

Description

This invention relates to handle operating switches and, more particularly, to a switch the switching operation of which is realized by such depressing action as a piano-key touch operation of a handle of the switch, according to the preamble of claim 1.

The handle operating switches of the kind referred to are installed on housing interior wall or the like for effective utilization in ON and OFF control of lighting fixtures and any other loads.

The known handle operating switches generally comprise a casing and a switch on-off means provided in the casing, in which switch on-off means a movable contact is provided to a movable contactor mounted rockably with its lower portion made as a fulcrum for switching on and off operation with respect to a stationary contact provided to a stationary terminal plate through turning operation of the movable contactor, the switch on-off means is operated through a handle member disposed for seesaw motion, that is, a rocking motion, and the movable contactor is thereby actuated to be turned for switching on and off the stationary and movable contacts. In the handle operating switch of the foregoing arrangement, however, there has been a problem that a designing restriction arises due to an inherent difference in stationary positions after every on or off operation of the handle. That is, the handle is required to be rocked from one position to the other upon every operation of the switch, and an improvement in the operation ability has been demanded.

In U.S. Patent No. 3,576,962 to Jean-Pierre Edmond Nicolas, on the other hand, there has been disclosed a push contact device in which an operating plate is placed on top side of a base plate, a metal plate is attached to a pushrod connected to the operating plate which a first terminal is connected to an end of the metal plate, a stirrup movable member is carried on the other end of the metal plate, and a movable contact engageable with and disengageable from a second terminal is provided to the movable member, so that the contact on and off operation relying not on the seesaw movement but on a depressing operation of the operating plate may be realized. With this contact on and off arrangement, however, the movable contact is arranged not for alternate on and off operation with respect to opposing stationary contacts and the pushrod is coupled to the center of the operating plate, so that it will be required to depress the entire body of the operating plate so as to render the operation ability to be troublesome.

GB-A-1 390 759 discloses a handle operating switch according to the preamble of claim 1. In this known switch the longitudinal direction of the rocker extends transverse to the depressing direction of the push button. The movable contacts are projecting

from the longitudinal ends of the rocker. A separate coil spring is provided for biasing a rocker actuator carriage.

A primary object of the present invention is, therefore, to provide a handle operating switch that can realize the on-off operation with a depressing action of a handle having constantly the same stationary position always in the same direction such as the piano-key touching action, can restrain any restriction in the design, and can improve the operation ability.

According to the present invention, this object can be realized by a handle operating switch according to the preamble of claim 1 and having the characterising features of claim 1.

Other objects and advantages of the present invention will be made clear by the description of the invention detailed in the followings with reference to preferred embodiments shown in accompanying drawings.

FIGURE 1 shows in a perspective view a handle operation switch according to the present invention, as disassembled into main components;

FIG. 1A is a reverse side perspective view of a piano handle of the switch shown in FIG. 1;

FIG. 2 is a perspective view of a switch body of the switch shown in FIG. 1, as disassembled into constituent parts;

FIGS. 3 and 4 are explanatory views in cross-sectional views for the operation of the piano handle in the switch of FIG. 1;

FIGS. 5, 7, 9 and 11 are cross-sectional views of a part of the switch body in the switch of FIG. 1 for showing respectively different operating states in the switch body;

FIGS. 6, 8, 10 and 12 are bottom plan views of the push handle with the slide cam means assembled with the handle for showing respectively different operating states thereof each of which corresponding to each state of FIGS. 5, 7, 9 and 11;

FIG. 13 is a schematic explanatory view for the relationship of the switch body to the mounting frame and piano handle in the switch shown in FIG. 1;

FIG. 14 is a schematic plan view of the switch shown in FIGS. 1 and 13;

FIG. 15 is a schematic explanatory view for the relationship of the switch body to the mounting frame and piano handle in another working aspect of the handle operating switch according to the present invention;

FIG. 16 is a schematic plan view of the switch shown in FIG. 15;

FIG. 17 is a schematic explanatory view for the relationship of the switch body to the mounting frame and piano handle in a further working aspect of the switch according to the present invention;

FIG. 18 is a schematic plan view of the switch shown in FIG. 17;

FIG. 19 is a more detailed plan view of the switch shown in FIG. 17;

FIG. 20 is a side view of the switch shown in FIG. 17 or 19 with the switch bodies omitted;

FIG. 21 is a detailed plan view in still another working aspect of the handle operating switch according to the present invention;

FIG. 22 shows in a cross-sectional view the handle operating switch in another embodiment of the present invention;

FIG. 23 shows in a perspective view as disassembled the switch shown in FIG. 22;

FIG. 24 is a diagram showing an indicator circuit employed in the switch shown in FIG. 22;

FIG. 25 is a detailed plan view in another working aspect of the handle operating switch in the embodiment of FIG. 22;

FIG. 26 is a side view of the switch shown in FIG. 25 with the switch bodies omitted; and

FIG. 27 is a detailed plan view in still another working aspect of the handle operating switch according to the present invention.

While the present invention shall now be detailed with reference to the embodiments shown in the accompanying drawings, it should be appreciated that the intention is not to limit the invention only to these embodiments but rather to include all modifications, alterations and equivalent arrangements possible within the scope of appended claims.

