SLIDE SWITCH

The present invention relates to the fixed contact of a slide switch that can be used in a car interior lamp and so forth, and the improvement of its external connecting device.

An example of this type of slide switch of the prior art is described in Utility Model Laid-Open Patent Publication No. 3-8833.

This prior art is a slide switch equipped with a movable contact for the sliding body comprising: a slot continuous with an insulating base having a cross-section formed roughly into the shape of the letter "U", a recess of that insulating base, knob 4 projecting to the outside from this slot, an insulated sliding body movably equipped within the recess of the above-mentioned insulating base, a locking hole (recess) continuous with a pair of holes opened in the lower portion of the sliding body, a movable contact having a roughly U-shaped cross-section and a locking portion locked in the above-mentioned locking hole by

inserting through said holes, a resilient spring juxtapositioned between the upper surface of this movable contact and the above-mentioned sliding body, and an insulating plate for arranging a plurality of fixed contacts, which make sliding contact with the above-mentioned movable contact by straddling said movable contact, on the lower portion of said insulating base.

In the above-mentioned prior art, since a fixed contact in the form of a harness must be wired directly to a power source or other circuit portions on an insulating base, there are considerable restrictions on the locations where it can be applied. In addition, since the lead portion of the fixed contact is exposed, it is susceptible to the occurrence of accidents resulting from contact with other members. Moreover, since it is also necessary to maintain the exposed portion of the fixed contact in an insulated state and reliably support it to prevent accidents caused by mutual shorting, the prior art has numerous disadvantages in the form of being bothersome and expensive.

In order to eliminate each of the above-mentioned problems, it would be desirable to be able to connect a power source line and a load in a single operation by operating a slide

switch via a plug-in jack, as well as protect the plugs with a plug cover formed into a single structure with a switch cover in the form of an insulating plate, while also reliably supporting the plug bases.

According to the present invention there is provided a slide switch comprising a housing, the housing including a hollow, upwardly-open insulating base in the lower wall of which is formed a slot communicating into the interior of the base, and an insulating plate covering the hollow interior of the base, the switch further comprising a sliding body within the base and including a knob protruding through said slot whereby said body can be slid relative to the base, a plurality of electrical contacts within the housing, each contact including a portion extending transversely of, and fixed within, the base, and an electrical conductor mounted on, to be moveable with, the sliding body within the base and resiliently urged towards, to make selective engagement with, said transverse portions of the contacts, at least one of the contacts further including an upstanding, plate-like support portion, the housing having formed therein, for the or each support portion, a corresponding groove into which the associated support portion is located, opposed faces of said support portion being bounded at least in part by opposed surfaces of said groove whereby the or each contact is positively supported in the housing, and, extending from said support portion, a plug which projects from the base, the insulating plate having integrally formed therewith a guide member which surrounds the or each plug and provides a guide for locating an associated jack on the or each plug.

In the case of a first embodiment, at least one of the fixed contacts is bent into the shape of the letter "U", rising support pieces are supported with the projecting piece grooves of the above-mentioned base, and the plugs on their ends are protected with a plug cover formed into a single structure with the above-

mentioned insulating plate.

In addition, the fixed contacts and plugs are respectively positioned by inserting the rising support pieces into the base projecting piece grooves. Moreover, the fixed contacts can be oriented by projections of the base and the inner surface grooves of the switch cover in the form of the insulating plate or the upper edge grooves of the base recess. In addition, the plugs can be protected with the plug cover. Thus, there is no inadvertent movement of the fixed contacts by an external disturbance such as sliding friction caused by the movable contact, and the plugs do not become loose during insertion and removal of a separately provided multi-jack and so forth.

In the case of a second embodiment the slide switch comprises a knob facing to the outside from a slot continuous with the recess of an insulating base, movably providing a sliding body within the above-mentioned recess of the above-mentioned insulating base, arranging in parallel a plurality of fixed contacts that make sliding contact with a movable contact resiliently provided on the sliding body by means of a resilient spring, and covering the outside surface with an insulating plate; wherein, at least one of the above-mentioned fixed contacts is bent up into the shape of the letter "L" in the

direction of its thickness, rising support pieces and plugs continuous with their upper portions are formed into a single structure in the form of a single vertical letter as viewed from the front, a guide piece, which guides a plug-in jack that inserts onto the plugs, projects from the outer surface of the above-mentioned insulating plate, and the bases of the plugs are positioned by inserting the bases of the above-mentioned plugs into its back vertical grooves.

Since rising support pieces and plugs projecting as a single structure from fixed contacts are in the form of a single vertical letter as viewed from the direction of jack insertion, there is no inadvertent bending or warping of the plugs due to insertion and removal of the jack or external disturbances. Moreover, the bases of the plugs can be positioned by the edges of the vertical grooves of a guide piece for guiding insertion of a plug-in jack, while also strengthening the plugs in the direction of their thickness.

