Fig. 6.

The actuating member 27 is insertably and removably accommodated in the mounting hole 42e of the sliding member 42 by means of the coil spring 28. The spring force of the coil spring 28 biases the contact protrusions 27a and 27b of the actuating member 27 at all times to push the contact protrusions 27a and 27b against the top faces of the first and second movable contact members 11 and 12, respectively.

As mentioned above, the components other than the second case 41 and the sliding member 42 in Fig. 5, that is the base 20, the first and second movable contact members 11 and 12, the actuating member 27, and the coil spring 28 are essentially the same as their corresponding components of the switch device illustrated in Figs. 1 to 3. Therefore, they will not be described in detail below.

A description will now be given of the operation of the sliding switch device, with reference to Fig. 6. The operation of the first and second movable contact members 11 and 12 is essentially the same as that of the conventional sliding switch device and the switch device shown in Figs. 1 to 3. Therefore, the description will concentrate on the operation of the sliding member 42.

The knob 42b of the sliding member 42, protruding from the opening 41a in the second cover case 41, is at the neutral position in Fig. 6.

Moving the knob 42b of the sliding member 42 toward, for example, the left in Fig. 6 causes the above-described slidably guided base 42a to slide toward the left, as well as the contact protrusion 27a (27b) of the actuating member to slide on the top face of the first movable contact member 11 (second movable contact member 12). Here, the contact protrusion 27a (27b) protrudes from the bottom of the base 42a, and the actuating member elastically contacts the top face of the first movable contact member 11, as indicated by the solid line of Fig. 6. When the contact end 27a moves over the center contact supporting plate 20g, the first movable contact member 11 rocks counterclockwise upon the center contact supporting plate 20g as fulcrum. As with the above-described seesaw type switch device, this causes the other end of the first movable contact member 11 to contact the first stationary contact 35a and the end in contact with the stationary contact 7b to separate therefrom, whereby a switching operation is performed by this switch portion. Movement of the base 42a of the sliding member 42 causes the contact end 27b of the actuating member 27 to rock on the second movable contact member 12 toward the second stationary contact. This, however, does not cause the second movable contact member 12 to slide, since it is already in contact with the second stationary contact, so that switching operation is not performed, as has been the case with the sliding switch device.

As with the conventional switching device, when operation of the knob 42b is stopped, the sliding member 42 returns back to the neutral position of Fig. 6 by the spring force of the coil spring 28.

Moving the knob 42b counterclockwise, on the contrary, causes a switching operation to be performed by the switch portion which has not performed a switching operation, with no switching operations performed by the above-described switch portion which has performed a switching operation.

In the seesaw type switch device and the sliding switch device in the present embodiment, common components are used for the base 20, the first and second movable contact members 11 and 12, the actuating member 27, and the coil spring 28. Therefore, the seesaw type switch device illustrated in Figs. 1 to 3 can be constructed simply by obtaining the selection components for constructing the seesaw switch device, namely the first cover case 24 and the lever 29, along with the common components of the switch types.

The sliding switch device illustrated in Figs. 4 to 6 can be constructed simply by obtaining the selection components for constructing the sliding switch, namely the second cover case 41 and the sliding member 42, along with the common components of the switch types.

Consequently, it is possible to mass-produce common components, and to make only slight changes in

the assembly process for producing seesaw and sliding switch devices, as a result of which costs are considerably reduced.

According to the present invention, the seesaw switch structure including a key top rotatably mounted to the first cover case, and the sliding switch structure including a sliding member slidably inserted into the second cover case can be selectively mounted to the base. Therefore, it is possible to produce seesaw or sliding switch devices merely by interchanging the two structures, without changing the volume of the switch device as a whole, thereby making the switch device suitable for general purpose use and very cheap.

