

LEVER SWITCH DEVICE

The present invention relates to a lever switch for use in switching interior automotive lamps or the like.

Lamps equipped with a lever switch have been disclosed, for example, in Japanese Patent Publication No. 57-22633. The conventional switch lamp structure disclosed therein generally includes a pair of sockets formed by bending a plate in such a manner that the central portion of the plate becomes the bottom. The socket has a pair of confronting fastening members each of which has a fastening hole. The base has socket-insertion holes formed at predetermined intervals, each of which has a projection formed on its confronting inner surfaces which can be fitted within the fastening hole formed in each of the pair of fastening members. A switch lever is fastened to the base and an elastic member constituting a switch mechanism is structured in such a manner that an end portion thereof is secured to the base at a position between either of the sockets and the switch lever. Another end portion of the elastic member is arranged to be brought into selected contact with the fastening members of either of the sockets.

The conventional switch structure described above has been developed so as to be used mainly as an interior automotive lamp. However, since the switch lever projects horizontally over the base (which is formed flat so that a lamp may be mounted thereto), the switch lever must be moved parallel to the flat base surface. Therefore, handling of the switch lever has been inefficient. What is even worse, however, is that the supporting shaft mechanism portion of the lever can be easily worn after it has been used frequently for a prolonged period of time, especially in the case where the supporting shaft mechanism is made of a plastics material. Therefore, manufacturing the conventional switch described above has been relatively complicated since the lever must be caulked and/or deformed in order to prevent separation of the lever.

It would be desirable to be able to improve the handling and assembling of automotive switches by employing a structure arranged in such a manner that the operation lever of the switch is oriented substantially perpendicularly to the switch base.

According to the present invention, there is provided a lever switch comprising an insulated base defining therein upper and lower switch operation spaces and a lamp-mounting space, a pair of opposed hinge bosses interposed between said upper and lower spaces, an operation lever provided with opposed hinge means thereon to permit resilient snap connection of the operation lever with said hinge bosses whereby the operation lever is pivotally coupled to the base with the upper and lower ends thereof

extending respectively into said upper and lower spaces, said lever being pivotal between first and second states, the lower end of the operation lever defining therein a recess across which extends a bridge member, a contact member snap connected to the bridge member to be pivotal with the operation lever, said contact member being of substantially U-shape and including a pair of opposed, resilient contact portions disposed adjacent the recess in the lower end of the operation lever so as to be resiliently displaceable therein, a lamp-holding connector mounted to the base for holding a lamp within said lamp-mounting space, and first and second contacts snap connected to the base to be located in the lower switch operation space thereof, the contact member being located between said contacts such that said resilient contact portions of the contact member make electrical contact with said first and second contacts when the operation lever is in its first state to make an electrical circuit associated therewith, and breaks electrical contact between said first and second contacts when the operation lever is in its second state to break the electrical circuit associated therewith, thereby to turn said lamp held by said lamp-holding connector on and off respectively, the base including a securing boss extending into said lamp-holding space, and the lamp-holding connector having formed therein an aperture in which is located said securing boss to couple the lamp-holding connector to the base.

In one embodiment of the invention, the lamp-holding connector and the first contact are integrally formed with one another.

In an alternative embodiment of the invention, the lamp-holding connector includes a female connection portion into which a portion of the first contact is inserted.

Our co-pending application no. 9010837.4 discloses and claims a lever switch of the above general type, this application relating more specifically to the provision of a means by which the lamp-holding connector is mounted to the base of the switch.

By way of example only, embodiments of the invention will now be described in greater detail with reference to the accompanying drawings wherein like reference numerals refer to like structural elements, and of which:

Figs. 1a to 1d are cross-sectional views which illustrate the order of assembly for several embodiments of the switches according to this invention;

Figs. 2a and 2b are each perspective views which illustrate preferred embodiments of an operation lever portion used in the switches of this invention;

Figs. 3a to 3d and 4a to 4d represent disassembled and partially assembled cross-sectional views of several embodiments of this invention, respectively;

Figs. 5a to 5d represent fully assembled cross-sectional views of several embodiments of this invention;

Fig. 6 is a bottom view of the assembled switch shown in Fig. 5a;

