

## **PANEL SWITCH**

### **FIELD OF THE DISCLOSURE**

[0001] Embodiments of the present disclosure relate to a panel switch, and particularly to a multi-control multi-shaft type unitary panel switch.

### **BACKGROUND OF THE DISCLOSURE**

[0002] A traditional panel switch employs the following solution: one operation panel controls one function module via a rotation shaft. To this end, in a traditional multi-control switch, a plurality of operation panels are arranged side by side. The thus formed multi-control switch has a larger number of parts. Further, since the a plurality of operation panels of the multi-control switch are arranged adjacent to one another, gaps exist between two adjacent operation panels, which are generally uneven. Thus, appearance of operation panels exhibit staggered heights and such a switch is so often called a rocker switch, which renders appearance of the switch less pleasant. Hence, there is a need to improve the multi-control panel switch in the prior art.

### **SUMMARY OF THE DISCLOSURE**

[0003] In view of the above, one of the objectives of the embodiments of the present disclosure is to provide a panel switch, which can at least solve one or more of aforesaid technical problems existing in the prior art.

[0004] According to a first aspect of the present disclosure, there is provided a panel switch, comprising: an operation panel provided with a plurality of shafts; a mounting panel pivotally engaged with the operation panel via the plurality of shafts, the mounting panel therein provided with a plurality of mounting holes for receiving switch modules, areas of the operation panel corresponding to the plurality of mounting holes forming operation regions of the operation panel; and a plurality of switch modules respectively mounted in the mounting holes; wherein the plurality of shafts are configured in a way that when a corresponding operation region is pressed down, the operation region presses a switch button of a switch module corresponding to the operation region so that the switch module acts to perform a switching function.

[0005] According to one embodiment of the present disclosure, the operation panel is a unitary member.

[0006] According to one embodiment of the present disclosure, the plurality of shafts at least comprise a pair of shafts consisting of two shafts located adjacent an outer periphery of the operation panel and extending along the same straight line on the opposite side of the operation panel.

[0007] According to one embodiment of the present disclosure, the plurality of shafts comprises several pairs of shafts extending in different directions.

[0008] According to one embodiment of the present disclosure, the mounting panel is provided with holes mating with the plurality of shafts, shapes of the holes are

configured in a way that when the operation region is not pressed, the shaft is made abut against a peripheral edge of the hole at a pressing side by virtue of an elastic member; when the operation region is pressed, the shaft is adapted to move in a pressing direction in the hole.

[0009] According to one embodiment of the present disclosure, the holes mating with the plurality of shafts are a semi-hole structure, wherein a side of the hole adjacent to the operation panel is closed, and a side of the hole away from the operation panel is open.

[0010] According to one embodiment of the present disclosure, the elastic member is a switch button of the switch module

[0011] According to one embodiment of the present disclosure, the operation panel is a substantially rectangular panel, the operation panel is mounted to the mounting panel via four pairs of shafts extending in directions perpendicular to each other, four mounting holes are axially symmetrically disposed in the mounting panel, two neighboring shafts perpendicular to each other among the four pairs of shafts are arranged close to each other adjacent a corner of the rectangular panel.

[0012] According to one embodiment of the present disclosure, the panel switch further comprises an misoperation preventing portion which comprises a first abutting portion disposed on the operation panel and a second abutting portion disposed on the mounting panel, the misoperation preventing portion is configured in a way that when a non-operation region of the panel switch is pressed, the first abutting portion abuts against the second abutting portion to prevent inadvertent action of the switch module; when an operation region of the panel switch is pressed, the first abutting portion moves and shun the second abutting portion to avoid affecting the action of the switch module.

[0013] According to one embodiment of the present disclosure, between the operation panel and the mounting panel is disposed a resilient member for applying a restoration force to the operation panel after the operation panel is pressed.

[0014] According to one embodiment of the present disclosure, the operation panel further comprises an indicating member configured to indicate an acting switch module.

[0015] The panel switch according to embodiments of the present disclosure achieves multi-control panel switch by virtue of the multi-shaft mounting structure. The panel switch according to embodiments of the present disclosure exhibits a simple structure, fewer parts and an enhanced pleasant appearance.

#### **BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

[0016] Now, the embodiments of the present disclosure will be described with reference to the accompanying drawings only in an exemplary manner, wherein:

[0017] Fig. 1 shows a structural schematic view of a general structure of a panel switch according to one embodiment of the present disclosure;

[0018] Fig. 2 shows an exploded view of the panel switch as shown in Fig. 1;

[0019] Fig. 3 shows a structural schematic view of an operation panel of the panel switch as shown in Fig. 1; and

[0020] Fig. 4 shows a schematic view in which the panel switch shown in Fig. 1 is in an operated state.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0021] Hereinafter, the embodiments of the present disclosure will be described in detail with reference to figures. It should be noted that same reference numerals may be used for like components or functional assemblies in the figures. The figures are only intended to illustrate the embodiments of the present disclosure. Those skilled in the art may obtain an alternative embodiment from the description below without departing from the spirit and protection scope of the present disclosure.