Claims

1. A switch device comprising:

common switch structure components including a base, a first stationary contact and a second stationary contact disposed side by side on said base, a first movable contact member rockably disposed above said first stationary contact so as to be capable of contacting said first stationary contact, a second movable contact member rockably disposed above said second stationary contact so as to be capable of contacting said second stationary contact, an elastically held actuating member with one end opposingly contacting said first and second movable contact members to allow said first movable contact or said second movable contact to selectively contact said associated stationary contact, and an elastic member for causing said actuating member to press-contact the top faces of said movable contact members;

seesaw switch structure selection components including a seesaw switch cover case mountable to said base, and a key top rotatably mounted to said cover and capable of insertably and removably accommodating said actuating member from the bottom thereof by means of said elastic member; and

sliding structure selection components including a slide switch cover case which has an opening at its top portion and is mountable to said base, and a sliding member slidably accommodated in said cover case and said base, capable of insertably and removably accommodating said actuating member from the bottom thereof by means of said elastic member, and having a protrusion at the top portion so as to protrude from the opening of said cover case,

wherein said seesaw switch structure selection components or said sliding switch structure selection components are selectively mounted to said base being one of said common switch structure components.

FIG. 1

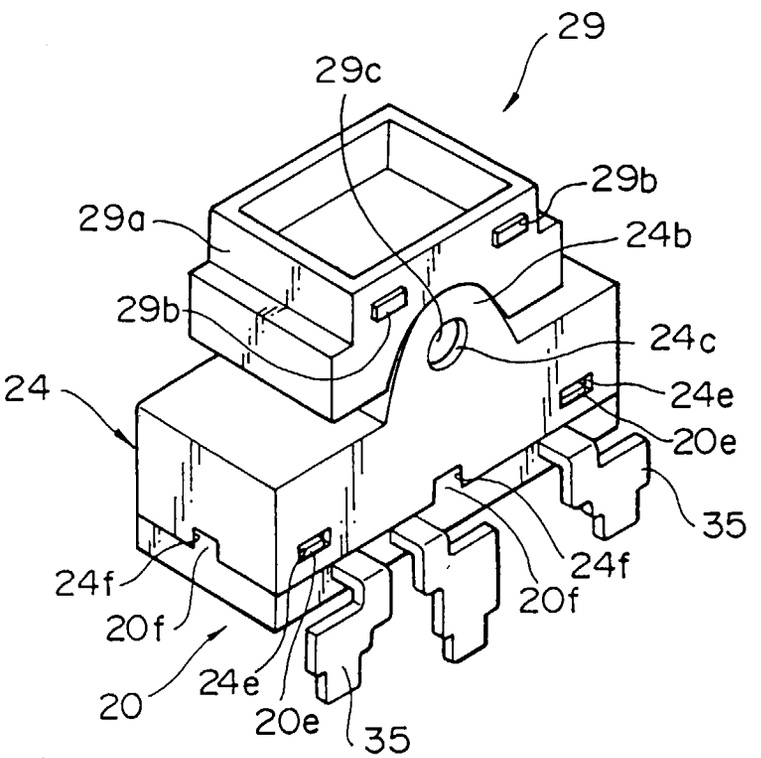

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FIG. 2

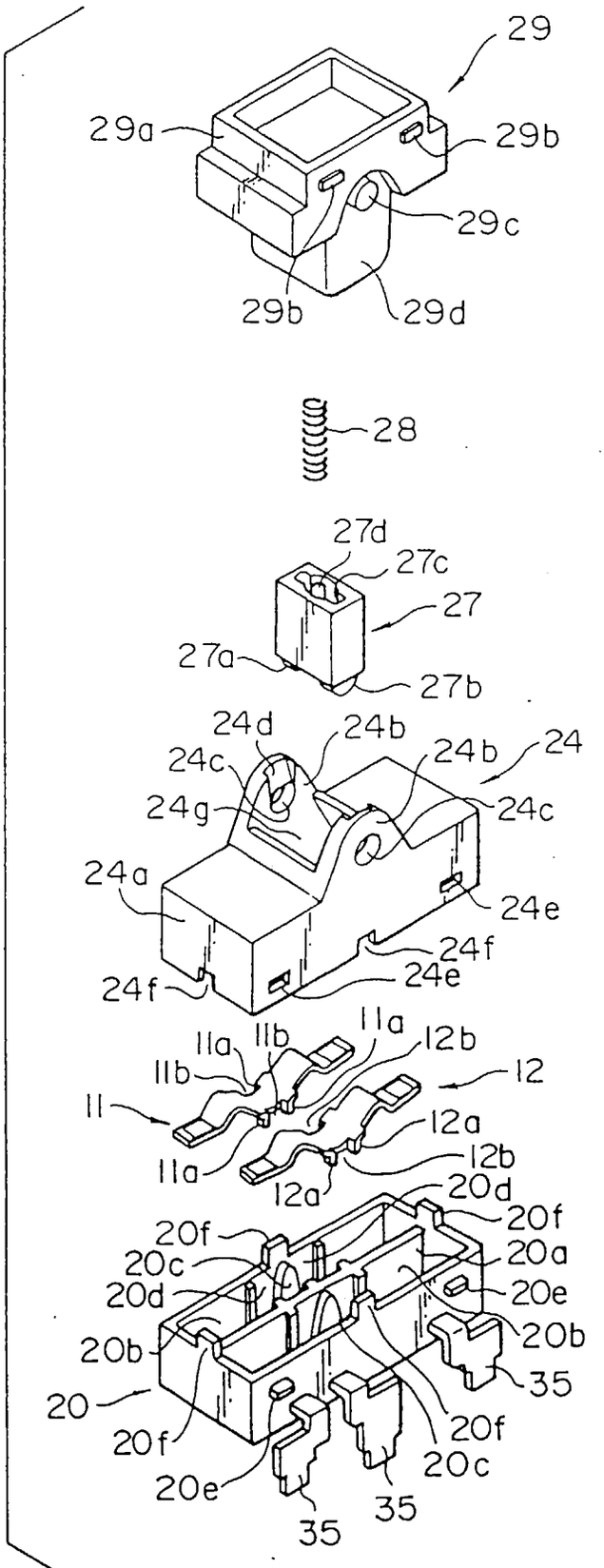
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FIG. 3

