(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 049 121 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.11.2000 Bulletin 2000/44

(51) Int. Cl.[7]: **H01H 15/10**

(21) Application number: **00303096.2**

(22) Date of filing: **12.04.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **27.04.1999 JP 12046699**

(71) Applicant:
ALPS ELECTRIC CO., LTD.
Ota-ku Tokyo 145 (JP)

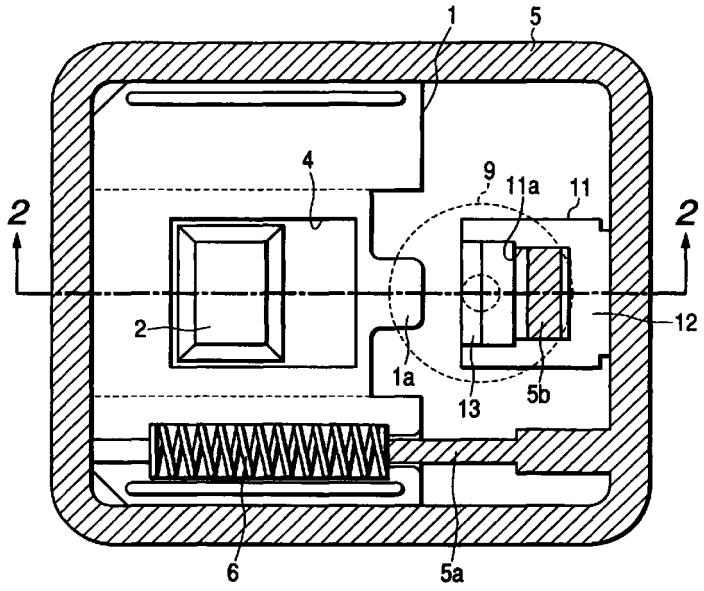
(72) Inventor:
Shimooka, Hidehito,
c/o Alps Electric Co., Ltd.
Ota-ku, Tokyo 145 (JP)

(74) Representative:
Kensett, John Hinton
Saunders & Dolleymore,
9 Rickmansworth Road
Watford, Hertfordshire WD18 0JU (GB)

(54) Sliding operation type switch apparatus

(57) A space is defined between the case (5) and the flexible board (8), and each of the moving member (1) which can be slidably moved and the driving member (11) which can be turned is stored in the space part. The moving member is resiliently biased toward its initial position by the coil spring (6) and then the tact spring (9) is present between the fixed contact point arranged at the flexible board and the driving member. Then, the sliding motion of the moving member is converted to a downward motion under turning operation of the driving means, the tact spring is depressed with the driving force, thereby the tact spring is depressed and turned oppositely to perform the changing-over between the switched-on state and the switched-off state of the switch just after the click touch is generated.

FIG. 1



EP 1 049 121 A2

Description

[0001] This invention relates to a relative thin-type sliding operation type switch apparatus in which a switched-off state is changed over to a switched-on state (or from the switched-on state to the switched-off state) when a click touch is produced by sliding the operation knob, and when the operating force is removed, the operating knob is automatically returned back to its initial position.

[0002] As this type of sliding operation type switch apparatus, it is well known in the art to provide a switch comprised of a moving member (a sliding member) having an operating knob and a sliding element fixed to it; a case for storing this moving member in such way that the moving member can be slidably moved; a printed circuit board having some contact patterns moved to or away from the sliding member; and a coil spring for automatically returning the moving member to its initial position, and then a click mechanism is constituted by a protrusion arranged at a side surface of the moving member and another protrusion arranged at an inner side surface of the case.

[0003] In the case of such a prior art as described above, when the operating knob exposed out of an opening of the case is operated and the moving member is slid by a predetermined amount while compressing the coil spring, the protrusion of the moving member is engaged with or disengaged from the protrusion of the case to generate a click touch, and immediately after the generation of the click touch, an electrical connected state of the sliding member in respect to the contact patterns is changed to cause the switch-on or switch-off state to be changed over. Accordingly, an operator can acknowledge positively a timing in which an off-state is changed over to an on-state (or from on - state to off - state) through a click touch transferred to a hand or a finger. In addition, when an operating force applied to the operating knob of the moving member slid is released, the moving member is automatically returned back to its initial position by a resilient force of the coil spring compressed up to now, so that the switch is returned back automatically to its off-state (or on-state).