Fig. 7 and 8 illustrate the switch operation when

viewed in cross-section in two different operational states;

Fig. 9 is a vertical cross-sectional view which illustrates an example in which a lever switch device according to the present invention is embodied in an interior automotive lamp;

Fig. 10 is a schematic lateral cross-sectional view;

Fig. 11 is an exploded perspective view of the structures shown in Fig. 9;

Fig. 12 is a cross-sectional view illustrating another example of a lamp-holding connector;

Fig. 13 is a vertical cross-sectional view which illustrates an example in which a further lever switch device according to the invention is embodied in an interior automotive lamp and;

Fig. 14 is an exploded perspective view which illustrates the lever switch device in a disassembled state.

The basic components of a lever switch device according to the present invention are shown in Figs. 1a - 1d, 3a - 3b, 4a - 4d and 5a - 5d which are cross-sectional views illustrating the order of assembly of several respective switch embodiments of this invention, as well as Figs. 2a - 2b which illustrate a perspective view of preferred embodiments of an operation lever portion that may be associated operatively with the various embodiments.

Referring to Figs. 1a - 1d and 2a - 2b illustrating exploded views of each of the components, the lever switch

device of this invention generally includes an insulating plastic base 1 and hinge bosses 41 confronting each other, disposed between upper and lower spaces 2 and 3 formed in the base 1.

An operation lever 6 is pivotally fastened in such a manner that the hinge bosses 41 are elastically inserted into holes (recessed portions) 51a formed in hinge members 51 in confronting relationship to the hinge bosses 41. A bridge member 6b connects the lower portions of a hole (recessed portion) 6a formed, as shown in Figs. 2a - 2b, in the lower portion of the operation lever 6. A substantially U-shaped movable contact 9 is pivotally fastened to the bridge member 6b and holes (recessed portions) 6a formed in the operation lever 6. These contacts 9a may thus be resiliently displaced within the holes (recessed portions) 6a during operation of the lever 6 (i.e. pivotal movement of the operation lever between its various states). A lamp-holding connector 13 integrally equipped with a first fixed contact 10 is inserted into the base 1 in the order as is shown in Figs. 4a, 4c, 5a, and 5c. A second fixed contact 11 is then fastened to the base 1 after it has been positioned as is shown in Fig. 1a. A securing portion or boss 15 (see Fig. 11) co-operates with apertures 13a in the connectors 13 so that the connectors 13 may be positioned within space 14 of base 1.

Fig. 6 is a bottom view of Fig. 5a where the same reference numerals represent the same or similar elements. In particular, the first and the second fixed contacts 10 and 11 are illustrated with cross-hatching for a better

understanding of the invention.

Referring to Figs. 2a - 2d, it will be seen that the operation lever includes a securing claw (or a securing hole) 6c for securing the movable contact 9. Furthermore, it will be seen that the operation lever 6 shown in Fig. 2b is similar to the operation lever shown in Fig. 2a with the principal exception being that pivot pins 52 are provided so as to hingedly cooperate with recesses 42a formed in the elastically deformable hinge bosses 42 (see Figs. 3c - 3d; 4c - 4d and 5c - 5d).

The fastening connectors 13 shown in the embodiments of this invention depicted in Figs. 4a, 4c, 5a and 5c are integral one-piece structures which include the fixed-contact 10. However, as shown in Figs. 4b, 4d, 5b and 5d, the fixed contact 10 may be provided as a separate structure having a planar tongue portion which is slidably received within a corresponding slot associated with a female connector portion 12 of the lamp-holding connector 13.

The operation lever 6 according to the present invention is arranged such that it can be pivoted with respect to the base 1 with the hinge boss 41 serving as a supporting point. Thus, as shown in Figs. 7 and 8, the operation lever may be rotated by the hinge action performed by the hinge member 5 and the hinge boss 41. The first and the second fixed contacts 10 and 11 are, as is shown in Fig. 8, electrically connected to each other by the movable contact 9 inserted into the bridge member 6b of the operation lever 6. As a result, a straight lamp L can

be switched to an 'on' state. On the contrary, when the operation lever 6 is pivoted as is shown in Fig. 7 so as to break the electrical circuit between the fixed contacts 10 and 11, the straight lamp L can be switched to an 'off' state.