[0022] An inventive idea of the present disclosure mainly lies in that a plurality of operation panels in the prior art are made into a unitary operation panel, thereby avoiding use of a plurality of operation panels as in the prior art. To implement the operation of the switch module, according to the present disclosure, a plurality of shafts are disposed on the unitary operation panel, different areas of the operation panel rotate about different rotation shafts, whereby the operation panel is divided into a plurality of operation regions by means of multi-axis arrangement, and switching actions of the switch module are implemented by pressing the respective operation regions.

[0023] Embodiments of the present disclosure will be described in conjunction with figures. It should be appreciated that the inventive idea according to the present disclosure is illustrated by taking a four-control switch provided with four switch modules as an example, but it should be appreciated that a larger or less number of switch modules, e.g. three, five, six, seven or even eight switch modules may be provided.

[0024] Fig. 1 shows a structural schematic view of a whole structure of a panel switch according to one embodiment of the present disclosure; Fig. 2 shows an exploded view of the panel switch as shown in Fig. 1; Fig. 3 shows a structural schematic view of a operation panel 10 of the panel switch as shown in Fig. 1; and Fig. 4 shows a schematic view in which the panel switch shown in Fig. 1 is in an operated state.

[0025] As shown in Fig.1-Fig. 3, the panel switch 1 comprises: an operation panel 10 provided with a plurality of shafts 12a, 12a', 12b, 12b', 12c, 12c', 12d, and 12d'; a mounting panel 20 pivotally engaged with the operation panel 10 via the plurality of shafts 12a, 12a', 12b, 12b', 12c, 12c', 12d, and 12d', the mounting panel 20 therein being provided with a plurality of mounting holes 26 for receiving switch modules 30, areas of the operation panel 10 corresponding to the plurality of mounting holes 26 forming operation regions of the operation panel 10; and a plurality of switch modules 30 respectively mounted in the mounting holes 26; wherein the plurality of shafts 12a, 12a', 12b, 12b', 12c, 12c', 12d, and 12d' are configured in a way that when a corresponding operation region is pressed down, the operation region presses a switch button 32 of a switch module 30 corresponding to the operation region so that the switch module 30 acts to perform a switching function.

[0026] According to embodiments of the multi-control multi-shaft type panel switch of the present disclosure, instead of an arrangement of one operation panel-one rotation shaft-one switch module in the prior art, one operation panel-multi rotation shafts-multi switch modules arrangement are used, whereby one operation panel may be used to implement control of the plurality of switch modules. With the multi rotation shaft structure, the same one operation panel is mounted to the mounting panel via the multiple rotation shafts and thus the multiple rotation shafts divide the operation panel into a plurality of operation regions. Further, the operation panel exhibits a unitary member, eliminates gaps among the plurality of operation panels in the prior art, and makes the appearance of the panel switch more pleasant. Using one operation panel to implement operations of the plurality of switch modules, a simple and compact structure is achieved, the number of parts is reduced, and space occupied by the panel switch is saved.

[0027] According to an embodiment of the present disclosure, the operation panel 10 is a unitary member. Although shown in the form of a unitary member in the figures, the operation member may be formed as a plurality of parts in other embodiments for the sake of for example pleasant appearance or other needs.

[0028] According to an embodiment of the present disclosure, the plurality of shafts 12a, 12a', 12b, 12b', 12c, 12c', 12d, and 12d' at least comprise a pair of shafts consisting of two shafts located adjacent an outer periphery of the operation panel 10 and extending along the same straight line on the opposite side of the operation panel 10. In the embodiment of the present disclosure, different areas of the operation panel 10 rotate about different rotation shafts, whereby the multi-shaft arrangement divides the operation panel into a plurality of operation regions. The multi-shaft arrangement makes it possible to use the same one operation panel to implement multi-area control. When a pair of shafts is arranged adjacent to the outer periphery, pivotal control of the operation regions can be simply achieved. It should be appreciated that the multiple shafts may not employ the structure as shown in the figure. In another embodiment not shown, for example a single shaft may be employed to implement the pivoting of the operation regions.

[0029] According to an embodiment of the present disclosure, the multiple shafts include several pairs of shafts extending in different directions. As such, each operation region is controlled via a shaft pair. In the illustrated embodiment, four shaft pairs are illustrated, for example, 12a, 12a'; 12b, 12b'; 12c, 12c'; 12d, 12d'. It should be appreciated that this is only exemplary, and shaft pairs in other numbers may be disposed according to the number of operation regions of the operation panel 10.