Referring to FIGS. 1 to 4, there is shown a handle operating switch 10 according to the present invention, in which a switch body 12 operated to be switched on and off by a push handle 11 is included. This switch body 12 is formed in a module type, that is a number of the switch bodies 12 are provided to be in the same dimensions, and the switch 10 is provided to be capable of accommodating, as required, a plurality of the switch bodies 12 such as three, for example, as shown in the drawings, in the instance of which a mounting of the switch body 12 to a mounting frame 13 is realized by engaging two pairs of engaging projections 14, 14a and 14b, 14c formed at upper position of both longitudinal end faces of the body 12 (only a pair on one end side are shown in FIG. 1) into any opposing two pairs of engaging slots or holes 15, 15a and 16, 16a; 17, 17a and 17b, 17c; and 19, 19a and 20, 20a provided in opposing side edge arms of the mounting frame 13. When, for example, only one switch body 12 is to be mounted to the mounting frame 13, the engaging projections 14-14c of the switch body 12 are to be engaged in central pairs of the engaging slots 17, 17a and 18, 18a of the mounting frame 13.

In top side face at one of the longitudinal ends of the switch body 12, an engaging recess 21 is provided while on the other end side top face an engaging pivot

part 22 is provided, and a piano handle 23 is mounted onto the switch body 12 by engaging projections 24 of the handle 23 into the recess 21 and a pivoting projection 25 of the handle 23 in the engaging pivot part 22 of the body 12. When, in this case, one side having the projections 24 of the piano handle 23 is depressed to be rotated with the other side having the pivoting projection 25 of the handle 23 made as a fulcrum and with the projections 24 caused to slide in the recess 21, the push handle 11 of the switch body 12 is depressed by the piano handle 23 through its optimally designed inner surface, and a switching operation with respect to the switch body 12 is carried out. While a resetting force against the depression of the piano handle 23 is provided simultaneously upon resetting action of the push handle 11, on the other hand, any further resetting motion than required of the piano handle 23 can be restrained by means of hook-shaped tip ends of the engaging projections 24 of the piano handle 23, the tip ends engaging a locking edge of the engaging recess 22, so that the piano handle 23 can be reset always to the same non-actuated position.

The switch body 12 comprises a hollow housing 26 formed by a synthetic resin and consisting of top and base housing parts 27 and 28, which are assembled together by means of engaging strips 29, 29a, 29b and 29c extended from the top housing part 27 and respectively having each of engaging slots 30, 30a, 30b and 30c (only three of them are shown in FIG. 2), the strips 29-29c being engaged to engaging projections 31, 31a, 31b and 31c projected on both side walls of the base housing part 28 (only two of these projections are seen in FIG. 2). The foregoing engaging projections 14-14c of the switch body 12 are provided to the top housing part 27 for the mounting of the body 12 to the mounting frame 13, and the foregoing engaging recess 21 is also provided in the top housing part 27 at the one end part having the engaging projections 14 and 14a so that the recess 21 existing as a vacancy will provide to the end part a resiliency effective to render the mounting engagement of the projections 14 and 14a into the slots of the mounting frame 13 smoothly realizable. Further, the top housing part 27 is provided with a top-open chamber 34 for receiving therein the push handle 11 to be movable vertically, i.e., toward and away from bottom wall of the chamber 34, which chamber having in opposing side walls engaging recesses 33 for receiving engaging projections 32 made at longitudinal ends of the push handle 11 and, in the bottom wall, bearing grooves 35 for receiving a later described turning handle.

The base housing part 28 is formed to have at both longitudinal ends connecting terminal receiving sections 35 and 36, received in one section 35 of which are common terminal plate 37, locking springs 38 and 38a and releasing button 39, while in the other

section 36 of which a first connecting terminal assembly of a terminal plate 40 and locking spring 41 as well as a second connecting terminal assembly of a terminal plate 42 and locking spring 43 are disposed together with a release button 44 acting commonly to the first and second connecting terminal assemblies. Between the both connecting terminal receiving sections 35 and 36, further, there is defined a central receiving section 45.

In the present instance, the terminal plate 40 of the first connecting terminal assembly disposed in the other receiving section 36 is extended at an end along an inner side wall of the central receiving section 45 and is then bent toward the center of the section 36 so that this extended end will lie along a support stud 48 on the one end side of the central receiving section 45, and a stationary contact 49 is secured to tip end portion of the extended end of the terminal plate 40. At base part of the terminal plate 40, further coupling strips 51 are provided for embraceably engaging an end part of a support stud 50 disposed to oppose the foregoing support stud 48 in the central receiving section 45 on one lateral side thereof. The terminal plate 42 of the second terminal assembly is formed to ride astride on a further support stud 50a made in the central receiving section 45 on the other lateral side thereof and to have an extended end bent to oppose the extended tip end of the terminal plate 40 having the stationary contact 49, and a further stationary contact 52 is secured to the extended end of the plate 42 to oppose the contact 49.