[0004] In the case of the aforesaid prior art sliding operation type switch, the click mechanism is operated such that the protrusion of the moving member is engaged with or disengaged from the protrusion of the case, wherein the engaged relation between the two members is utilized, so that considering a disturbance in size
(tolerance) generated at the forming stage or assembling stage shows that it is difficult to define strictly a timing where the click touch is produced. However, the sliding operation type switch in which the timing where the click touch is generated and the timing where the switched-on or switched-off state is changed over are substantially displaced provides a poor convenience in use for an operator. In addition, since the
operator is apt to finish the sliding operation at the time when the click touch is generated, in particular if an operating stroke of the moving member is low, a degree of influence caused by the dispersion in view of its size becomes relatively large and the click touch is generated slightly fast, the operator misunderstands that the switch is changed over irrespective of the fact that the switched-on or switched-off change-over state of the switch is not carried out, and erroneously operates the switch. Such a disadvantage as described above further provides a restriction that an operating stroke of the moving member can not be set to a too small value.

[0005] The present invention is operated such that as the moving member is slid by a predetermined amount, a driving member is driven in a direction opposite to its moving direction to depress a tact spring and as this tact spring is reversed, the switched-on or switched-off change-over state of the switch is carried out along with a production of this click touch. Such a sliding operation type switch as described above is operated such that a presence of the driving member causes an operating force for slidably moving the moving member to be changed to a force for depressing and operating the tact spring and then as one member of this tact spring is reversed in operation, a production of the click touch and the changing-over of the switched-on or switched-off state are carried out substantially in a synchronous manner. Accordingly, even if each of the component parts shows a disturbance in size, a timing where the click touch is produced and another timing where the switched-on or switched-off state is carried out can always be substantially coincided to each other, resulting in that any erroneous operation can be prevented to improve a convenience in usage and at the same time a reduction in operating stroke is facilitated and so a degree of freedom in design is expanded.

[0006] In the case of the sliding operation type switch apparatus of the present invention, there are provided a case having an opening; a board integrally formed with this case to define a space section; a moving member having an operating knob exposed out of the opening and stored in the space section in such a way that it can be slidably moved in a predetermined direction substantially in parallel with the board; a recovering means for resiliently biasing the moving member to its initial position; a driving member held in the space section in such a way that it can be moved in a direction intersecting the board (a direction intersecting the predetermined direction); a tact spring arranged between the driving member and the board; a switching section operated by this tact spring, wherein the sliding motion of the moving member is changed by the driving member toward a direction intersecting the board to depress the tact spring and then the switched-on or switched-off state of the switching section is changed over along with a reversing operation of the tact spring.

[0007] The sliding operation type switch apparatus

constituted as described above is operated such that as the operating knob exposed out of the opening of the case is operated to cause the moving member to be slid by a predetermined amount against a resilient force of the recovering means, this moving member drives the driving member in a direction intersecting its moving direction and the driving member pushes the tact spring with the driving force, so that the switched-on state or switched-off state of the switching section can be changed over by the reversed tact spring. That is, the sliding operation type switch apparatus is operated such that the operating force for moving the moving member is changed over to a force for depressing and operating the tact spring through the driving member and at same time a click touch is produced as the reversing operation of the tact spring is carried out and the switched-on or switched-off state at the switching section are changed over. More practically, the click touch is produced at the time when the tact spring is reversed and the switched-on or switched-off state is changed over just after reversing operation. Accordingly, there occurs no possibility that a timing where the click touch is produced and another timing where the switched-on or switched-off state of the switching section is changed over are displaced undesirably.