Moreover, the fixed contacts themselves are embedded in fixed contact positioning grooves provided in base projecting pieces and in the opposing surfaces of the base or insulating plate, and are rigidly positioned by screws or other known orienting means. Thus, there is no inadvertent movement of the fixed contacts by an external disturbance such as sliding friction caused by the movable contact, and the plugs do not move inadvertently during

insertion and removal of a separately provided plug-in jack and so forth.

In the case of a third embodiment, the slide switch comprises a knob protruding to the outside from a slot continuous with a recess of an insulating base, movably providing a sliding body within the above-mentioned recess of the above-mentioned insulating base, arranging in parallel a plurality of fixed contacts that make sliding contact with a movable contact resiliently provided on the sliding body by means of a resilient spring, and covering the outside surface with an insulating plate; wherein, at least one of the above-mentioned fixed contacts is bent into the shape of the letter "U", rising support pieces are supported by being clamped by a projection, provided projecting from the edge of the opening of the above-mentioned base, and an edge projection of the insulating plate, which is fixed by covering the edge of the opening of the above-mentioned base, and plugs, formed on the ends of the above-mentioned rising support pieces, are protected with a plug cover formed into a single structure with the above-mentioned insulating plate.
Fixed contacts and plugs are respectively and reliably positioned by clamping rising support pieces between a base projecting piece and an insulating plate projecting piece fixed by covering the

base. Moreover, the fixed contacts can be oriented by projections of the base and the inner surface grooves of the switch cover in the form of the insulating plate or the upper edge grooves of the base recess. In addition, the plugs can be protected with the plug cover.

In the case of fourth and fifth embodiments, the rising support pieces of bent fixed contacts are supported by being clamped in clamping grooves composed in the plug cover itself. Plugs formed on the ends of the above-mentioned rising support pieces are then protected with a plug cover.

In addition, by providing lower projections on the fixed contacts, providing grooves into which those lower projections tightly fit on the upper edge of the base, and fitting the lower projections of the fixed contacts into the upper edge grooves in opposition to a resilient spring, the fixed contacts can be temporarily fixed, thus being able to contribute to greater ease of assembly of the slide switch.

As was previously described, fixed contacts and plugs are securely positioned, the fixed contacts can be oriented by projections of the base and the inner surface grooves of the switch cover in the form of the insulating plate or the upper edge grooves of the base recess, and the plugs can be protected with a plug cover.

Thus, there is no inadvertent movement of the fixed contacts by an external disturbance such as sliding friction caused by the movable contact, and the plugs do not become loose during insertion and removal of a separately provided multi-jack and so forth.

By connecting, for example, the positive pole of a power source to one of the plugs, connecting, for example, the negative pole of a power source to the other plug through a load such as a door switch or lamp in series, and then controlling the continuity between fixed contacts with a movable contact by moving a sliding body, it is possible to, for example, manually turn on and off an interior lamp or turn on an interior lamp when the car door is open.

By way of example only, embodiments of the invention will now be described in greater detail with reference to the accompanying drawings of which:

Figs. 1A, 1B, 1C, 1D and 1E are exploded perspective views of an embodiment of the present invention.

Figs. 2A, 2B, 2C, 2D and 2E are exploded corss-sectional views of an embodiment of the present invention.

Figs. 3A, 3B, 3C, 3D and 3E are cross-sectional views following assembly of that shown in Figs. 2A, 2B, 2C, 2D and 2E.

Figs. 4A, 4B, 4C, 4D, and 4E are cross-sectional views taken along the broken line of Figs. 3A, 3B, 3C, 3D and 3E.

Figs. 5A, 5B, 5C, 5D and 5E are perspective views cutting out the essential portion following assembly of that shown in Figs. 1A, 1B, 1C, 1D and 1E.

Figs. 6A, 6B, 6C, 6D and 6E are exploded cross-sectional views showing another example of the present invention.

Figs. 7A, 7B, 7C, 7D and 7E are cross-sectional views showing another example of the present invention.

Fig. 8 is a perspective view showing another example of the rising support piece according to an embodiment of the present invention.

Fig. 9 is a perspective view showing another example of the projecting piece groove according to an embodiment of the present invention.

Fig. 10 is a longitudinal cross-sectional view showing an example of use of the product of an embodiment of the present invention.

Fig. 11 is a longitudinal cross-sectional view of a different state of that shown in Fig. 10.

Fig. 12 is a cross-sectional view of an assembly example in which the temporary locking legs of the movable contact have been shortened.

Fig. 13 is an exploded perspective view showing another embodiment of the present invention.

Fig. 14 is an exploded perspective view showing another embodiment of the present invention.