Any vertical or horizontal movement of the operation lever 6 can be blocked by the holes (recessed portions) 51a formed in the hinge members 51 due to the pivotal coupling with respect to the hinge bosses 41. Thus, the operation lever 6 cannot be separated from the base 1 and the movable contact 9 cannot be separated from the operation lever 6 due to its elastic force and the elastic contact action which is exerted by the first fixed contact 10.

In cases where the lamp-holding connector 13 and the first fixed contact 10 are integrally formed as a one-piece unit (see, Figs. 1a, 1c, 4a, 4c, 5a and 5c), the fastening of the first fixed contact 10 as well as the assembly efficiencies of the overall body of the switch can be improved.

When the operation lever 6 is pivoted by connecting either of lamp bases L' of a straight lamp L which is inserted into the lamp-holding connector 13 to electrodes of a power source, the first and the second fixed contacts 10 and 11 can be electrically connected or disconnected by means of the movable contact 9. As a result, the straight lamp L can be switched between on/off states.

The present invention can be applied to a switch for interior automotive lamps as is shown in Figs. 9, 10 and 11 where symbol L represents a lamp, L' represents bases of

the lamp L, and F represents a transparent hood or a lens member. Furthermore, a bus bar B may be coupled operatively to one of the lamp-holding connectors 13. Other reference numerals represent the same or similar elements shown in Figs. 1a, 3a and 5a.

Any undesirable vertical or lateral movements of the operation lever 6 can be blocked by the hinge bosses 41 disposed corresponding to the holes or the holes (recessed portions) 51a or the hinge bosses 52 disposed corresponding to the holes (recessed portions) 42a of the hinge elastic members 42. Therefore, the arrangement of each of the components such as the operation lever 6 and the movable contact 9 can be reliably maintained for a long time.

In particular, since the inner surfaces of the contact portions 9a of the movable contact 9 according to the present invention confront each other at the hole (recessed portion) 6a formed in the operation lever 6, the elastic resilience force of the contact portions 9a will not be deteriorated. Therefore, the fixed contacts 10 and 11 can be satisfactorily electrically connected or disconnected with each other even if the fixed contacts 10 and 11 are not made of elastic materials.

Furthermore, in the embodiments in which the first fixed contact 10 is inserted into the slot of female connector 12 associated with the lamp-holding connector 13, a planar contact is maintained. The operation lever 6 can thus be easily fastened to the base 1 and the assembly efficiencies of the first fixed contact and the overall

body of the switch portion can significantly be improved.

CLAIMS

1. A lever switch comprising an insulated base defining therein upper and lower switch operation spaces and a lamp-mounting space, a pair of opposed hinge bosses interposed between said upper and lower spaces, an operation lever provided with opposed hinge means thereon to permit resilient snap connection of the operation lever with said hinge bosses whereby the operation lever is pivotally coupled to the base with the upper and lower ends thereof extending respectively into said upper and lower spaces, said lever being pivotal between first and second states, the lower end of the operation lever defining therein a recess across which extends a bridge member, a contact member snap connected to the bridge member to be pivotal with the operation lever, said contact member being of substantially U-shape and including a pair of opposed, resilient contact portions disposed adjacent the recess in the lower end of the operation lever so as to be resiliently displaceable therein, a lamp-holding connector mounted to the base for holding a lamp within said lamp-mounting space, and first and second contacts snap connected to the base to be located in the lower switch operation space thereof, the contact member being located between said contacts such that said resilient contact portions of the contact member make electrical contact with said first and second contacts when the operation lever is in its first state to make an electrical circuit associated therewith, and breaks electrical contact between said first and second contacts when the operation lever is in its



second state to break the electrical circuit associated therewith, thereby to turn said lamp held by said lamp-holding connector on and off respectively, the base including a securing boss extending into said lamp-holding space, and the lamp-holding connector having formed therein an aperture in which is located said securing boss to couple the lamp-holding connector to the base.

2. A lever switch as claimed in claim 1 in which the lamp-holding connector and the first contact are integrally formed with one another.

3. A lever switch as claimed in claim 1 in which the lamp-holding connector includes a female connection portion into which a portion of the first contact is inserted.

4. A lever switch substantially as described with reference to and as illustrated by the accompanying drawings.