[0008] In the aforesaid configuration, although it is also possible to slide the driving member in an upward or downward direction crossing at a right angle with the board, it is preferable that the driving member is operated to turn and the tact spring is depressed by it. In this case, if the driving member is provided with a fulcrum point acting as a center of turning operation and an acting portion positioned more near to the moving member than that of fulcrum point, wherein the moving member is engaged with the acting portion when the moving member is slid and moved, the driving member is rotationally driven around the fulcrum point, the driving member may be operated smoothly and positively by the moving member during its sliding motion.

[0009] In addition, with the aforesaid configuration, if the driving member is provided with a position setting hole and a restricting member inserted into the position setting hole is protruded at the case, the positional displacement of the fulcrum portion is prevented by the restricting member when the driving member is turned, resulting in that it is possible to stabilize a lotus of the acting portion and to perform a positive depression of the central part of the tact spring and further it becomes possible to improve more a reliability in operation.

[0010] In addition, in the aforesaid configuration, although it is also possible to apply a leaf spring as the returning means, it is preferable to use a coil spring as the returning means. In this case, if the coil spring is assembled into the moving member, concurrently a driving protrusion is arranged at the case, the end part of the coil spring is restricted in its position by the driving protrusion during sliding motion of the moving member and compressed, a self-return mechanism is simplified and a small-sized thin formation of an entire switch may easily be promoted.

[0011] Further, in the aforesaid configuration, it is satisfactory if the tact spring has a function to generate at least a click touch. For example, in the case that a pair of opposing films have a fixed contact point and a movable contact point as found in a membrane switch for the aforesaid switching section, it is satisfactory that the movable contact point on the film is brought into contact with the fixed contact point as the tact spring is reversed. In addition, it is also possible that the tact spring has a function for generating a click touch and another function for acting as a movable contact point. In this case, if the fixed contact point is arranged on the board as the switching part, it is possible to change over the switched-on or switched-off state of the switching section as the tact spring is reversed, so that the number of component parts can be reduced.

[0012] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig.1 is a partial sectional top plan view for showing a switched-off state of the sliding operation type switch of the preferred embodiment of the present invention.

Fig.2 is a sectional view taken along line 2-2 of Fig.1.

Fig.3 is a partial sectional top plan view for showing a switched-on state of the sliding operation type switch.

Fig.4 is a sectional view taken along line 4-4 of Fig.3.

Fig.5 is a top plan view for showing a moving member installed at the sliding operation type switch.

Fig.6 is a bottom view for showing a case installed at the sliding operation type switch.

Fig.7 is a front elevational view for showing a driving member installed at the sliding operation type switch.

Fig.8 is a bottom view for showing the driving member.

[0013] The sliding operation type switch shown in these figures is mainly comprised of a moving member 1 having an operating knob 2 or a spring storing part 3; a case 5 having an opening 4 for exposing the operating knob 2 and storing the moving member 1 in such a way that the moving member can be slid and moved toward a predetermined direction (the right and left direction in Figs.1 to 4); a coil spring 6 arranged within the spring storing part 3 of the moving member 1 while its extending or retracting direction is being substantially coincided with the predetermined direction; a supporting plate 7 integrally formed at the lower end of the case 5; a flexible board (substrate) 8 fixed on the supporting plate 7 and having a contact pattern (a fixed contact point) not shown; a tact spring 9 mounted on the flexible

board 8 to cover the contact pattern and generating a click touch when it is turned in a reverse direction; an adhesive tape 10 fixing the tact spring 9 to the flexible board 8; and a driving member 11 (refer to Figs.7 and 8) connecting a fulcrum point 12 with an acting part 13 and rotatably arranged within the case 5 (refer to Figs.7 and 8), the moving member 1 and the driving member 11 are stored in a space defined between the case 5 and the flexible board 8.