Further, the inner frame 47 is formed to include an erected wall having a recess (not shown), in which a movable terminal plate 53 as a switch on-off means is freely engaged specifically at a projection 54 of the plate 53, so that the movable terminal plate 53 will be rockable for an angular range defined by a rock-allowing angle of the recess. This movable terminal plate 53 is formed by a conducting material and is brought into contact at a lower end with a conducting bearing plate part 56 made integral with the common terminal plate 37 and disposed between the both support studs 48, 50 and 50a of the central receiving section 45, and a movable contact 57 is secured to upper end part of the movable terminal plate 53 so that, as the movable terminal plate 53 rocks with the lower end made as the fulcrum, the movable contact 57 will achieve the switch on and off operation with each of the stationary contacts 49 and 52 of the terminal plates 40 and 42.

The switch on-off means comprising the movable terminal plate 53 is interlocked with the turning means which comprises a coil spring 58, turning handle 59 and slide cam means 60 disposed along the inner face of the push handle 11. In this case, the coil spring 58 is engaged at one end to an upward projection 61 of the movable terminal plate 53 and inserted at the other end into a downward opened axial hole

of the turning handle 59 of a cylindrical shape, so as to provide to the movable terminal plate 53 such turning action in response to a rocking motion of the turning handle 59 as will be described later. The turning handle 59 per se is disposed to project, through an aperture 62 made in the bottom wall of the chamber 34 of the top housing part 27, into this chamber 34 while engaging a pair of triangular shaft projections 63 formed on opposing both sides of the cylindrical shape freely into the bearing grooves 35 of the top housing part 27. A rectangular portion is formed at the top of the turning handle 59, and a pair of engaging projections 64 and 64a are provided to be erected at both longitudinal ends of the rectangular top portion in a direction perpendicular to projecting direction of the shaft projections 63.

The slide cam means 60 is formed substantially into a frame of rectangular shape, preferably with such thermoplastic resin as polyacetal high in the elasticity, and a pair of camming projections 65 and 65a are provided to both opposing side edges of the rectangular frame shape to be slidably engageable with the engaging projections 64 and 64a at the top of the turning handle 59. Further, the slide cam means 60 includes a pair of resilient strips 66 and 66a integrally extended inside the frame shape from one side to the other opposing side while transversing the direction in which the camming projections 65 and 65a are provided to oppose and gradually approaching each other at extended ends. The push handle 11 is provided in the center of the inner surface with a projection 67 which is held between the resilient strips 66 and 66a so that, upon sliding of the slide cam means 60 in either direction in which the camming projections 65 and 65a are opposing, a resetting force will be provided by the resilient strip 66 or 66a to the means 60 with respect to the projection 67. Further, a resetting spring 68 is disposed between the push handle 11 and the bottom of the chamber 34 of the top housing part 27, and this spring 68 is formed preferably in such that the spring 68 is coupled at a central top portion to the push handle 11 and resiliently engages at both side legs with the bottom of the chamber 34 while the legs are gradually opened in downward direction away from the push handle 11, whereby the push handle 11 and eventually the piano handle 23 are constantly urged upward, away from the switch body 12.

Referring next to the operation of the handle operating switch according to the present invention, a depression of the push handle 11 against the resilient force of the resetting spring 68 through the depression of the piano handle 23 on its side having the engaging projections 24 in a position shown in FIGS. 5 and 6 causes the slide cam means 60 also to be pushed down, upon which the camming projection 65a on one side of the slide cam means 60 engages at a part of its inside slope with the engaging projection 64a at

one end top portion of the turning handle 59 in a state tilted on one side in such position shown in FIGS. 7 and 8. As the push handle 11 is further depressed in response to the depression of the piano handle 23, the engaging projection 64a of the turning handle 59 is displaced to have eventually the turning handle 59 rocked so that, when the coil spring 58 moves beyond its dead point, the turning handle 59 will be turned to a position shown in FIGS. 9 and 10, accompanying which the movable terminal plate 53 interlocked with the turning handle 59 through the coil spring 58 is also caused to rockingly turn, so that the movable contact 57 of the movable terminal plate 53 will be separated from the stationary contact 52 with which the movable contact 57 has been in the contact closing state but will be brought into the contact closing state with the other opposing stationary contact 49, and the switching action is thereby carried out.

In the foregoing structure, the distance between the engaging projections 64 and 64a of the turning handle 59 as well as the distance between the engaging camming projections 65 and 65a are so set that, when the slide cam means 60 slides while engaging at one of the camming projections 65 and 65a with one of the engaging projections 64 and 64a of the turning handle 59, the other of the camming projections 65 and 65a is positioned on inner side of the other of the engaging projections 64 and 64a, so as to smoothly and reliably execute the switch on and off operation, whereby the engaging projections 64 and 64a of the turning handle 59 are displaced in counter-clockwise direction as shown in FIGS. 5, 7 and 9 following the rocking motion of the turning handle 59 due to the depression of the push handle 11, and the camming projections 65 and 65a interlocked with the engaging projections 64 and 64a are caused to slide against the resilient force of the resilient strip 66 or 66a in leftward direction in the drawings, as shown in FIGS. 5, 7 and 9. In the present instance, even in an event of an upward movement of the other one of the engaging projections 64 and 64a upon a turning of the handle 59 beyond its level position, the slide cam means 60 still slides in the leftward direction so as not to hinder the turning handle 59 from rockingly turning. Since the slide cam means 60 is provided to involve no frictional resistance upon the sliding, further, the turning handle 59 and slide cam means 60 are assured to achieve their mutual operation in smooth manner.