Fig. 15 is a cross-sectional view following assembly of that shown in Fig. 13.

Fig. 16 is a longitudinal cross-sectional view showing an example of use of another embodiment of the product of the present invention.

Fig. 17 is a longitudinal cross-sectional view of a different state of that shown in Fig. 16.

Fig. 18 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 19 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 20 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 21 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 22 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 23 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 24 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 25 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 26 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

Fig. 27 is exploded perspective views of the essential portions of other applied embodiments of the present invention.

The following provides an explanation of a first embodiment of the present invention with reference to the drawings.

To begin with, as shown in Fig. 1A, the basic constitution of the present invention consists of knob 104 protruding to the outside as shown in Fig. 2A from slot 103 continuous with recess 102 of insulating base 101 formed from plastic in the shape of a hollow rectangle, and movably providing sliding body 105, made of plastic and so forth, within recess 102 of the above-mentioned insulating base 101.

In addition, movable contact 107, having a pair of temporary locking legs 107a, is resiliently provided as shown in Fig. 2A within recess 105a opened in the outer surface of this sliding body 105 by means of resilient spring 106 such as a coil spring. Furthermore, dimples 107c are preferably provided on this movable contact 107 to improve contact.

Moreover, a plurality of fixed contacts 108, made of metal strips which make sliding contact with the outer surface of this movable contact 107, are arranged in parallel as shown in Fig. 4A by

means of positioning grooves 102a and pins 102b provided on the upper edge of the above-mentioned insulating base recess 102. A slide switch can then be composed by covering its outer surface with insulating plate 109, fastened with screws in screw holes n to base 101 as shown in Figs. 3A and 5A.

In the present invention, the back half of each of the above-mentioned fixed contacts 108 or at least one of said fixed contacts 108 is bent in advance into the shape of the letter "U" as shown in Fig. 1A. Its rising support pieces 108a are supported by inserting into projecting piece grooves 101a in the shape of the letter "T" formed vertically in projecting piece 101A of the above-mentioned insulating base 101 as shown in Figs. 3A and 4A. The slide switch according to the present invention can then be composed by protecting the periphery of plugs 108b on the ends of said rising support pieces 108a by covering with plug cover 110 formed into a single structure with hole 109a opened in the above-mentioned insulating plate 109.

In addition, the position of each fixed contact 108 is restricted by inner grooves 109b of insulating plate 109. Moreover, with respect to the means of fixing insulating plate 109 with respect to base 101, insulating plate 109 can be attached to base 101 by any known fixing means such as by hooking resilient tab 109c shown with the broken line in Fig. 1A on the upper edge of side wall recess 101b of base 101 with its resiliency.

Furthermore, in order to conceal the entire outer surface of fixed contacts 108 with insulating plate 109, overhang 101c is provided protruding from the side of insulating base 101 as shown in Figs. 6A and 7A. The vicinity of the U-shaped rising portion of the portion of fixed contacts 108 extending towards the back is placed at this portion. By then covering insulating plate 109, having a slightly larger width, over the top of fixed contacts 108 as shown in Fig. 7A, in addition to being able to protect plugs 108b with plug cover 110, the entire outer surface of fixed contacts 108 can be protected as a result of being concealed by insulating plate 109.

In addition, one of fixed contacts 108 is grounded directly or through a lamp to the automobile chassis and so on at a short distance, a known plug-in jack J (see Fig. 3A) is connected to form a circuit to only one other fixed contact 108 by forming plugs 108b through U-shaped rising support pieces 108a and covering with plug cover 110, and other fixed contacts 108 may be grounded to the body at a short distance as described above.

Moreover, the shape of rising support pieces 108a themselves of fixed contacts 108 can be made to be that of an overhang to one side as shown in Fig. 8, and these rising support pieces 108a can then be inserted into base projecting piece grooves 101a as shown in Fig. 9 to support the rising portions.

Additionally, if three or more fixed contacts 108 are provided,

to, for example, manually turn on and off an interior lamp or turn on an interior lamp when a car door is open.

Furthermore, if guide legs 107a of movable contact 107 are shortened together with resilient spring 106 as shown in Fig. 12, the entire slide switch can be made to be flat.

In addition, molding pin extraction hole 105b ends up being formed in sliding body 105 as shown in Figs. 1A and 3A to expand the back of recess 102 as shown in Figs. 2A and 3A.

The following provides an explanation of a second embodiment of the present invention with reference to the drawings.

To begin with, as shown in Fig. 1B, the basic constitution of a second embodiment of the present invention consists of knob 204 protruding to the outside as shown in Fig. 2B from slot 203 continuous with recess 202 of insulating base 201 formed from plastic in the shape of a hollow rectangle, and movably providing sliding body 205, made of plastic and so forth, within recess 202 of the above-mentioned insulating base 201.