As shown in Figs.1 to 5, a tapered part 1a opposing to the acting part 13 of the driving member 11 is formed at the extremity end of the moving member 1 sliding along it, both ends of the spring storing part 3 become receiving portions 1b of the coil spring 6 under no load and then one of the receiving portions 1b is provided with a recess 1c for use in inserting a driving protrusion 5a to be described later. As shown in Figs.1 to 4, and Fig.6, at a top surface of the case 5 (an inner bottom surface) are protruded a driving protrusion 5a inserted into the recess 1c and abutted against one end of the coil spring 6, and a restricting part 5b inserted into a position setting hole 11a arranged between the fulcrum point 12 and the acting part 13 of the driving member 11. This driving protrusion 5a is extended toward a sliding movement direction of the moving member 1 to guide the recess 1c when the moving member 1 is slid and moved and to restrict a position of the coil spring 6 for compression. In turn, the restricting part 5b restricts a position of the entire driving member 11 to prevent a positional displacement of the fulcrum point 12 when the driving member 11 rotates. The tact spring 9 may also act as a movable contact point and this spring can be moved to or away from the contact point pattern (the fixed contact point) on the flexible board 8. In addition, the acting part 13 of the driving member 11 is provided with a pressing protrusion 13a abutted against the central part of the tact spring 9. When the central part of the tact spring 9 is pushed by the pressing protrusion 13a and oppositely turned, a click touch is generated and concurrently the tact contact spring 9 comes into contact with the fixed contact point to be changed from the switched-off state to the switched-on state. In addition, the driving means 11 is rotationally driven around the fulcrum point 12 due to the fact that when the tapered part 1a is engaged with the acting part 13 as the moving member 1 is slid, the acting part 13 is pushed down by the tapered part 1a.

[0014] Next, an operation of the sliding operation type switch constructed as described above will be described as follows. Under no load state shown in Fig.1, the moving member 1 is pushed against the left end shown in the figure in the case 5 with a resilient force of the coil spring 6 under an initial compressed state resiliently abutted against the driving protrusion 5a and both receiving portions 1b, and the tapered part 1a of the moving member 1 is placed at a position spaced apart from the acting part 13 of the driving member 11. Under this state, as shown in Fig.1, since the tact spring 9 acting as the movable contact point is spaced apart from the fixed contact point of the flexible board 8, it is kept at the switched-off state.

[0015] Now, when an operator operates the operating knob 2 exposed at the opening 4 of the case 5, slides the moving member 1 by a predetermined amount in a rightward direction as viewed in Figs.1 and 2 against a resilient force of the coil spring 6 to cause the driving protrusion 5a to be advanced relatively, the tapered part 1a is abutted against the acting part 13 under a further sliding motion of the moving member 1 and the driving member 11 is rotationally driven in a counter-clockwise direction shown in Fig.2. Then, when the moving member 1 is slid and moved up to the position shown in Fig.3, a descending amount of the acting part 13 is increased and the pressing protrusion 13a oppositely turns the central part of the tact spring 9 as shown in Fig.4, resulting in that a click touch is produced and the switched-off state is changed over to a switched-on state. Accordingly, the operator can positively acknowledge that this sliding operation type switch is turned on with the click touch transferred to the hand and fingers of the operator. In addition, when the aforesaid operating force under such a switched-on state is removed, the moving member 1 is moved from the position shown in Figs.3 and 4 toward a leftward direction by the resilient force of the coil spring 6 of which position is restricted by the driving protrusion 5a and compressing amount is increased and then the moving member is automatically returned back to the initial position shown in Figs.1 and 2, resulting in that the moving member 1 is returned automatically to the original switched-off state.

[0016] The sliding operation type switch of the preferred embodiment is operated such that the operating force for slidably moving the moving member 1 is converted to a force for pressing the tact spring 9 through the driving member 11, the click touch is generated when the tact spring 9 is oppositely turned, and then the switched-on state or switched-off state is changed over. Accordingly, there occurs no possibility that a timing where the click touch is produced and a switch-over timing of the switched-on or switched-off state of the switch are displaced undesirably, resulting in that an erroneous operation can be prevented positively and its convenience in use is also improved.

[0017] In addition, in the preferred embodiment the tapered part 1a of the moving member 1 is engaged with the acting part 13, thereby the driving member 11 is rotationally driven around the fulcrum point 12 and a positional displacement of the fulcrum point 12 during the turning operation is prevented by the restricting part 5b arranged at the case 5, resulting in that the driving member 11 can be operated smoothly and positively by the driving member 1 when it is slid. However, it is also possible to employ a driving member in which the sliding motion of the moving member 1 can be converted into an operation (for example, an upward or downward motion) other than rotation.