[0030] According to an embodiment of the present disclosure, the operation panel 10 is a substantially rectangular panel, the operation panel is mounted to the mounting panel 20 via four pairs of shafts extending in directions perpendicular to each other, four mounting holes 26 are axially symmetrically disposed in the mounting panel 20, two neighboring shafts perpendicular to each other among the four pairs of shafts are arranged close to each other adjacent a corner of the

rectangular panel. Such mounting structure can reduce mutual influence between different operation regions to a maximum degree. In this way, respective operation regions occupy an operation area as large as possible, and reduce the influences on each other to a minimum degree.

[0031] According to an embodiment of the present disclosure, the mounting panel 20 is provided with holes mating with the multiple shafts, shapes of the holes 22 are configured in a way that when the operation region is not pressed, the shaft abuts against a peripheral edge at a pressing side of the hole 22 by virtue of an elastic member; when the operation region is pressed, the shaft is adapted to move in a pressing direction in the hole 22. According to an embodiment of the present disclosure, the elastic member is a switch button 32 of the switch module 30.

[0032] According to an embodiment of the present disclosure, between the operation panel 10 and the mounting panel 20 is disposed a resilient member for applying a restoration force to the operation panel 10 after the operation panel 10 is pressed. The resilient member disposed additionally may enhance the hand feeling of manipulating the panel switch.

[0033] According to an embodiment of the present disclosure, the panel switch 1 further comprises an misoperation preventing portion which comprises a first abutting portion 14 disposed on the operation panel 10 and a second abutting portion 24 disposed on the mounting panel 20. The misoperation preventing portion is configured in a way that when a non-operation region of the panel switch 1 is pressed, the first abutting portion 14 abuts against the second abutting portion 24 to prevent inadvertent action of the switch module; when an operation region of the panel switch 1 is pressed, the first abutting portion 14 moves and shun the second abutting portion 24 to avoid affecting the action of the switch module.

[0034] According to an embodiment of the present disclosure, the operation panel 10 further comprises an indicating member (not shown in the figure) configured to indicate an acting switch module 30. The indicating member is disposed to display which switch module is acting so that the user can learning about the operation state of the panel switch.

[0035] It should be appreciated that although the figures exemplarily show that the panel switch is mounted with four switch module, the four switch modules are not all mounted according to needs in some embodiments, and instead, only a portion of switch modules are mounted and it can also achieve the idea of the present application.

[0036] To better understand the operation procedure of the present disclosure, an operation manner of the panel switch according to an embodiment of the present disclosure will be illustrated with reference to Fig. 4. Fig. 4 shows a schematic view in which the panel switch shown in Fig. 1 is in an operated state.

[0037] When the panel switch is not pressed, as shown in Fig. 1, the operation panel is for example as a whole substantially located in the same horizontal plane in a top view. It should be appreciated that the terminology about direction are only intended to describe the present disclosure, unrestrictive and irrelevant to an actual mounting or application state of the panel switch. In this state, the switch button

32 of the switch module 30 closely abuts against a bottom surface of the operation panel 10. Exemplarily, the shaft pairs 12a, 12a'; 12b, 12b'; 12c, 12c'; 12d, 12d' disposed at the outer periphery of the operation panel 10 respectively are arranged in the holes 22 disposed at an inner periphery of the mounting panel 20 and abut against its upper side inner surface (the figure only illustrates holes 22a and 22b, other holes being likewise arranged and not shown). In the shown embodiment, the holes 22a and 22b are a semi-hole structure, that is, an upper side of the mounting hole is closed whereas a lower side thereof is open. The shaft pair 12a, 12b respectively abut against an upper side edge (or inner surface) of the holes 22a and 22b due to action of the elastic member (which is the button 32 of the switch module 30 in an embodiment, or an additionally arranged elastic member at proper position).

[0038] When the operation region of the panel switch is pressed, in the shown embodiment, the operation region is a region of the operation panel which is on the right side of Fig. 4 and which corresponds to the position where the mounting hole 26 for receiving switch modules is provided, the shaft pair 12a, 12b disposed on a pressing side of the operation panel 10 moves downward along the hole 22, the right side region of the operation panel 10 pivots about a pair of shafts 12 on the left side without any hindrance due to the pressing force, whereby the operation region of the operation panel 10 is pressed to press the switch button of the switch module 30, thereby driving the switch module to perform the switching action.

[0039] After the pressed force is removed (e.g., a finger is removed), the pressed operation panel moves upward driven by the elastic force of the switch button of the switch module 30 and thereby restore to an unpressed initial state. In an embodiment not shown, an additional resilient member (e.g., a spring) is disposed between the operation panel 10 and the mounting panel 20 to further improve the operation hand feeling.