When the depressing force of the piano handle 23 is released after the foregoing turning operation, the push handle 11 and piano handle 23 are reset to the original position by means of the resilient force of the resetting spring 68 as shown in FIGS. 11 and 12, and the slide cam means 60 is also caused to slide to be reset to the original position by the resilient force of the resilient strips 66 and 66a.

When the piano handle 23 is depressed again on

the side of the engaging projections 24, the above described operation is carried out in reverse manner, so that the movable terminal plate 53 is rocked to carry out the contact switching operation, and the movable contact 57 is separated from the stationary contact 49 and brought into contact closing state with the other stationary contact 52.

In the foregoing embodiment, the description has been made to that, as schematically shown in FIGS. 13 and 14, the single switch body 12 of the modular type is mounted to the center of the mounting frame 13 adapted to concurrent mounting of three of the module type switch bodies, and also the single piano handle 23 of a relatively large size is employed for the switch on and off operation, but the dimension of the mounting frame 13, number of the switch body to be mounted and number or size of the piano handle are selectable as required. As shown in FIGS. 15 and 16, for example, the mounting frame 13A is provided for concurrent mounting of the two module type switch bodies 12A and 12A1, while the piano handle may be divided into two handles 23A and 23A1 in correspondence with the number of the switch bodies 12A and 12A1. Further, it is also possible, as shown in FIGS. 17 and 18, to concurrently mount three of the module type switch bodies 12B, 12B1 12B2 to the same mounting frame 13B, together with three-divided piano handles 23B, 23B1 and 23B2 corresponding to the three switch bodies.

While in the foregoing embodiment, on the other hand, the switch has been referred to as comprising only the switch body 12, mounting frame 13 to which the switch body 12 is mounted, and the piano handle 23 mounted to the switch body, it will be preferable, so long as the mounting frame 13 generally formed by a metal is deemed not acceptable in the appearance, to employ additionally such an ornamental plate 70 as shown in FIGS. 19 and 20, which is made of a synthetic resin to have an aperture 69 for disposing therein three, for example, of the piano handles 23C, 23C1 and 23C2 and is mounted also to the mounting frame 13 by means of screws or the like so as to cover the frame 13.

The dimension and arrangement of the switch body 12, mounting frame 13 and piano handle 23 may be modified as shown in FIG. 21, in which event two relatively smaller piano handles 23D and 23D1 are jointly mounted to a square shaped mounting frame, together with a relatively larger rectangular piano handle 23D2 disposed on a side of the handles 23D and 23D1 in a direction perpendicular to a direction in which the two handles 23D and 23D1 are arranged, and an ornamental plate 70D is fitted over the frame to surround the handles.

According to another feature of the present invention, the handle operating switch is provided with a function of indicating the operating state of the switch. Referring to FIGS. 22 and 23, there is shown

another embodiment of the present invention, in which the top housing part 127 is provided with an indicator 200 adjacent the chamber 134. The indicator 200 generally comprises an indicator compartment 201 and a printed circuit board 202 on which such indicator circuit as shown in FIG. 24 is mounted. In FIG. 24, there is shown an internal circuit of one of the switch bodies forming a three-way switch with two of the switch bodies, in which a luminous diode 204 with which a counter-electromotive-force preventing diode 203 is connected in parallel is inserted on secondary side of a current transformer 146 connected between the common terminal plate 137 and the conducting support plate 156, and an ON indication of load of the switch body 112 is thereby carried out. On the other hand, a neon tube 207 to which resistors 205 and 206 are connected is inserted between the terminal plates 140 and 142 to which the stationary contacts are secured, so that an OFF indication of the load connected to the switch body 112 can be carried out by this neon tube 207. In the present instance, the connection of the circuit board 202 to the terminal plates 140 and 142 may be realized by means of resilient contactors 208 and 208a connected at one end to the printed circuit board 202 and resiliently contacted at the other end with the terminal plates 208 and 208a.

The indicator compartment 201 is opened on top side to form an aperture 209, the luminous diode 204 and neon tube 207 are disposed inside the aperture 209, and preferably a light permeating cover 210 is fitted to the aperture 209, so that the operating state of the handle operating switch will be readily visible constantly through the cover 210. It should be appreciated that, in the event where the load connected to the switch is a lighting equipment, the foregoing arrangement will function as a firefly-glimmer-like pilot lamp lighting in the dark when the lighting equipment is turned off. In the embodiment of FIGS. 22 and 23, further, the base housing part 128 is expanded at the bottom of the central receiving section 145 for receiving therein a current transformer 146, and an inner frame 147 is disposed at a position above the current transformer 146 and corresponding to the position of the bottom plate of the base housing part 28 in the foregoing embodiment. This inner frame 147 is provided with the support studs 148 and 150 for seating therealong the terminal plates 140 and 142, and with a lateral stud having in a side face a V-shaped recess 155 for freely rockably engaging therein a projection 154 of the movable terminal plate 153. The conducting bearing plate part 156 is formed as divided from the common terminal plate 137 but as connected thereto, for rockably bearing thereon the movable terminal plate 153. In the arrangement of FIGS. 22 and 23, other constituent parts are the same as those in the embodiment of FIGS. 1-4 and are denoted by the same reference numerals as those used in FIGS. 1-

4 but as added by 100.