[0018] In addition, the driving protrusion 5a for use in compressing the coil spring 6 is extended in a slide moving direction of the moving member 1 and at the same time its partial portion is inserted into the recess 1c even in both cases of non-operated state (under no load state) and of operated state, resulting in that the driving protrusion 5a is not engaged with the recess 1c and the moving member 1 can be slid and moved smoothly.

[0019] In addition, in the case of the preferred embodiment although the operating knob 2 is integrally formed with the moving member 1, it is also applicable that both members are separately arranged and the operating knob 2 is fixed to the moving member 1. Similarly, it is also applicable that the top surface (an upper wall) and the side surfaces (side walls) are formed as separate component parts.

[0020] Further, although the tact spring 9 is also applied as a movable contact point in the preferred embodiment, it is also available that the movable contact point is arranged in separate from the tact spring 9 in such a way that a membrane switch is used in place of the flexible board 8 and then the tact spring 9 is mounted on the membrane switch. Additionally, if a rigid board is used in place of the flexible board 8, the rigid board may have a function of the supporting plate 7.

[0021] In addition, if a sliding member is arranged at the lower surface of the moving member 1 and some conductive patterns such as resistors or electrical collectors which are in slidable contact with the sliding member are arranged at the flexible board 8, it is also possible perform simultaneously a changing of resistance value accompanied by the sliding motion of the moving member 1 in separate from the aforesaid switching mechanism where the driving member 11 or the tact spring 9 is present.

[0022] Since the operating force for slidably moving the moving member is converted into a force for oppositely turning the tact spring through the driving member, the click touch is generated by the opposite turning action of the tact spring and at the same time the switched-on state or switched-off state is changed over, even if the size disturbance in each of the component parts or disturbed state in assembly occurs, a timing where the click touch is produced and another timing where the switched-on or switched-off state is changed over can always be coincided to each other, an erroneous operation can be prevented and a convenience in operation can be improved and at the same time the operating stroke can be easily reduced, resulting in that a degree of freedom in design is also expanded.

Claims

1. A sliding operation type switch apparatus comprising: a case having an opening therein; a board integrally formed with this case to define a space part; a moving member having an operating knob exposed out of said opening and stored in said space part in such a way that it can be slid and moved in a predetermined direction substantially in parallel with said board; a returning means for resiliently biasing the moving member to its initial position; a driving member held within said space part in such a way that it can be moved in a direction intersecting said board; a tact spring arranged between the driving member and said board; and a switching part operated by this tact spring,

   wherein the sliding motion of said moving member is converted by said driving member into a direction intersecting said board to depress said tact spring and a switched-on or switched-off state of said switching part is changed over as said tact spring is turned oppositely.

2. A sliding operation type switch apparatus according to claim 1, wherein said driving member is provided with a fulcrum point serving as a center of turning operation and an acting part positioned at said moving member side compared with the fulcrum point, and when the moving member is slid, said moving member is engaged with said acting part to cause said driving member to be rotationally driven around said fulcrum point.

3. A sliding operating type switch apparatus according to claim 1 or 2, wherein a position setting hole is formed at said driving member and a restricting part inserted into said position setting hole is protruded at said case.

4. A sliding operation type switch apparatus according to claim 1, 2 or 3, wherein said returning means is comprised of a coil spring assembled into said moving member, a driving protrusion is arranged at said case, and the end part of said coil spring is restricted in its position with said driving protrusion when said moving member is slid and moved, whereby the spring is compressed.