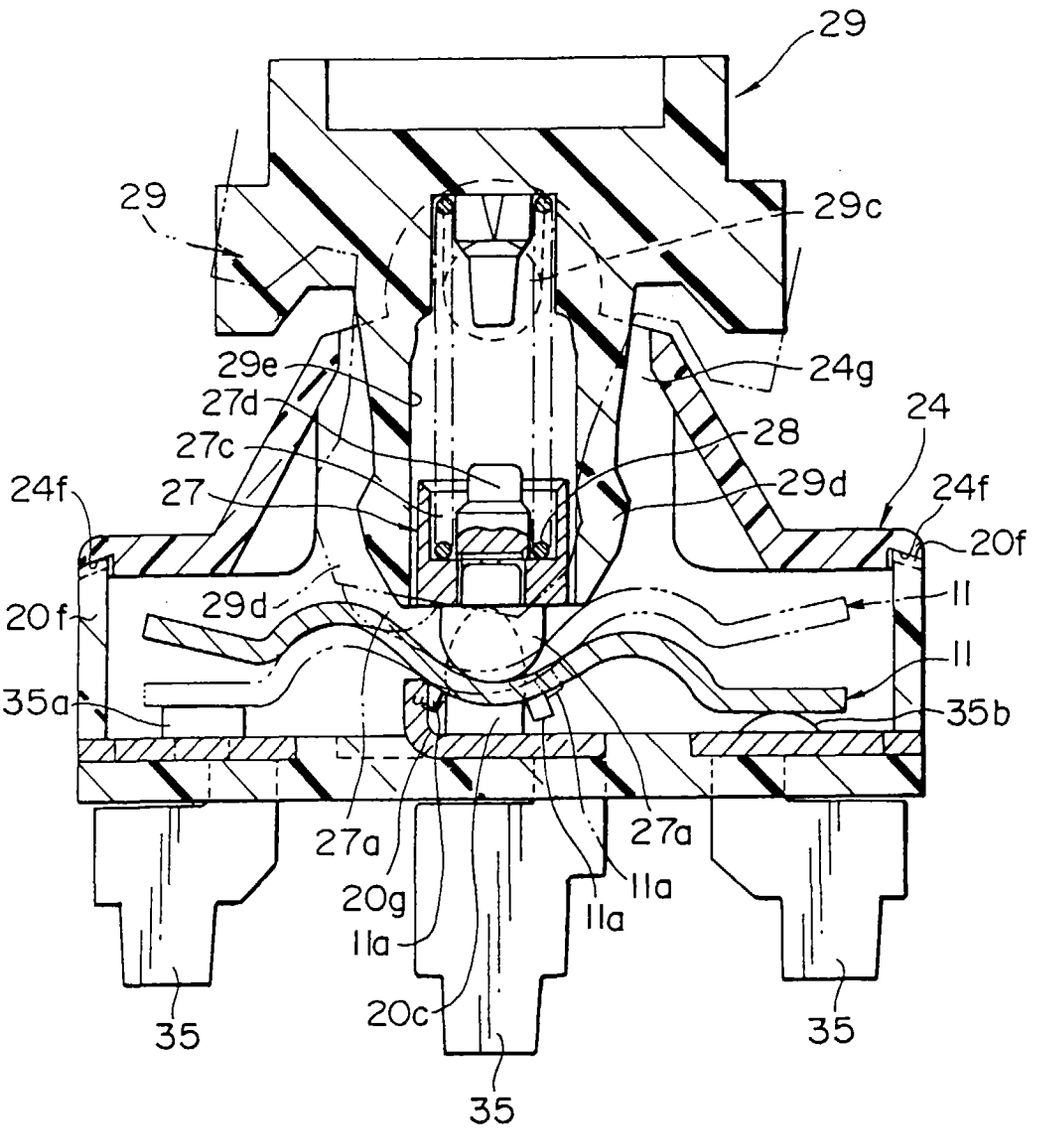
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FIG. 4

