

Slide Switch

Background of the Invention

Field of the Invention

This invention relates to a slide switch suitable for use as a switch for turning on and off or switching an automobile interior lamp.

Description of the Prior Art

Examples of this type of slide switch of the prior art are described in Utility Model Laid-Open Publication No. 3-38833 previously proposed by the present applicant, as well as those described in Utility Model Examined Publication No. 57-10032 and Utility Model Examined Publication No. 55-55469 filed by other applicants. All of these slide switches employ a coil spring and plate spring, each of which is used independently as a spring for causing a moving contact to slide and make resilient contact with a stationary contact, and a spring for generating a clicking action during knob operation, namely a clicking sensation that is transmitted to the fingers that makes it feel like the switch has been switched to a different position.

However, in these examples of the prior art, a coil spring and plate spring are used, they are remarkably more disadvantageous than switches using a single spring that do not produce a clicking sensation in terms of parts management and ease of assembly, and also have the problem of leading to increased costs.

Therefore, as a means of solving the above-mentioned problems, a switch is described in Utility Model Laid-Open Publication No. 63-137421 that produces a clicking sensation and applies pushing pressure to a moving contact and stationary contact with a single member. This slide is referred to as a clicking slide switch that uses a single plate spring material in which the two short and long pairs of opposing ends of four ends of a flat H-shaped plate spring material are respectively used for producing a clicking sensation and as moving contacts.

However, in this example of the prior art, in addition to having the shortcoming of being susceptible to defective contact and defective clicking due to the inherent "permanent fatigue" of the plate spring, since the switch is quite large in terms of its area, there is also the problem of it

inhibiting the switch from being made smaller.

Summary of the Invention

In order to solve the above-mentioned problems, the object of the present invention is to inexpensively and with good ease of operation provide a slide switch that is compact in terms of its area and is able to provide a clicking sensation during switching as well as applying pushing pressure to a stationary contact of a moving contact using a single resilient member by employing an assembly in which a clicking thruster and moving contact are respectively arranged in a row on both sides of a coil spring provided in a hole opened in the slider of a slide switch.

Brief Description of the Drawings

Fig. 1 is an exploded perspective view of the slide switch according to the present invention prior to its assembly.

Fig. 2 is a longitudinal cross-sectional view of the above-mentioned slide switch after assembly.

Fig. 3 is a cross-sectional overhead view of a slide switch after assembly.

Fig. 4 is a cross-sectional overhead view showing a different state from that shown in Fig. 3.

Fig. 5 is a cross-sectional overhead view showing a different state from that shown in Fig. 4.

Fig. 6 is a cross-sectional overhead view showing another example of that shown in Fig. 3.

Fig. 7 is an exploded perspective view of a slide switch exhibiting a second embodiment prior to its assembly.

Fig. 8 is a longitudinal cross-sectional view of the above-mentioned slide switch after assembly..

Fig. 9 is a cross-sectional overhead view of a slide switch after assembly.

Fig. 10 is a cross-sectional overhead view showing a different state from that shown in Fig. 9.

Fig. 11 is an exploded perspective view of a slide switch exhibiting a third embodiment prior to its assembly.

Fig. 12 is a longitudinal cross-sectional view of the above-mentioned slide switch both during and after assembly.

Fig. 13 is a cross-sectional overhead view of a slide switch after assembly.

Fig. 14 is a cross-sectional overhead view showing a different state from that shown in Fig. 13.

Fig. 15 is a cross-sectional overhead view showing a different state from that shown in Fig. 14.

Fig. 16 is a cross-sectional overhead view showing a different state from that shown in Fig. 15.

Fig. 17 is an exploded perspective view of an oscillating switch exhibiting a fourth embodiment prior to its assembly.

Fig. 18 is a longitudinal cross-sectional view of the above-mentioned switch during and after assembly.

Fig. 19 is a cross-sectional overhead view used for explaining the operation of the oscillating switch of a fourth embodiment.

Fig. 20 is a cross-sectional overhead view showing a different state from that shown in Fig. 19.

Fig. 21 is a cross-sectional overhead view showing a different state from that shown in Fig. 20.

Fig. 22 is an exploded perspective view of an oscillating switch exhibiting another embodiment prior to its assembly.

Fig. 23 is a side view of the pivoting support portion of the operating lever of the above-mentioned switch.

Fig. 24 is a longitudinal cross-sectional view of Fig. 22 after assembly.