In the handle operating switch having the indicating function as shown in FIGS. 22 and 23, too, the size of the mounting frame, number of the switch body to be mounted to the frame and size and number of the piano handle as well as the use of the ornamental plate having the aperture for disposing therein the piano handle or handles may be properly selected as required. As shown in FIGS. 25 and 26, for example, the arrangement may take an aspect of disposing three of the piano handles 123C, 123C1 and 123C2 within the aperture 169 of the ornamental plate 170, in the same manner as in the aspect of FIGS. 19 and 20, except for an additional provision of the light permeating portions 221A, 221A1 and 221A2 corresponding in the position to the light permeating covers of the indicators of the respective switch bodies on the side of the pivoting side of the respective piano handles 123C, 123C1 and 123C2. Alternatively, as shown in FIG. 27, the arrangement may be in an aspect of the two relatively smaller piano handles 123D and 123D1 arranged in two stages and the one relatively larger piano handle 123D2 arranged on a lateral side of the above two while all the three handles are disposed in the ornamental plate 170D. Also in this aspect, the respective piano handles 123D, 123D1 and 123D2 are provided with the light permeating portions 221B, 221B1 and 221B2 at positions corresponding to the light permeating covers of the indicators in the switch bodies.

Claims

1. A handle operating switch comprising a switch body (12) having a housing (27,28), a pivotable contact support (53) having a movable contact (57) and rockable for engagement and disengagement of said movable contact (57) with and from opposing stationary contacts (49,52), and means for turning the contact support (53) upon urging into a depressed position of a push button (11) biased by a resetting spring (68) to a non-depressed position, said turning means including a rocker (59) coupled to the contact support (53) and provided on a side opposing the push button with a pair of mutually opposing engaging projections (64,64a), a coil spring (58) providing to the rocker (59) a resilient snap action, and a sliding cam (60) disposed on an interior surface of the push button (11) to be slidable from a neutral position in a direction transverse to depressing direction of the push button, said sliding cam (60) being provided with a pair of mutually opposing engaging cam parts (65,65a) and with a resilient resetting means (66) for biasing the sliding cam towards the neutral position, and said engaging cam parts (65,65a) being mutually opposed

another embodiment of the present invention, in which the top housing part 127 is provided with an indicator 200 adjacent the chamber 134. The indicator 200 generally comprises an indicator compartment 201 and a printed circuit board 202 on which such indicator circuit as shown in FIG. 24 is mounted. In FIG. 24, there is shown an internal circuit of one of the switch bodies forming a three-way switch with two of the switch bodies, in which a luminous diode 204 with which a counter-electromotive-force preventing diode 203 is connected in parallel is inserted on secondary side of a current transformer 146 connected between the common terminal plate 137 and the conducting support plate 156, and an ON indication of load of the switch body 112 is thereby carried out. On the other hand, a neon tube 207 to which resistors 205 and 206 are connected is inserted between the terminal plates 140 and 142 to which the stationary contacts are secured, so that an OFF indication of the load connected to the switch body 112 can be carried out by this neon tube 207. In the present instance, the connection of the circuit board 202 to the terminal plates 140 and 142 may be realized by means of resilient contactors 208 and 208a connected at one end to the printed circuit board 202 and resiliently contacted at the other end with the terminal plates 208 and 208a.

The indicator compartment 201 is opened on top side to form an aperture 209, the luminous diode 204 and neon tube 207 are disposed inside the aperture 209, and preferably a light permeating cover 210 is fitted to the aperture 209, so that the operating state of the handle operating switch will be readily visible constantly through the cover 210. It should be appreciated that, in the event where the load connected to the switch is a lighting equipment, the foregoing arrangement will function as a firefly-glimmer-like pilot lamp lighting in the dark when the lighting equipment is turned off. In the embodiment of FIGS. 22 and 23, further, the base housing part 128 is expanded at the bottom of the central receiving section 145 for receiving therein a current transformer 146, and an inner frame 147 is disposed at a position above the current transformer 146 and corresponding to the position of the bottom plate of the base housing part 28 in the foregoing embodiment. This inner frame 147 is provided with the support studs 148 and 150 for seating therealong the terminal plates 140 and 142, and with a lateral stud having in a side face a V-shaped recess 155 for freely rockably engaging therein a projection 154 of the movable terminal plate 153. The conducting bearing plate part 156 is formed as divided from the common terminal plate 137 but as connected thereto, for rockably bearing thereon the movable terminal plate 153. In the arrangement of FIGS. 22 and 23, other constituent parts are the same as those in the embodiment of FIGS. 1-4 and are denoted by the same reference numerals as those used in FIGS. 1-

4 but as added by 100.