Movable contact 207, having a pair of temporary locking legs 207a, is resiliently provided as shown in Fig. 2B within recess 205a opened in the outer surface of this sliding body 205 by means of resilient spring 206 such as a coil spring.

Moreover, a plurality of fixed contacts 208, made of metal strips which make sliding contact with the outer surface of this movable

contact 207, are arranged in parallel as shown in Fig. 4B by a known positioning means such as positioning grooves 202a and pins 202b provided on the upper edge of the above-mentioned insulating base recess 202. A slide switch can then be composed by covering its outer surface and orienting with insulating plate 209, fastened with screws in screw holes n to base 201 as shown in Figs. 3B and 5B.

In the present invention, the back half of each of the above-mentioned fixed contacts 208 or at least one of said fixed contacts 208 is bent up into the shape of the letter "L" in the direction of its thickness as shown in Fig. 1B to form rising support pieces 208a. Plugs 208b are then made by extending their ends towards the front in the form of a single vertical letter as viewed from the front resulting in a form that is not inadvertently bent vertically.

Next, after bringing the back surfaces of rising support pieces 208a in contact with projecting piece 201A of the above-mentioned base 201 as shown in Figs. 3B and 4B, insulating plate 209 is covered over the edge of the opening of base 201 via plugs 208b through slots 209a of insulating plate 209, and fixed on base 201 with screws and so on.

Moreover, guide piece 210, in the shape of the letter "U" that guides insertion of plug-in jack J (Fig. 3B), protrudes from the periphery of slots 209a opened in insulating base 209 at the

positions corresponding to the above-mentioned plugs 208b. By inserting the bases of plugs 208b into vertical grooves 210a located in its rear, the periphery of the bases of the above-mentioned plugs 208b is surrounded by the edges of vertical grooves 210a as shown in Figs. 3B and 5B. The slide switch according to the present invention is then composed by securely positioning and reinforcing the bases of plugs 208b from their direction of thickness.

Namely, since the rising support pieces 208a and plugs 208b projecting in the form of a single structure from fixed contacts 208 in the slide switch of the present invention are in the form of a single vertical letter as viewed from the direction of jack insertion, there is no inadvertent bending or warping of plugs 208b due to insertion and removal of the jack or external disturbances. Moreover, the bases of plugs 208b can be positioned by the edges of vertical grooves 210a of guide piece 210 for guiding insertion of a plug-in jack J (Fig. 3B), while also reinforcing plugs 208b in the direction of their thickness. Moreover, the fixed contacts themselves are embedded in fixed contact positioning grooves 209b provided in base projecting pieces 202b and in the opposing surfaces of base 201 or insulating plate 209, and are rigidly positioned by screws or other known orienting means.

In addition, with respect to the means of fixing insulating plate

209 with respect to base 201, insulating plate 209 can be attached to base 201 by any known fixing means such as by hooking resilient tab 209c shown with the broken line in Fig. 1B on the upper edge of side wall recess 201b of base 201 with its resiliency.

Furthermore, in order to conceal the entire outer surface of fixed contacts 208 with insulating plate 209, overhang 201c is provided protruding from the side of insulating base 201 as shown in Figs. 6B and 7B. The vicinity of the U-shaped rising portion of the portion of fixed contacts 208 extending towards the back is placed at this portion. By then covering insulating plate 209, having a slightly larger width, over the top of fixed contacts 208 as shown in Fig. 7B, the entire outer surface of fixed contacts 208 can be protected as a result of being concealed by insulating plate 209.

Moreover, one of fixed contacts 208 is grounded directly or through a lamp to the automobile chassis and so on at a short distance, a known plug-in jack J (see Fig. 3B) is connected to form a circuit to only one other fixed contact 208 by forming plugs 208b through U-shaped rising support pieces 208a and covering with plug cover 210, and other fixed contacts 208 may be grounded to the body at a short distance as described above with screws.

In addition, if three or more fixed contacts 208 are provided,

two each of adjacent fixed contacts 208 can be sequentially switched on and off with movable contact 207, enabling the present invention to be used as a switching slide switch.
Furthermore, the portions in Fig. 1B indicated with the reference numeral 208c enable positioning and orientation of fixed contacts 208 to be performed reliably by aligning the V-shaped notches or holes with pins 201b of the above-mentioned base 201.