FIG. 1

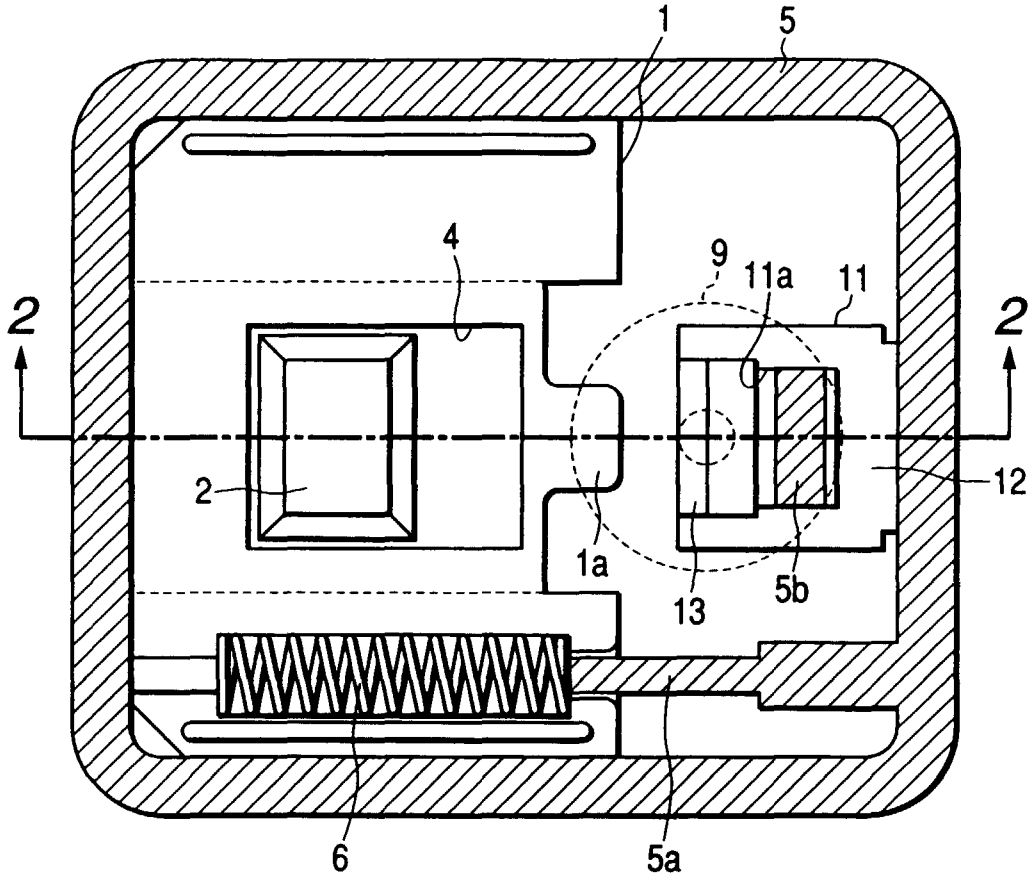


FIG. 2

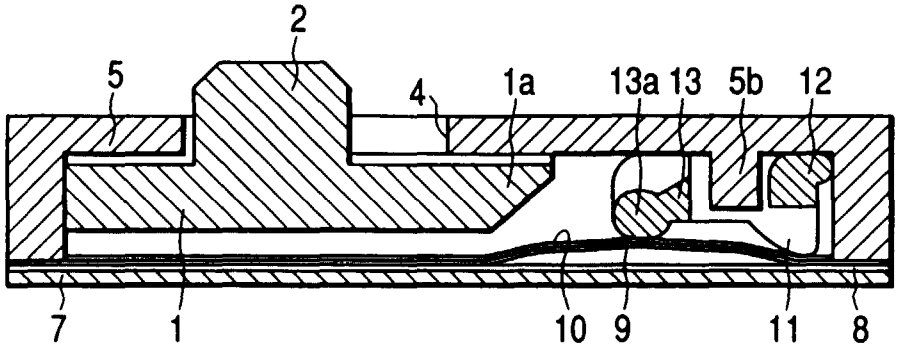


FIG. 3