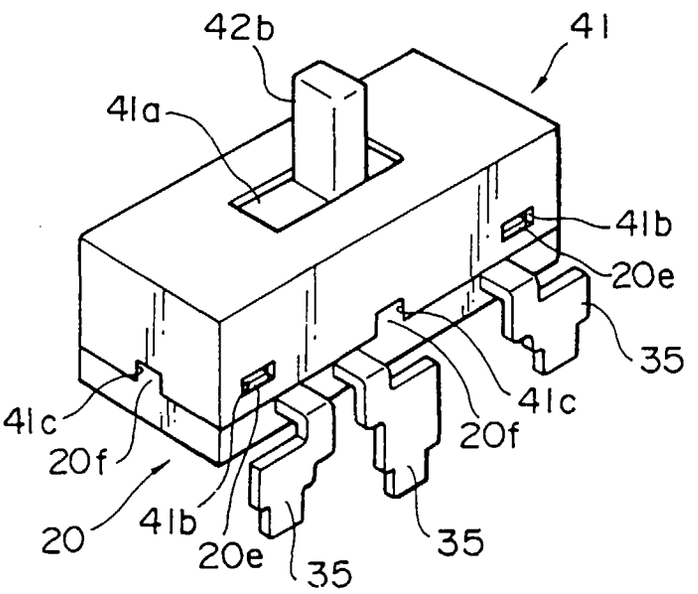

FIG. 5

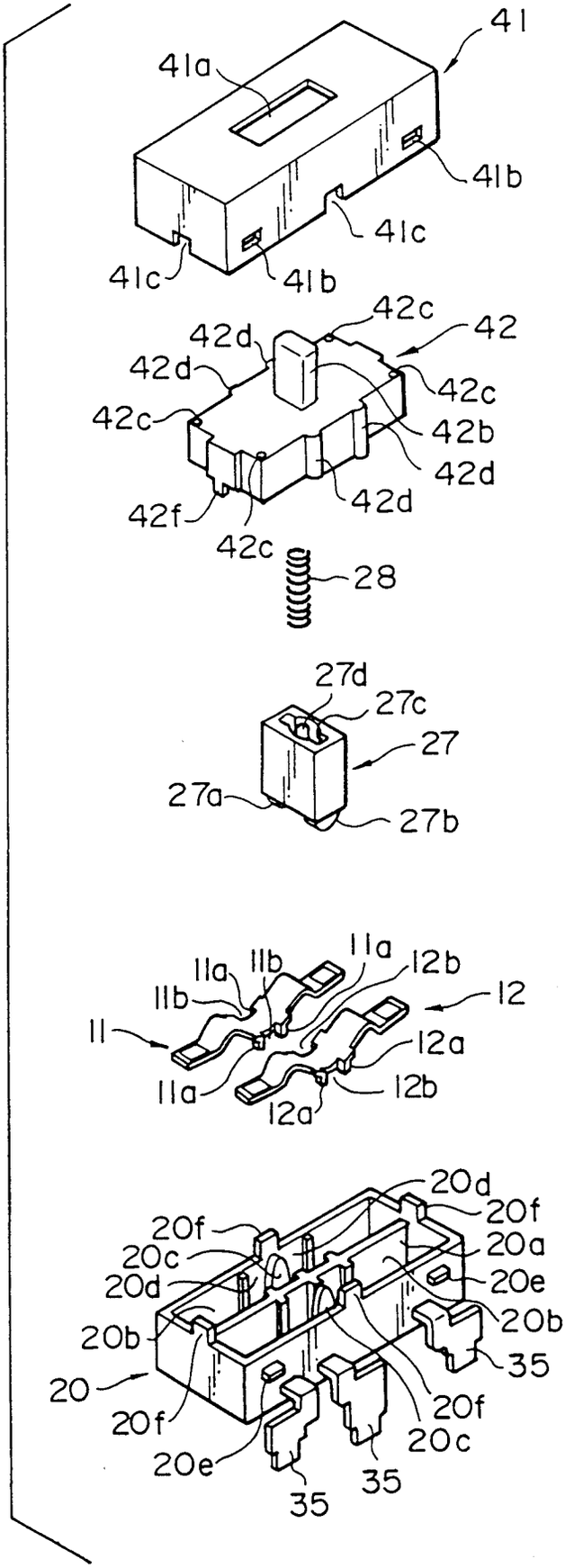
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FIG. 6