The following provides an explanation of a third embodiment of the present invention with reference to the drawings.
To begin with, as shown in Fig. 1C, the basic constitution of the third embodiment of the present invention consists of knob 304 protruding to the outside as shown in Fig. 2C from slot 303 continuous with recess 302 of insulating base 301 formed from plastic in the shape of a hollow rectangle, and movably providing sliding body 305, made of plastic and so forth, within recess 302 of the above-mentioned insulating base 301.
Movable contact 307, having a pair of temporary locking legs 307a, is resiliently provided as shown in Fig. 2C within recess 305a opened in the outer surface of this sliding body 305 by means of resilient spring 306 such as a coil spring.
Moreover, a plurality of fixed contacts 308, made of metal strips which make sliding contact with the outer surface of this movable contact 307, are arranged in parallel as shown in Fig. 4C by

means of positioning grooves 302a and pins 302b provided on the upper edge of the above-mentioned insulating base recess 302. A slide switch can then be composed by covering its outer surface with insulating plate 309, fastened with screws in screw holes n to base 301 as shown in Figs. 3C and 5C.

In the present invention, the back half of each of the above-mentioned fixed contacts 308 or at least one of said fixed contacts 308 is bent in advance into the shape of the letter "L" as shown in Fig. 1C. The ends after going through its rising support pieces 308a are again bent forward in the shape of the letter "L" to create plugs 308b in the form of a single vertical letter.

The back surfaces of rising support pieces 308a are brought in contact with recess grooves 301a formed vertically in projecting piece 301A of the above-mentioned base 301 as shown in Figs. 3C and 4C. Next, the inner surfaces of the above-mentioned rising support pieces 308a are supported by bringing in contact with the outer surfaces of projecting piece 309A perpendicularly provided on the back edge of insulating plate 309 fixed with screws and so forth while covering the edge of the opening of base 301 via plugs 308b through slots 309a of said insulating plate 309.

As a result of protecting the periphery of the above-mentioned plugs 308b by covering as shown in Figs. 3C and 5C with plug cover 310 formed into a single structure with slots 309a opened

in insulating plate 309, the slide switch according to the present invention can be composed wherein rising support pieces 308a are securely clamped by each projecting piece 301A and 309A of base 301 and insulating plate 309, respectively.

In addition, the position of each fixed contact 308 is restricted by inner grooves 309b of insulating plate 309. Moreover, with respect to the means of fixing insulating plate 309 with respect to base 301, insulating plate 309 can be attached to base 301 by any known fixing means such as by hooking resilient tab 309c shown with the broken line in Fig. 1C on the upper edge of side wall recess 301b of base 301 with its resiliency.

Furthermore, in order to conceal the entire outer surface of fixed contacts 308 with insulating plate 309, overhang 301c is provided protruding from the side of insulating base 301 as shown in Figs. 6C and 7C. The vicinity of the U-shaped rising portion of the portion of fixed contacts 308 extending towards the back is placed at this portion. By then covering insulating plate 309, having a slightly larger width, over the top of fixed contacts 308 as shown in Fig. 7C, together with being able to protect plugs 308b by covering with plug cover 310, the entire outer surface of fixed contacts 308 can be protected as a result of being concealed by insulating plate 309.

In addition, one of fixed contacts 308 is grounded directly or through a lamp to the automobile chassis and so on at a short

distance, a known plug-in jack J (see Fig. 3C) is connected to form a circuit to only one other fixed contact 308 by forming plugs 308b through U-shaped rising support pieces 308a and covering with plug cover 310, and other fixed contacts 308 may be grounded to the body at a short distance as described above by fastening with screws.

Moreover, the shape of plugs 308b themselves of fixed contacts 308 is that of a single horizontal letter as shown in Fig. 8, insulating plate 309, wherein slots 309 having a broad width are opened as shown in Fig. 9 through these plugs 308b, covers the edges of the opening in base 301, and the above-mentioned rising support pieces 308a can be supported with its projecting piece 301A.

Additionally, if three or more fixed contacts 308 are provided, two each of adjacent fixed contacts 308 can be sequentially switched on and off with movable contact 307, enabling the present invention to be used as a switching slide switch.

Furthermore, the portions in Fig. 1C indicated with the reference numeral 308c enable positioning and orientation of fixed contacts 308 to be performed reliably by aligning the V-shaped notches or holes with pins 301b of the above-mentioned base 301.

The following provides an explanation of a fourth embodiment of the present invention with reference to the drawings.

To begin with, as shown in Fig. 1D, the basic constitution of the fourth embodiment of the present invention consists of knob 404 protruding to the outside as shown in Fig. 2D from slot 403 continuous with recess 402 of insulating base 401 formed from plastic in the shape of a hollow rectangle, and movably providing sliding body 405, made of plastic and so forth, within recess 402 of the above-mentioned insulating base 401.

In addition, upper edge grooves 401B are opened in the upper edge of insulating base 401 to insert projections 408d of fixed contacts 408.

Movable contact 407, having a pair of temporary locking legs 407a, is resiliently provided as shown in Fig. 2D within recess 405a opened in the outer surface of this sliding body 405 by means of resilient spring 406 such as a coil spring.