Description of the Preferred Embodiments

The following provides an explanation of a first embodiment of the slide switch as claimed in the present invention with reference to Figs. 1 through 5.

In the composing of a slide switch equipped with a moving contact and clicking thruster on a slider as shown in Figs. 1 and 2, in the first embodiment, relatively small hole 4, which is nearly perpendicular to the direction of sliding, is formed in advance as shown in Figs. 1 and 3 in slider 3, which is arranged so as to be able to slide as shown in Fig. 2 through slot 2a with knob 3a facing to the outside, within recess 2 of insulating base 1 formed from plastic into the shape of a rectangular frame.

Within this hole 4, clicking thruster 6, in the form of a steel ball and so forth, and moving contact 7 are respectively arranged on both sides of coil spring 5 inserted

as shown in Fig. 2 so as to tend to respectively protrude as shown in Fig. 3.

Next, the basic form of the slide switch according to the present invention is composed by clicking thruster 6 and moving contact 7 respectively making resilient contact as shown in each of the above-mentioned drawings with clicking recess 8 and a plurality of stationary contacts 9 provided as shown in Figs. 2 and 3 on the respective opposing inner surfaces of the above-mentioned recess 2, arranging the above-mentioned slider 3 within the above-mentioned recess 2 so as to be able to move as shown in Fig. 2, and covering the opening edge of this recess 2 with cover plate 10 as shown in Fig. 2 by using its locking hooks 10a and so forth.

Furthermore, in order to assemble this slide switch automatically, in addition to drawing one end of hole 4 of slider 3 smaller than clicking thruster 6 to form a narrow end as shown in Fig. 3 so that clicking thruster 6 partially protrudes but does not come out as is also shown in Fig. 3, by forming outward facing locking holes 7a in moving contact 7 as shown in Fig. 1, and allowing these locking holes 7a to engage with the end hooks of resilient locking tabs 4a

provided in opposition on the outside of hole 4 of slider 3 as shown in Fig. 3 in opposition to the resiliency of coil spring 5 as is also shown in Fig. 3 to prevent them from coming out, automation of the assembly of this slide switch can be promoted.

Clicking thruster 6 and moving contact 7 tend to protrude at all times due to the resiliency of coil spring 5, and the dimensions and so forth of contact locking holes 7a are set so that they can be pushed in to the outer surface of slider 3 in opposition to the resiliency of coil spring 5.

As a result of the slide switch according to the present invention having the constitution as described above, in order to use this slide switch, in the slider position of Fig. 3, moving contact 7 is juxtaposed about two adjacent stationary contacts 9, and makes resilient contact due to the resiliency of coil spring 5. Both of these stationary contacts 9 are in a state of electrical continuity, and clicking thruster 6 drops into clicking recess 8 of base recess 2 due to the resiliency of coil spring 5. As a result, the above state of electrical continuity can be easily maintained without inadvertently moving slider 3.

Next, when slider 3 is moved as shown in Fig. 5 through the state of Fig. 4 with the fingers and so forth along slot 2a, moving contact 7 is juxtaposed about two adjacent stationary contacts 9 that are different from those described above, and makes resilient contact with said stationary contacts 9. Thus, two stationary contacts 9 that are different from those of Fig. 3 are in a state of electrical continuity. Clicking plunger 6 drops into another clicking recess 8 of base recess 1a that is different from that shown in Fig. 3 as shown in Fig. 5 due to the resiliency of coil spring 5, which together with providing the fingers and so forth with a sensation of changing position, namely a clicking action, enables slider 3 to easily maintain a state of electrical continuity according to the above-mentioned Fig. 5 after said clicking plunger 6 drops into said clicking recess 8 without moving inadvertently.

Furthermore, in the above-mentioned present embodiment, although locking holes 7a are shown to prevent the end hooks of resilient locking tabs 4 from coming out as a means of containing moving contact 7 in hole 4 of slider 3, Fig. 6 shows an example of mounting moving contact 7 to slider 3 to

prevent it from coming out. Namely, locking flanges 7A of moving contact 7 are made to engage with and lock onto locking tabs 4A provided protruding into hole 4 of slider 3 due to the inherent resiliency of the contact.