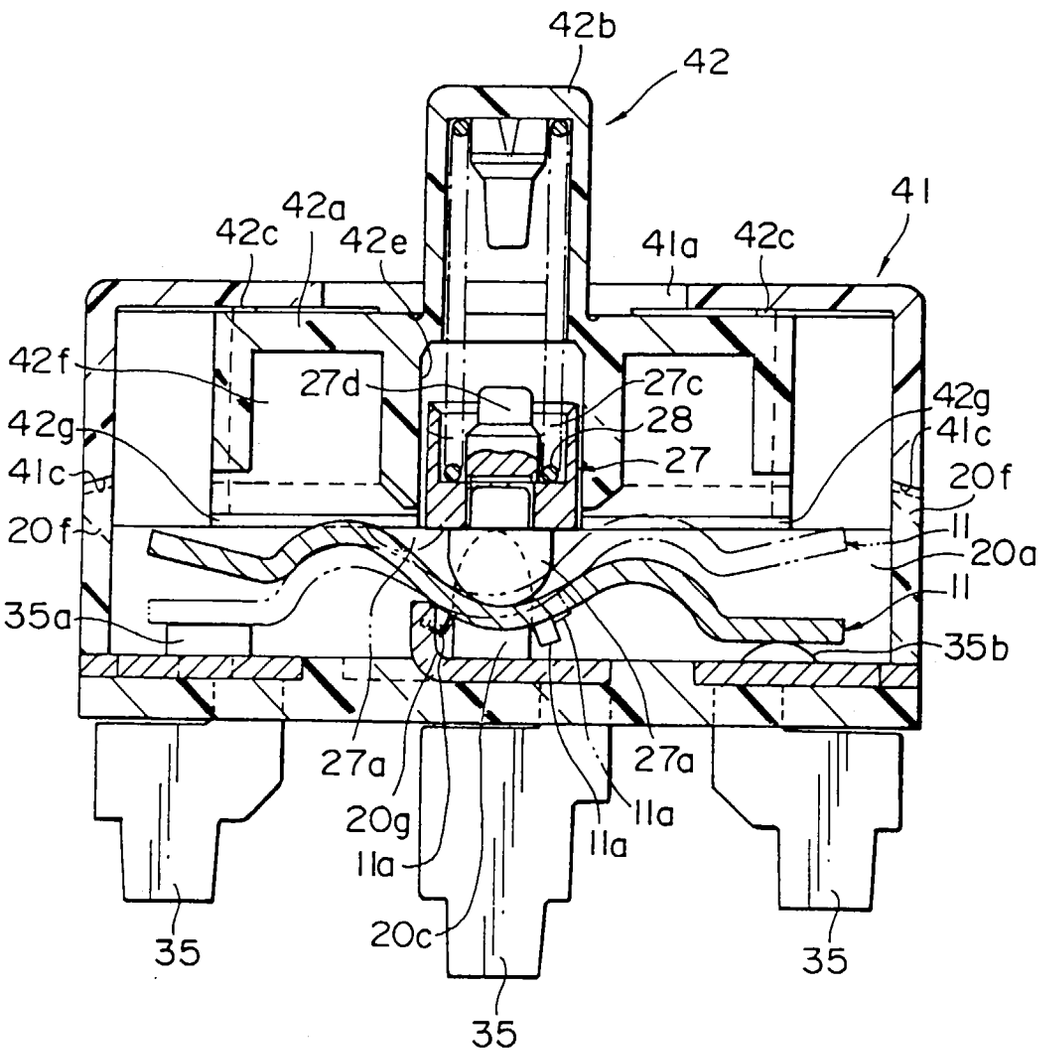
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FIG. 7
PRIOR ART