Moreover, a plurality of fixed contacts 408, made of metal strips which make sliding contact with the outer surface of this movable contact 407, are arranged in parallel as shown in Fig. 4D by means of positioning grooves 402a and pins 402b provided on the upper edge of the above-mentioned insulating base recess 402. A slide switch can then be composed by covering its outer surface with insulating plate 409, fastened with screws in screw holes n to base 401 as shown in Figs. 3D and 5D.

In the present invention, the back half of each of the above-mentioned fixed contacts 408 or at least one of said fixed

contacts 408 is bent in advance into the shape of the letter "U" as shown in Fig. 1D. The ends, after going through its rising support pieces 408a, form plugs 408b, and projections 408d are formed on the lower ends of rising support pieces 408a.

Fixed contacts 408 are temporarily fixed by tightly fitting the above-mentioned projections 408d into upper edge grooves 401b of base 401 in opposition to resilient spring 406.

The back surfaces of rising support pieces 408a are supported with recess grooves 409a formed in plug cover 410 as shown in Figs. 3D and 4D.

The periphery of the above-mentioned plugs 408b is protected by covering with plug cover 410 formed into a single structure with insulating plate 409 as shown in Figs. 3D and 5D.

Accordingly, the slide switch according to the present invention can be composed wherein rising support pieces 408a are securely clamped by recess grooves 409a formed in plug cover 410.

In addition, the position of each fixed contact 408 is restricted by inner grooves 409b of insulating plate 409. Moreover, with respect to the means of fixing insulating plate 409 with respect to base 401, insulating plate 409 can be attached to base 401 by any known fixing means such as by hooking resilient tab 409c shown with the broken line in Fig. 1D on the upper edge of side wall recess 401b of base 401 with its resiliency.

Furthermore, in order to conceal the entire outer surface of

fixed contacts 408 with insulating plate 409, overhang 401c is provided protruding from the side of insulating base 401 as shown in Figs. 6D and 7D. Together with being able to protect plugs 408b by covering with plug cover 410, the entire outer surface of fixed contacts 408 can be protected as a result of being concealed by insulating plate 409.

The following provides an explanation of a fifth embodiment of the present invention with reference to the drawings.

To begin with, as shown in Fig. 1E, the basic constitution of the fifth embodiment of the present invention consists of knob 504 protruding to the outside as shown in Fig. 2E from slot 503 continuous with recess 502 of insulating base 501 formed from plastic in the shape of a hollow rectangle, and movably providing sliding body 505, made of plastic and so forth, within recess 502 of the above-mentioned insulating base 501.

In addition, upper edge grooves 501B are opened in the upper edge of insulating base 501 to insert projections 508d of fixed contacts 508.

Movable contact 507, having a pair of temporary locking legs 507a, is resiliently provided as shown in Fig. 2E within recess 505a opened in the outer surface of this sliding body 505 by means of resilient spring 506 such as a coil spring.

Moreover, a plurality of fixed contacts 508, made of metal strips which make sliding contact with the outer surface of this movable

contact 507, are arranged in parallel as shown in Fig. 4E by means of positioning grooves 502a and pins 502b provided on the upper edge of the above-mentioned insulating base recess 502. A slide switch can then be composed by covering its outer surface with insulating plate 509, fastened with screws in screw holes n to base 501 as shown in Figs. 3E and 5E.

In the present invention, the back half of each of the above-mentioned fixed contacts 508 or at least one of said fixed contacts 508 is bent in advance into the shape of the letter "L" as shown in Fig. 1E. The ends after going through its rising support pieces 508a are again bent forward into the shape of the letter "L" to form plugs 508b in the form of a single vertical letter. Projections 508d are then formed on the lower ends of rising support pieces 508a.

Fixed contacts 508 are temporarily fixed by tightly fitting the above-mentioned projections 508d into upper edge grooves 501b of base 501 in opposition to resilient spring 506.

The back surfaces of rising support pieces 508a are supported with recess grooves 509a formed in plug cover 510 as shown in Figs. 3E and 4E.

The periphery of the above-mentioned plugs 508b is protected by covering with plug cover 510 formed into a single structure with insulating plate 509 as shown in Figs. 3E and 5E.

Accordingly, the slide switch according to the present invention

can be composed wherein rising support pieces 508a are securely clamped by recess grooves 509a formed in plug cover 510.

The sixth embodiment of the present invention is an application of the first through fourth embodiments. As shown in Figs. 13, 14, 15 and 16, the basic constitution consists of providing a movable conductor 107a, such as a steel ball, within recess 105a opened in the outer surface of sliding body 105 via resilient spring 106 such as a coil spring.