In the handle operating switch having the indicating function as shown in FIGS. 22 and 23, too, the size of the mounting frame, number of the switch body to be mounted to the frame and size and number of the piano handle as well as the use of the ornamental plate having the aperture for disposing therein the piano handle or handles may be properly selected as required. As shown in FIGS. 25 and 26, for example, the arrangement may take an aspect of disposing three of the piano handles 123C, 123C1 and 123C2 within the aperture 169 of the ornamental plate 170, in the same manner as in the aspect of FIGS. 19 and 20, except for an additional provision of the light permeating portions 221A, 221A1 and 221A2 corresponding in the position to the light permeating covers of the indicators of the respective switch bodies on the side of the pivoting side of the respective piano handles 123C, 123C1 and 123C2. Alternatively, as shown in FIG. 27, the arrangement may be in an aspect of the two relatively smaller piano handles 123D and 123D1 arranged in two stages and the one relatively larger piano handle 123D2 arranged on a lateral side of the above two while all the three handles are disposed in the ornamental plate 170D. Also in this aspect, the respective piano handles 123D, 123D1 and 123D2 are provided with the light permeating portions 221B, 221B1 and 221B2 at positions corresponding to the light permeating covers of the indicators in the switch bodies.

Claims

1. A handle operating switch comprising a switch body (12) having a housing (27,28), a pivotable contact support (53) having a movable contact (57) and rockable for engagement and disengagement of said movable contact (57) with and from opposing stationary contacts (49,52), and means for turning the contact support (53) upon urging into a depressed position of a push button (11) biased by a resetting spring (68) to a non-depressed position, said turning means including a rocker (59) coupled to the contact support (53) and provided on a side opposing the push button with a pair of mutually opposing engaging projections (64,64a), a coil spring (58) providing to the rocker (59) a resilient snap action, and a sliding cam (60) disposed on an interior surface of the push button (11) to be slidable from a neutral position in a direction transverse to depressing direction of the push button, said sliding cam (60) being provided with a pair of mutually opposing engaging cam parts (65,65a) and with a resilient resetting means (66) for biasing the sliding cam towards the neutral position, and said engaging cam parts (65,65a) being mutually opposed



through a distance so set that, in a rocking motion of the rocker (59) upon depression of the push button (11), initially one of the cam parts (65,65a) of the cam (60) engages an outer side of one of the engaging projections (64,64a) of the rocker to cause the rocker to turn and then, during the rocking motion, the other of the projections (64,64a) comes into engagement with an inner side of the other one of the cam parts (65,65a) to promote the slide of the cam (60) in remaining stroke of the rocking motion of the rocker (59), characterized in that, in the contact-support turning means, the rocker (59) is of a cylindrical shape and the contact support (53) is of a plate shape pivotably secured at a lower end as contacted with a common terminal (37) and having at an upper end the movable contact (57) and an upward projection (61), the coil spring (58) couples the rocker (59) to the contact support (53) as inserted on one end side in a downward open axial hole of the cylindrical rocker (59) and as engaged at the other end to said upward projection (61) of the support (53) so that a rocking motion of the rocker (59) with its axis causes the coil spring (58) to attain the snap action for turning a downward end of the rocker (59) and eventually the upper end of the contact support (53) between the stationary contacts (49,52), and the sliding cam (60) is formed in a rectangular frame, the resilient resetting means (66) of the cam comprising a pair of strips (66,66a) formed to be integral at their one end with one side portion of the frame to extend inside the frame transverse the direction in which the cam parts (65,65a) mutually oppose, and to hold between the other resilient ends of the strips (66,66a) a projection (67) of the inner surface of the push button (11) to cause a biasing force of the strips for resetting the sliding cam to the neutral position.

2. Switch according to claim 1, characterized by further comprising a generally plate-shaped operating handle (23) pivotably mounted substantially over the switch body (12) with a pivoting projection (25) along one edge of the lever pivotably mounted in a pivot portion (22) on one side of the housing (27) and with an engaging projection (24) along the other edge of the lever inserted in a recess (21) on the other side of the housing, so as to engage at inner surface with the outer surface of the push button (11).