In addition, a simple sphere, hemisphere or bowl-shaped plunger can be used for clicking plunger 6. In addition, instead of aligning and arranging stationary contacts 9 with positioning grooves 9a provided in the inner surface of the above-mentioned recess 2, they may also be aligned and fixed in position with a known fixing means such as fastening with screws or adhesion. Moreover, instead of attaching and mounting cover plate 10 as described above by aligning with the edges of base locking holes 1a by its locking hooks 10a, it can be made to cover the opening edge of base recess 1a with a known means such as fastening with screws.

Next, an explanation is provided of a second embodiment with reference to Figs. 7 through 10. Furthermore, those reference numerals that are the same as in the above-mentioned first embodiment indicate the same members, and their explanation is omitted.

In this embodiment, relatively small hole 4, which is nearly perpendicular to the direction of sliding, is formed in advance as shown in Figs. 7 and 9 in slider 3, which is arranged so as to be able to slide as shown in Fig. 8 through slot 2a with knob 3a facing to the outside, within recess 2 of insulating base 1.

Within this hole 4, clicking thruster 6 and moving contact 7 are respectively arranged on both sides of coil spring 5 inserted as shown in Fig. 8 through the state of Fig. 1 so as to tend to protrude as shown in Fig. 3.

Next, clicking thruster 6 and moving contact 7 respectively make resilient contact as shown in Figs. 7 and 9 with clicking recesses 8, respectively provided as shown in Figs. 7 and 9 in the inner surface to the side of slot 2a of the above-mentioned recess 2, and a plurality of narrow electrically conductive strips in the form of stationary contacts 9 arranged in opposition to these recesses 8, arranging the above-mentioned slider 3 within the above-mentioned recess 2 so as to be able to move, and covering the opening edge of this recess 2 with cover plate 10 with the above-mentioned stationary contacts 9 in between through base

locking holes 1a as shown in Fig. 8 by using its locking hooks 10a and so forth.

As a result of the slide switch employing a constitution like that described above, in the slider position of Fig. 9, moving contact 7 is juxtaposed about two adjacent stationary contacts 9 on the right side, and makes resilient contact to form a state of electrical continuity. Clicking thruster 6 drops into center clicking recess 8 of base recess 2 due to the resiliency of coil spring 5. In addition to this producing a clicking action to the fingers and so forth, the above-mentioned state of electrical continuity can be easily maintained according to the above-mentioned Fig. 9 without inadvertently moving slider 3 after clicking plunger 6 has dropped into said clicking recess 8.

Next, an explanation is provided of a third embodiment with reference to Figs. 11 through 16. Furthermore, those reference numerals that are the same as in each of the above-mentioned embodiments indicate the same members, and their explanation is omitted.

In this embodiment, relatively small hole 4, which is nearly perpendicular to the direction of sliding, is formed

in advance as shown in Figs. 11 and 12 in slider 3, which is arranged so as to be able to move as shown in Fig. 12 through slot 2a with knob 3a facing to the outside, within recess 2 of insulating base 1. Within this hole 4, coil spring 5, and clicking thruster 6 and moving contact 7, which is inserted into contact insertion holes 7a, are arranged in a row on both sides of this coil spring 5.

Next, in the containing of slider 3 within recess 2, when slider 3 is first pushed into recess 2 while juxtaposing the lower portion of slider 3 about the inside inclined surfaces of locking tabs 2A provided protruding towards the opposing inner surfaces near the opening edge of recess 2 as shown in Fig. 12(a), opposing frame pieces 1A are deflected to the outside in opposition to their resiliency due to this pushing force.

As a result, together with the gap between the above-mentioned locking tabs 2A increasing to the width of the slider as shown in Fig. 12(a), slider 3 can be pushed inward in the order of Figs. 12 (b) and (c) by going through the space between the widened locking tabs 2A. When the upper edge of slider 3 has passed locking tabs 2A, opposing frame

pieces 1A return to their original shape due to their own resiliency as shown in Fig. 12(d) thereby locking slider 3 in position.

After returning in this manner, slider 3 can be contained in recess 2 while allowing to move along slot 2a. In addition, together with the above-mentioned locking tabs 2A preventing slider 3 from coming out as shown in Fig. 12(d), the above-mentioned clicking thruster 6 and moving contact 7 are respectively made to make resilient contact as is respectively shown in Figs. 12(d) and 13 with clicking recesses 8 provided in the opposing inner surfaces of the above-mentioned recess 2, and a plurality of stationary contacts 9 arranged in positioning grooves 9a formed in opposition to this recess.