A plurality of fixed contacts 108, made of metal strips that straddle the outer surface of this movable conductor 107A, are arranged in parallel by means of known positioning means such as positioning grooves 102a and pins 102b provided on the upper edge of the above-mentioned insulating base recess 102. As a result of orienting these fixed contacts 108 by covering the outer surface with insulating plate 109, which is fastened with screws in screw holes n to base 101, movable conductor 107A, such as a steel ball, is made to drop into the gap between two fixed contacts 108, thus being able to compose a slide switch in which continuity is made between each fixed contact 108.

Furthermore, in the case of desiring to turn the switch turn on by making movable conductor 107A fall into the gap between two fixed conductors 108 without forming curved projections 108A in fixed contacts 108, a gap is naturally formed in which movable

conductor 107A falls between two fixed contacts 108.

A seventh embodiment of the present invention is also an application of the first through fourth embodiments. As shown in Figs. 18 through 27, the basic constitution enables the insertion direction of the plug-in jack to be set as desired by changing the bending pattern of fixed contacts 608 in the form of metal strips, and composing a matching plug cover.

As a result of being composed as explained above, the present invention offers the advantages as described below.

In the case of the first embodiment, fixed contacts 108 and plugs 108b are respectively positioned and fixed by inserting rising support pieces 108a into base projecting piece grooves 101a. Moreover, fixed contacts 108 can be oriented by inner grooves 109a of a switch cover in the form of insulating plate 109 or by upper edge grooves 102a of base recess 102. In addition, plugs 108b can be protected with a plug cover.

Thus, since there is no inadvertent movement of fixed contacts 108 by an external disturbance such as sliding friction caused by movable contact 107, and plugs 108b do not become loose during insertion and removal of a separately provided plug-in jack and so forth, together with being able to maintain good contact for a long time, fixed contacts 108 can be connected in a single operation to another location via jack J, thereby improving ease

of use and enabling assembly wherein all members are aligned from a single direction. Thus, the present invention offers numerous advantages including being able to promote automated production and enabling high-quality and uniform products to be supplied with stability and in large volume.

Since rising support pieces 108a are provided by bending fixed contacts 108 into the shape of the letter "U" and extending to the side of base recess 102, the present invention offers the additional advantage of being able to protect fixed contacts 108 by concealing the entirety of base recess 102 with insulating plate 109, including the entire outer surfaces of fixed contacts 108.

The present invention offers the additional advantage of being able to fix insulating plate 109 to insulating base 101 in a single operation without using screws.

Since rising support pieces 208a and plugs 208b, which are provided in the form of a single structure on fixed contacts 208a of the slide switch, are in the form of a single vertical letter as viewed from the direction of jack insertion, plugs 208b are not inadvertently bent or warped due to insertion and removal of the jack or external disturbances. Moreover, since the bases of plugs 208b can be positioned by the edges of vertical grooves 210a of guide piece 210 for guiding insertion of plug-in jack J (Fig. 3B) while also being able to reinforce said plugs 208b in

the direction of thickness, the present invention offers a first advantage of being able to improve electrical reliability. Moreover, since fixed contacts 208 themselves are embedded in fixed contact positioning grooves provided in base projecting pieces 202 and in the opposing surfaces of base 201 or insulating plate 209, and are rigidly positioned by screws or other known orienting means, there is no inadvertent movement of fixed contacts 208 by an external disturbance such as sliding friction caused by movable contact 207. Thus, the present invention offers a second advantage of enabling insertion and removal to be performed favorably at all times while also being able to maintain electrical contact.

Fixed contacts 308 and plugs 308b are respectively and securely positioned and fixed by clamping rising support pieces 308a between base projecting piece 301A and projecting piece 309A of insulating plate 309 fixed by covering the edge of the opening of base 301. Moreover, fixed contacts 308 can be oriented by inner surface grooves 309a of the switch cover in the form of insulating plate 309 or upper edge grooves 302a of base recess 302. In addition, plugs 308b can be protected with a plug cover. Thus, since there is no inadvertent movement of fixed contacts 308 by an external disturbance such as sliding friction caused by movable contact 307, and plugs 308b do not become loose during insertion and removal of a separately provided plug-in jack and

so forth, together with being able to maintain good contact for a long time, fixed contacts 308 can be connected in a single operation to another location via jack J, thereby improving ease of use and enabling assembly wherein all members are aligned from a single direction. Thus, the present invention offers numerous advantages including being able to promote automated production and enabling high-quality and uniform products to be supplied with stability and in large volume.

In the case of the fourth and fifth embodiments of the present invention, since rising support pieces 408a and 508a of bent fixed contacts 408 and 508 are supported by being clamped with clamping grooves 409A and 509A composed in the plug cover itself, the structure of base 401 is able to be simplified.

In addition, lower projections 408d and 508d are provided on fixed contacts 408 and 508, and grooves 401B and 501B, into which those lower projections 408d and 508d are tightly fit, are provided on the upper edge of the base. Since fixed contacts 408 and 508 are able to be temporarily fixed by fitting those lower projections 408d and 508d into upper edge grooves 401B and 501B in opposition to resilient springs 406 and 506, the present invention offers the advantage of making assembly of the slide switch easier.