Patentansprüche

1. Durch einen Drücker betätigbarer Schalter mit einem Schalterkörper (12) mit einem Gehäuse (27, 28),

mit einer verschwenkbaren Kontakthalterung (53), welche einen bewegbaren Kontakt (57) aufweist, der zum Eingriff und zur Auskuppelung des bewegbaren Kontakts (57) mit und von gegenüberliegenden stationären Kontakten (49, 52) verschwenkbar ausgebildet ist, und mit einer Einrichtung zum Verschwenken der Kontakthalterung (53) auf Betreiben eines Tastschalters (11), welcher mittels einer rückstellenden Feder (68) zu einer nicht-gedrückten Stellung vorgespannt ist, in eine gedrückte Stellung hinein, wobei die Verschwenkeinrichtung eine Wippe (59), welche mit der Kontakthalterung (53) verbunden ist und welche an einer dem Tastschalter gegenüberliegenden Seite ein Paar wechselseitig gegenüberliegender eingreifender Vorsprünge (64, 64a) aufweist, eine Spiralfeder (58), welche die Wippe (59) mit einer federnden Schnappfunktion versieht, und einen auf einer inneren Fläche des Tastschalters (11) angeordneten gleitenden Nocken (60) umfaßt, welcher aus einer neutralen Stellung in eine Richtung quer zur drückenden Richtung des Tastschalters gleitbar ist, wobei der gleitende Nocken (60) mit einem Paar sich wechselseitig gegenüberstehender eingreifender Nockenteile (65, 65a) und mit einer federnden rückstellenden Einrichtung (66) zum Vorspannen des gleitenden Nockens auf die neutrale Stellung hin aufweist, und wobei die eingreifenden Nockenteile (65, 65a) durch einen Abstand so wechselseitig gegenübergesetzt sind, daß bei einer verschwenkenden Bewegung der Wippe (59) auf das Niederdrücken des Tastschalters (11) hin anfänglich eines der Nockenteile (65, 65a) des Nockens (60) in eine äußere Seite einer der eingreifenden Vorsprünge (64, 64a) der Wippe eingreift, um die Wippe zu kippen und dann, während der verschwenkenden Bewegung, der andere der Vorsprünge (64, 64a) mit einer inneren Seite des anderen der Nockenteile (65, 65a) in Eingriff kommt, um das Gleiten des Nockens (60) im verbleibenden Hub der verschwenkenden Bewegung der Wippe (59) zu unterstützen, dadurch gekennzeichnet, daß in der verschwenkenden Einrichtung für die Kontakthalterung die Wippe (59) von zylindrischer Gestalt ist und die Kontakthalterung (53) scheibenförmig ist und an einem unteren Ende dadurch verschwenkbar gesichert ist, daß sie mit einem gemeinsamen Anschlußpunkt (37) kontaktiert ist, wobei sie an einem oberen Ende den bewegbaren Kontakt (57) und einen aufwärts gerichteten Vorsprung (61) aufweist, daß die Spiralfeder (58) die Wiege (59) dadurch an die Kontakthalterung (53) ankoppelt, daß sie an einer Endseite in ein abwärtiges offenes Axi-



alloch der zylindrischen Wiege (59) eingefügt ist und daß sie am anderen Ende mit dem aufwärts gerichteten Vorsprung (61) der Halterung (53) eingreift, so daß eine verschwenkende Bewegung der Wiege (59) mit ihrer Achse die Spiralfeder (58) veranlaßt, die Schnappfunktion zum Verschwenken eines abwärtigen Endes der Wiege (59) und eventuell des oberen Endes der Kontakthalterung (53) zwischen den stationären Kontakten (49, 52) zu erreichen, und daß der gleitende Nocken (60) in einem rechtwinkligen Rahmen ausgebildet ist,

daß die federnde rückstellende Einrichtung (66) des Nocken ein Paar Streifen (66, 66a) umfaßt, welche geformt sind, um an ihrem einen Ende mit einem Seitenteil des Rahmens integrierend zu sein, um sich innerhalb des Rahmens quer zu der Richtung, in welcher sich die Nockentelle (65, 65a) wechselseitig gegenüberstehen, zu erstrecken, und um zwischen den anderen federnden Enden der Streifen (66, 66a) einen Vorsprung (67) der inneren Fläche des Drucktasters (11) zu halten, um eine vorspannende Kraft der Streifen zum Zurückstellen des gleitenden Nocken in die neutrale Stellung zu bewirken.

2. Schalter nach Anspruch 1, dadurch gekennzeichnet,

daß ein im allgemeinen plattenförmiger betätigender Drücker (23) im wesentlichen über dem Schalterkörper (12) verschwenkbar befestigt vorgesehen ist, welcher einen verschwenkenden Vorsprung (25) entlang einer Kante des Hebels auf einer Seite des Gehäuses (27) in einem Verschwenkteil (22) verschwenkbar befestigt und einen eingreifenden Vorsprung (24) entlang der anderen Kante des Hebels auf der anderen Seite des Gehäuses in einer Ausnehmung (21) eingesetzt aufweist, um an der inneren Fläche mit der äußeren Fläche des Drucktasters (11) einzugreifen.