As a result of this slide switch employing a constitution as described above, in the slider position of Fig. 13, moving contact 7 is juxtaposed about two adjacent stationary contacts 9 on the right side, and makes resilient contact to form a state of electrical continuity between these stationary contacts 9 due to the resiliency of coil spring 5. Clicking thruster 6 drops into clicking recess 8

of base recess 2 due to the resiliency of coil spring 5, thus enabling the slide switch to easily maintain the above-mentioned state of electrical continuity without inadvertently moving slider 3.

Next, when slider 3 is moved as shown in Fig. 15 through the state of Fig. 14 with the fingers and so forth along slot 2a in opposition to the resiliency of coil spring 5, moving contact 7 is juxtaposed about two adjacent stationary contacts 9 on the right side and makes resilient contact with said stationary contacts 9. Thus, a state of electrical continuity is formed between the two stationary contacts 9 on the left side in Fig. 15 that differ from those in Fig. 13. Clicking plunger 6 drops into the clicking recess 8 shown in Fig. 15 that differs from that of Fig. 13 of frame recess 2 due to the resiliency of coil spring 5, which together with providing the fingers and so forth with a clicking action, enables slider 3 to easily maintain a state of electrical continuity according to the above-mentioned Fig. 15 after said clicking plunger 6 drops into said clicking recess 8 without moving inadvertently.

Furthermore, when slider 3 is further moved to the left to the position of Fig. 16, moving contact 7 forms an all-off state in it only makes contact with a single stationary contact 9, and this state can be easily maintained by recess 8.

Next, an explanation is provided of a fourth embodiment with reference to Figs. 17 through 21. Furthermore, those reference numerals that are the same as in each of the above-mentioned embodiments indicate the same members, and their explanation is omitted.

Furthermore, in contrast to the above-mentioned embodiments performing switching of a switch by moving slider 3 in the horizontal direction, this embodiment performs switching of a switch by oscillating while using slider 3 as a fulcrum.

In this embodiment, within recess 2 of frame 1, in the pivotal arranging of operating lever 3 while allowing to tilt back and forth through opening edge 2a with knob 3a facing to the outside, together with pre-forming hole 4 nearly perpendicular to the direction of tilting in this operating lever 3 by plastic molding, clicking thruster 6 and moving

contact 7 are provided arranged in a row on both sides of coil spring 5 inserted into this hole 4.

In addition to pivotally supporting the above-mentioned operating lever 3 by pivoting support projections 3A provided protruding from its sides while able to tilt as shown in Fig. 18(b) on pivot support portions 2A of the above-mentioned frame 1 by deflecting to the inside as shown in Fig. 18(a) in opposition to its resiliency, the above-mentioned clicking thruster 6 and moving contact 7 respectively make resilient contact with clicking recesses 8, respectively provided on the opposing inner surfaces of the above-mentioned recess 2, and a plurality of stationary contacts 9, arranged in opposition to said recesses, due to the resiliency of the above-mentioned coil spring 5 as shown in Fig. 3.

Furthermore, clicking thruster 6 and moving contact 7 tend to protrude at all times due to the resiliency of coil spring 5, and the depth and so forth of contact insertion holes 7a is set so that they can be pushed in to the outer surface of operating lever 3 in opposition to the resiliency of coil spring 5. In addition, as one example of a means of pivotally supporting operating lever 3, operating lever 3 is

pivotally supported within frame recess 2 by engaging hinge bosses 2B of the inner surface of frame recess 2 in hinge recesses (holes) 3B formed on pivoting support projections 3A by deflecting to the inside as shown in Fig. 18(a) in opposition to the resiliency of the above-mentioned pivoting support projections 3A, and then allowing pivoting support projections 3A to resiliently return as shown in Fig. 18(b). Moreover, in addition to being in the form of a hollow rectangle as in the previous example, frame 1 may also be in the form of a combination of opposing plate pieces arranged while leaving an opening in the middle.

In the case of a lever switch composed in the manner described above, in the lever position of Fig. 19, moving contact 7 is juxtaposed about two adjacent stationary contacts 9, and makes resilient contact to form a state of electrical continuity between these stationary contacts 9 due to the resiliency of coil spring 5. Clicking thruster 6 drops into clicking recess 8 of base recess 2 due to the resiliency of coil spring 5, thus enabling the slide switch to easily maintain the above-mentioned state of electrical continuity without inadvertently moving slider 3.