In the case of the sixth embodiment, fixed contacts 108 and plugs

108b are respectively reinforced by firmly positioning rising support pieces 108a by engaging the wide portions of the above-mentioned rising support pieces 108a in side grooves 101a, having roughly the shape of the Greek letter "&P", formed in base projecting piece 101A. Moreover, fixed contacts 108 can be embedded either in fixed contact embedding grooves 109b in the inner surface of the switch cover in the form of insulating plate 109, or in upper edge grooves 102a of base recess 102, or by other orienting means.

Thus, since there is no inadvertent movement of fixed contacts 108 by an external disturbance such as sliding friction caused by movable contact 107 such as a steel ball, and fixed contacts 108 and plugs 108b are not inadvertently moved during insertion and removal of a separately provided plug-in jack and so forth, the present invention offers the advantage of being able to maintain good contact and operation during jack insertion and removal for a long time.

In particular, since movable conductor 107A of knob operation is in the form of a ball, as a result of said ball resiliently falling in the gap between each fixed contact 108 integrated into a single narrow conducting strip, as well as the gap between curved projections 108A, the operation of the knob as a slide switch is given a clicking action, or in other words, a snapping action. Thus, together with enabling knob operation having a

reliable clicking action, the present invention also offers the advantage of improved precision of control as a switch.

CLAIMS:

1. A slide switch comprising a housing, the housing including a hollow, upwardly-open insulating base in the lower wall of which is formed a slot communicating into the interior of the base, and an insulating plate covering the hollow interior of the base, the switch further comprising a sliding body within the base and including a knob protruding through said slot whereby said body can be slid relative to the base, a plurality of electrical contacts within the housing, each contact including a portion extending transversely of, and fixed within, the base, and an electrical conductor mounted on, to be moveable with, the sliding body within the base and resiliently urged towards, to make selective engagement with, said transverse portions of the contacts, at least one of the contacts further including an upstanding, plate-like support portion, the housing having formed therein, for the or each support portion, a corresponding groove into which the associated support portion is located, opposed faces of said support portion being bounded at least in part by opposed surfaces of said groove whereby the or each contact is positively supported in the housing, and, extending from said support portion, a plug which projects from the base, the insulating plate having integrally formed therewith a guide member which surrounds the or each plug and provides a guide for locating an associated jack on the or each plug.

2. A slide switch as claimed in claim 1 in which the at least one fixed contact is bent into a substantially U-shape the upstanding base of which comprises said support portion of the contact and is located in, to be supported by, an associated groove in the insulating base, the guide member comprising a cover in which the or each plug is housed.

3. A slide switch as claimed in claim 1 in which the upstanding support portion and the plug together comprise an L-shaped portion which is narrower than said transverse portion in the plane of the insulating plate, the guide member including a back plate upstanding from the insulating plate and in which is formed, for said at least one fixed contact, an upstanding groove for receiving therein, to locate, said upstanding support portion of the contact.

4. A slide switch as claimed in claim 2 or claim 3 in which the at least one fixed contact is bent such that the plug thereof is located to the side of the insulating base.

5. A slide switch as claimed in claim 1 in which the at least one fixed contact is bent into a substantially U-shape the base of which comprises the upstanding support portion, the insulating base including a projecting piece upstanding from the top edge thereof, and the insulating plate including a projecting piece integral therewith and depending therefrom to overlap said projecting piece on the base, the support portion of the at least one fixed contact being clamped between the projecting pieces on the base and on the plate, the guide member comprising a cover in which the at least one plug is housed.

6. A slide switch as claimed in claim 5 in which the upstanding support portion of the at least one fixed contact, and the projecting pieces on the base and the plate are all located to the side of the insulating base.

7. A slide member as claimed in any one of claims 1 to 6 in which the insulating base includes one or more recesses in the sidewalls thereof, and the insulating plate includes one or more resilient tabs for co-operation with said recesses to retain the plate on the base.

8. A slide switch as claimed in claim 1 in which the at least one fixed contact is bent into a substantially U-shape the base of which comprises the upstanding support portion, the guide member having formed therein, for the at least one fixed contact, an upstanding groove in which the upstanding support portion of the associated fixed contact is located to be supported thereby.

9. A slide switch as claimed in claim 8 in which the at least one fixed contact is provided with a depending projection thereon, the base having, for the or each fixed contact, a groove formed in the upper edge thereof into which the projection on the associated fixed contact is a tight fit against resilient means urging the electrical conductor

towards engagement with the at least one fixed contact.

10. A slide switch as claimed in any one of claims 1 to 9 in which the electrical conductor comprises a spherical ball.