[0040] Fig. 4 further shows an exemplary embodiment of an misoperation preventing portion according to the present disclosure. The misoperation preventing portion is used to prevent the operation panel from misoperating the switch module when a non-operation area of the operation panel is pressed. The working principle of the misoperation preventing portion is as follows: the misoperation preventing portion comprises a first abutting portion 14 disposed on the operation panel 10 and a second abutting portion 24 disposed on the mounting panel 20. When a non-operation region of the panel switch 1 is pressed, the first abutting portion 14 abuts against the second abutting portion 24 to prevent inadvertent action of the switch module; when an operation region of the panel switch 1 is pressed, and along with the operation panel rotating about the shaft, the first abutting portion 14 shuns the second abutting portion 24 to avoid affecting the pressing action of the operation area to the switch module. In the embodiment shown in the figure (see Fig. 3), the first abutting portion 14 is formed as a protruding member with ledges, and the second abutting portion 24 is formed as a projection disposed in the mounting panel 20. It should be appreciated that this is

only exemplary, and those having ordinary skill in the art may devise other members in other shapes or configurations according to the teaching of the present disclosure.

[0041] The panel switch according to the present disclosure achieves multi-control panel switch by virtue of the multi-shaft structure, and the operation panel is a unitary plane-shaped structure with a simple structure and pleasant appearance.

[0042] Through the teachings provided in the above description and relevant figures, many modification forms and other embodiments of the present disclosure will be realized by those skilled in the art. Therefore, it should be understood that the embodiments of the present disclosure are not limited to the preferred embodiments as disclosed; moreover, the modified forms and other embodiments are intended to be included within the scope of the present disclosure. Besides, although the above description and relevant figures have described the exemplary embodiments under the background of some exemplary combinations of components and/or functions, it should be aware that different combination forms of the components and/or functions may be provided by alternative embodiments without departing from the scope of the present disclosure. In this case, for example, other combination forms of components and/or functions somewhat different from what have been explicitly described are also predicted to fall within the scope of the present disclosure. Although specific terms are employed here, they are only used in their general and descriptive meanings, not intended for limitation.

## Claims

1. A panel switch, comprising:
  - an operation panel provided with a plurality of shafts;
  - a mounting panel pivotally engaged with the operation panel via the plurality of shafts, the mounting panel therein provided with a plurality of mounting holes for receiving switch modules, areas of the operation panel corresponding to the plurality of mounting holes forming operation regions of the operation panel; and
  - a plurality of switch modules respectively mounted in the mounting holes;wherein the plurality of shafts are configured in a way that when a corresponding operation region is pressed down, the operation region presses a switch button of a switch module corresponding to the operation region so that the switch module acts to perform a switching function.
2. The panel switch according to claim 1, wherein the plurality of shafts at least comprise a pair of shafts consisting of two shafts located adjacent an outer periphery of the operation panel and extending along the same straight line on the opposite side of the operation panel.
3. The panel switch according to claim 2, wherein the plurality of shafts comprises several pairs of shafts extending in different directions.
4. The panel switch according to claim 1, wherein the mounting panel is provided with holes mating with the plurality of shafts, and shapes of the holes are configured in a way that when the operation region is not pressed, the shaft abut against a peripheral edge of the hole at a pressing side by virtue of an elastic member; when the operation region is pressed, the shaft is adapted to move in the hole in a pressing direction.
5. The panel switch according to claim 4, wherein the holes mating with the plurality of shafts are a semi-hole structure, wherein a side of the hole adjacent to the operation panel is closed, and a side of the hole away from the operation panel is open.
6. The panel switch according to claim 5, wherein the elastic member is a switch button of the switch module.
7. The panel switch according to claim 4, wherein the operation panel is a substantially rectangular panel, the operation panel is mounted to the mounting panel via four pairs of shafts extending in directions perpendicular to each other, four mounting holes are axially symmetrically disposed in the mounting panel, two neighboring shafts perpendicular to each other among the four pairs of shafts are arranged close to each other adjacent a corner of the rectangular panel.

8. The panel switch according to any one of claims 1-7, wherein the panel switch further comprises an misoperation preventing portion which comprises a first abutting portion disposed on the operation panel and a second abutting portion disposed on the mounting panel, and the misoperation preventing portion is configured in a way that when a non-operation region of the panel switch is pressed, the first abutting portion abuts against the second abutting portion to prevent inadvertent action of the switch module; when an operation region of the panel switch is pressed, the first abutting portion moves and shun the second abutting portion to avoid affecting the action of the switch module.

9. The panel switch according to any one of claims 1-7, wherein between the operation panel and the mounting panel is disposed a resilient member for applying a restoration force to the operation panel after the operation panel is pressed.

10. The panel switch any one of claims 1-7, wherein the operation panel further comprises an indicating member configured to indicate an acting switch module.