Next, when operating lever 3 is tilted with the fingers by grabbing onto knob 3a using hinge bosses 2B as a fulcrum, and is tilted in opposition to the spring force of coil spring 5 as shown in Fig. 21 after going through the state shown in Fig. 20, clicking thruster then drops into recess 8 on the left side in opposition to the resiliency of coil spring 5. In addition to this creating a clicking sensation, moving contact 7 is in the off state when it is in contact with only a single stationary contact 9, and this state can be easily maintained by recess 8.

Furthermore, in the above-mentioned fourth embodiment, although operating lever 3 is shown to be able to oscillate freely as a result of inserting pivoting support projections 3A into hinge bosses 2B formed within recess 2 of frame 1, as another embodiment of this, hinge bosses 3C formed on operating lever 3 may resiliently fit into hinge recesses 2C of frame 1 as shown in Figs. 22 through 24.

Namely, notches 2D, which are slightly narrower than the diameter of hinge bosses 3C, are formed with guiding tapered portions 2E in the upper portion of hinge recesses 2C of frame 1. By inserting hinge bosses 3C by sliding over

guiding tapered portions 2E, and fitting into hinge recesses 2C by means of notches 2D, hinge bosses 3C are able to rotate freely.

Furthermore, although it is easier to fit hinge bosses 3C into the above-mentioned notches 2D by providing deflection relief grooves b in said notches 2D, these relief grooves b are not necessary.

Effects of the Invention

As has been described above, since the present invention provides a through hole in a slider, positions a moving contact within said through hole in opposition to stationary contacts, positions a clicking thruster in opposition to clicking thruster recesses, and fits a resilient member between the above-mentioned moving contact and the above-mentioned clicking thruster, the above-mentioned resilient member can be used both for clicking and for resilient contact by the moving contact with the stationary contacts. Since it is also able to provide a clicking sensation during switching, the present invention is able to have a simple structure, offer easy operation and be able to be provided

inexpensively.

In addition, by forming a containment means for the above-mentioned clicking thruster while also forming a containment for the above-mentioned moving contact, said clicking thruster and moving contact can be mounted reliably and easily to said slider; thus improving the ease of assembly of the slide switch and promoting automated assembly.

Moreover, since the stationary contacts are positioned in uniformly level by fitting into the grooves of the insulating base, the moving contact is able to move smoothly during sliding and oscillation of the slider, thus offering the advantage of smooth switching of the switch.

CLAIMS:

1. A slide switch composed so that, together with a moving contact contained within a slider shorting between a plurality of desired stationary contacts by moving over said stationary contacts, a clicking thruster provided with resiliency by a resilient member such as a spring produces a clicking sensation during switching by engaging with clicking thruster recesses as a result of sliding said slider; wherein, a through hole is provided in said slider, said moving contact is positioned within said through hole in opposition to said stationary contacts, said clicking thruster is positioned in opposition to said clicking thruster recesses, and said resilient member is fit in between said moving contact and said clicking thruster.
2. A slide switch as set forth in claim 1 wherein a containment means of said clicking thruster is formed in one end of said through hole.
3. A slide switch as set forth in claim 2 wherein said containment means consists of the end diameter of said through hole being smaller than said clicking thruster.



4. A slide switch as set forth in claim 1 wherein containment means are formed in said through hole and on said moving contact.

5. A slide switch as set forth in claim 4 wherein said containment means consists of locking holes, formed in bent portions bent at roughly a right angle from both ends of the contact portion of said moving contact that makes sliding contact with said stationary contacts, engaging with resilient locking tabs formed in said through hole.

6. A slide switch as set forth in claim 4 wherein said containment means consists of locking projections, formed in the bent portions of said moving contact, being locked in locking flanges formed in said through hole.

7. A slide switch as set forth in claim 1 wherein said through hole provided in said slider is formed in the direction perpendicular to the sliding direction of said slider.

8. A slide switch as set forth in claim 1 wherein said through hole provided in said slider is formed in the direction parallel to the sliding direction of said slider.



9. A slide switch as set forth in claim 1 wherein said stationary contacts are uniformly level by fitting into grooves of an insulating base.

10. A slide switch as set forth in claim 1 wherein said slider is axially supported by means of a hinge means so that it oscillates relative to said insulating base.

11. A slide switch as set forth in claim 1 wherein said clicking thruster is in the form of a steel ball.