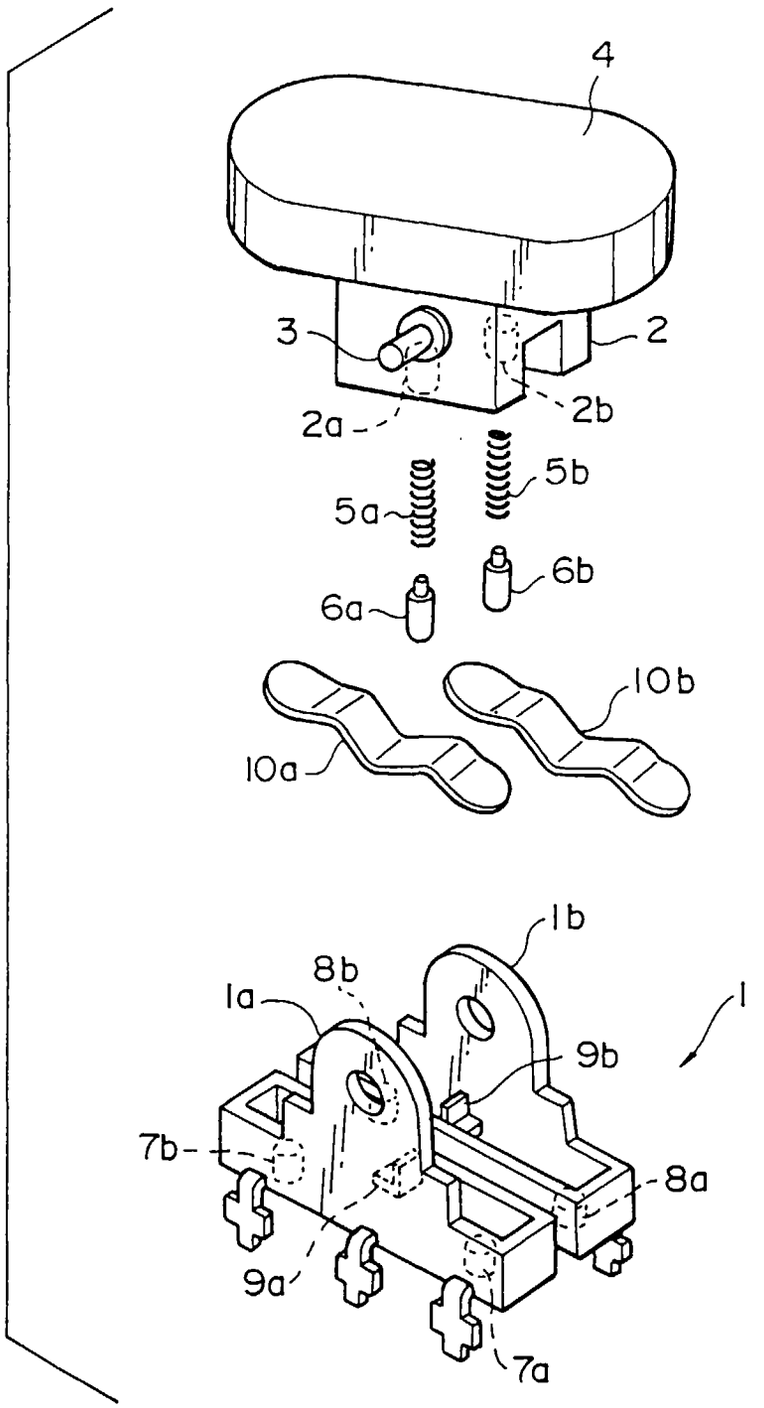

FIG. 8A
PRIOR ART

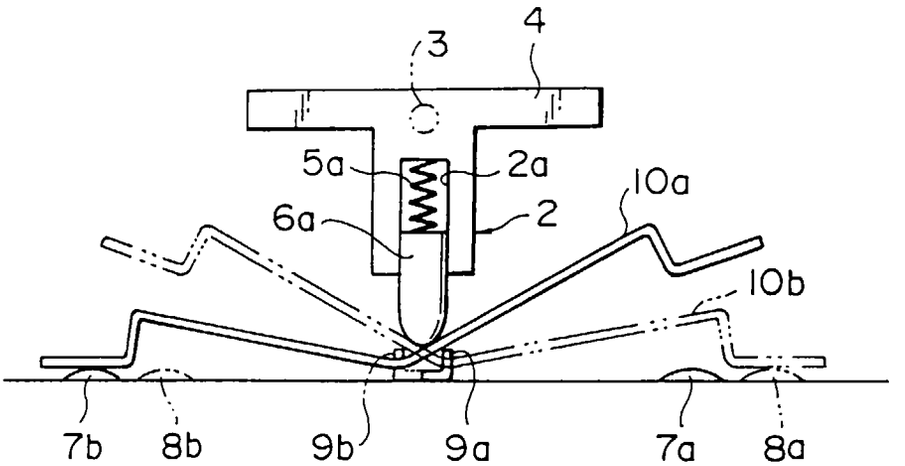

FIG. 8B
PRIOR ART