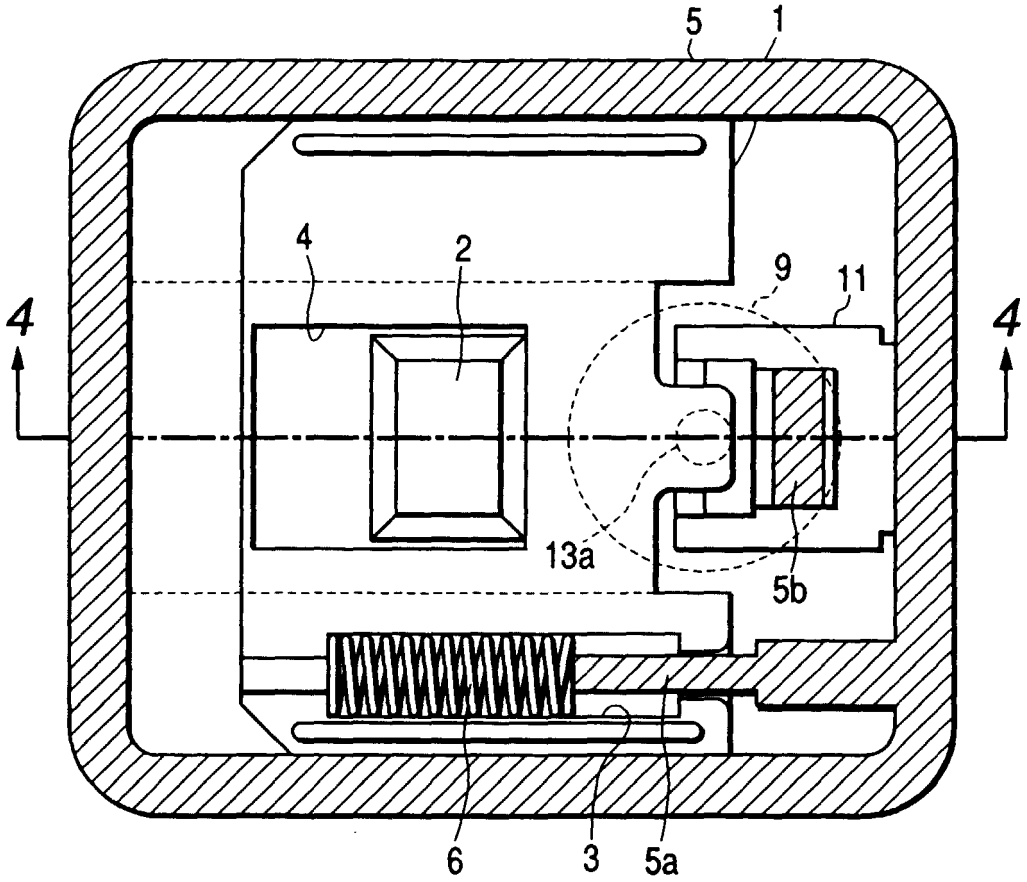


FIG. 4

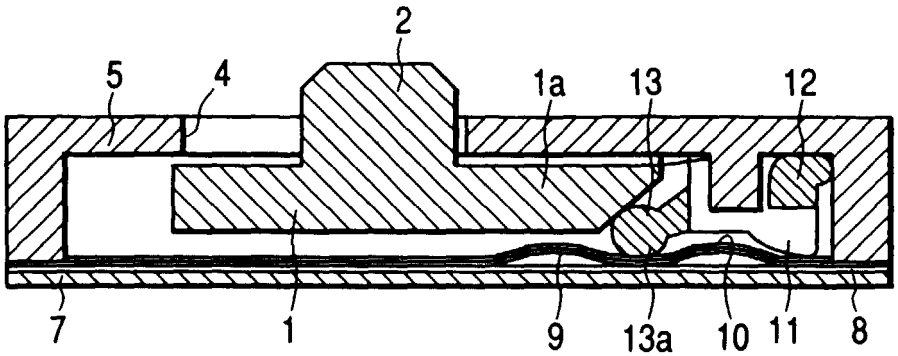


FIG. 5

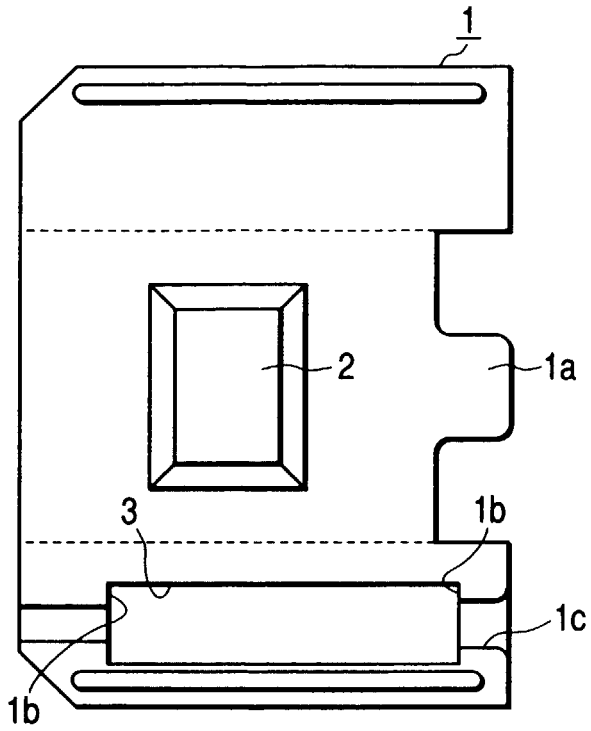