Revendications

1. Interrupteur actionné par touche comportant un corps (12) d'interrupteur ayant un boîtier (27, 28), un support pivotant (53) de contact ayant un contact mobile (57) basculant pour engager ledit contact mobile (57) avec des contacts fixes opposés (49, 52) et l'en dégager, et des moyens destinés à faire tourner le support (53) de contact hors d'une sollicitation dans une position enfoncée d'un bouton-poussoir (11) rappelé par un ressort (68) de repositionnement vers une position non défoncée, lesdits moyens tournants comprenant un basculeur (59) accouplé au support (63) de contact et pourvu, sur un côté opposé au bouton-poussoir, de deux saillies mutuellement opposées (64, 64a) d'engagement, un ressort hélicoïdal (58) procurant au culbuteur (59) une action d'encliquetage élastique, et une came coulissante (60) disposée sur une surface intérieure du bouton-poussoir (11) de façon à pouvoir coulisser à partir d'une position neutre dans une direction transversale à la direction d'enfoncement du bouton-poussoir, ladite came coulissante (60) étant pourvue de deux parties de came d'engagement mutuellement opposées (65, 65a) et d'un moyen élastique (66) de repositionnement pour rappeler la came coulissante vers la position neutre, et lesdites parties de came d'engagement (65, 65a) étant mutuellement opposées, à une distance telle l'une de l'autre que, lors d'un mouvement de basculement du basculeur (59) à la suite de l'enfoncement du bouton-poussoir (11), initialement l'une des parties de came (65, 65a) de la came (60) engage un côté extérieur de l'une des saillies d'engagement (64, 64a) du basculeur pour faire tourner du basculeur puis, pendant le mouvement de basculement, l'autre des saillies (64, 64a) vient en engagement avec un côté intérieur de l'autre des parties de came (65, 65a) afin de favoriser le coulisement de la came (60) dans la course restante du mouvement de basculement du basculeur (59), caractérisé en ce que, dans les moyens destinés à faire tourner le support de contact, le basculeur (59) est d'une force cylindrique et le support (53) de contact est en forme de plaque montée de façon pivotante à une extrémité inférieure, en contact avec une borne commune (37) et ayant, à une extrémité supérieure, le contact mobile (57) et une saillie (61) orientée vers le haut, le ressort hélicoïdal (58) accouple le basculeur (59) au support (53) de contact lorsqu'il est inséré sur un côté extrême dans un trou axial ouvert vers le bas du basculeur cylindrique (59) et qu'il est engagé à l'autre extrémité sur ladite saillie (61) orientée vers le haut du support (53) afin qu'un mouvement de basculement du basculeur (59), avec son axe, amène le ressort hélicoïdal (58) à effectuer l'action d'encliquetage pour faire tourner une extrémité orientée vers le bas du basculeur (59) et, finalement, l'extrémité supérieure du support (63) de contact entre les contacts fixes (49, 52), et la came coulissante (60) est formée dans un bâti rectangulaire, les moyens élastiques (66) de repositionnement de la came comprenant deux bandes (66, 66a) formées de façon à être solidarisées, par l'une de leurs extrémités, avec une partie latérale du cadre afin de s'étendre à l'intérieur du cadre transversalement à la direction dans laquelle les parties (65, 65a) de la came s'opposent mutuellement, et à maintenir entre les autres extrémités élastiques des bandes (66, 66a) une saillie (67)

ton-poussoir, de deux saillies mutuellement opposées (64, 64a) d'engagement, un ressort hélicoïdal (58) procurant au culbuteur (59) une action d'encliquetage élastique, et une came coulissante (60) disposée sur une surface intérieure du bouton-poussoir (11) de façon à pouvoir coulisser à partir d'une position neutre dans une direction transversale à la direction d'enfoncement du bouton-poussoir, ladite came coulissante (60) étant pourvue de deux parties de came d'engagement mutuellement opposées (65, 65a) et d'un moyen élastique (66) de repositionnement pour rappeler la came coulissante vers la position neutre, et lesdites parties de came d'engagement (65, 65a) étant mutuellement opposées, à une distance telle l'une de l'autre que, lors d'un mouvement de basculement du basculeur (59) à la suite de l'enfoncement du bouton-poussoir (11), initialement l'une des parties de came (65, 65a) de la came (60) engage un côté extérieur de l'une des saillies d'engagement (64, 64a) du basculeur pour faire tourner du basculeur puis, pendant le mouvement de basculement, l'autre des saillies (64, 64a) vient en engagement avec un côté intérieur de l'autre des parties de came (65, 65a) afin de favoriser le coulisement de la came (60) dans la course restante du mouvement de basculement du basculeur (59), caractérisé en ce que, dans les moyens destinés à faire tourner le support de contact, le basculeur (59) est d'une force cylindrique et le support (53) de contact est en forme de plaque montée de façon pivotante à une extrémité inférieure, en contact avec une borne commune (37) et ayant, à une extrémité supérieure, le contact mobile (57) et une saillie (61) orientée vers le haut, le ressort hélicoïdal (58) accouple le basculeur (59) au support (53) de contact lorsqu'il est inséré sur un côté extrême dans un trou axial ouvert vers le bas du basculeur cylindrique (59) et qu'il est engagé à l'autre extrémité sur ladite saillie (61) orientée vers le haut du support (53) afin qu'un mouvement de basculement du basculeur (59), avec son axe, amène le ressort hélicoïdal (58) à effectuer l'action d'encliquetage pour faire tourner une extrémité orientée vers le bas du basculeur (59) et, finalement, l'extrémité supérieure du support (63) de contact entre les contacts fixes (49, 52), et la came coulissante (60) est formée dans un bâti rectangulaire, les moyens élastiques (66) de repositionnement de la came comprenant deux bandes (66, 66a) formées de façon à être solidarisées, par l'une de leurs extrémités, avec une partie latérale du cadre afin de s'étendre à l'intérieur du cadre transversalement à la direction dans laquelle les parties (65, 65a) de la came s'opposent mutuellement, et à maintenir entre les autres extrémités élastiques des bandes (66, 66a) une saillie (67)



de la surface intérieure du bouton-poussoir (11) pour engendrer une force de rappel des bandes afin de repositionner la came coulissante vers la position neutre.

2. Interrupteur selon la revendication 1, caractérisé en ce qu'il comporte en outre une touche (23) de manoeuvre globalement en forme de plaque montée de façon pivotante sensiblement au-dessus du corps (12) de l'interrupteur, avec une saillie de pivotement (25) le long d'un bord du levier, montée de façon pivotante dans une partie (22) de pivot sur un côté du boîtier (27) et avec une saillie (24) d'engagement le long de l'autre bord du levier, insérée dans un évidement (21) sur l'autre côté du boîtier, afin de porter par une surface intérieure contre la surface extérieure du bouton-poussoir (11).

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