FIG. 6

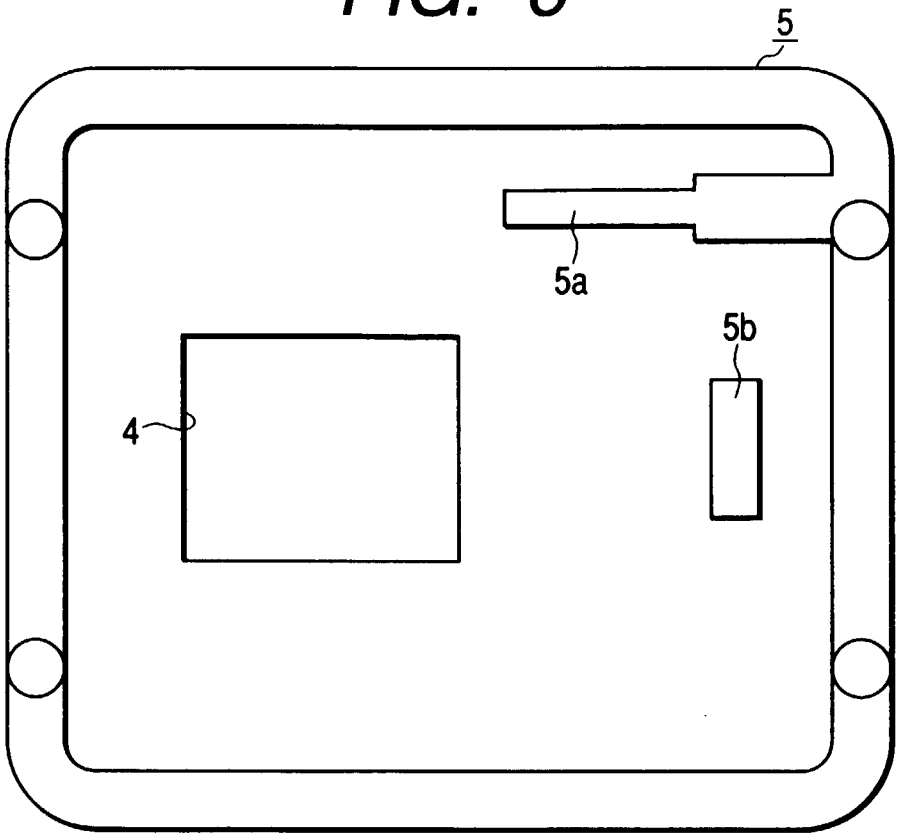


FIG. 7

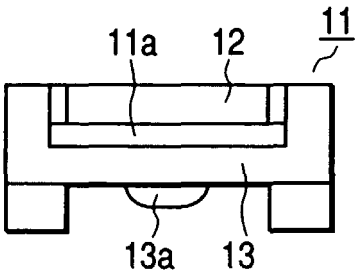


FIG. 8