

PANEL SWITCH

FIELD

[0001] Embodiments of the present disclosure generally relate to a panel switch.

BACKGROUND

[0002] Conventional panel switches include covers and switch modules. The switch modules may be actuated by operating the covers, to implement ON/OFF control of the switch panel. However, control sensitivity of the conventional covers is not good enough. This disadvantage is particularly prominent, for example, when the cover is formed into a large size. There is need to improve the panel switch.

SUMMARY

[0003] Embodiments of the present disclosure provide a panel switch, to address one or more of the above and other potential problems.

[0004] In accordance with a first aspect of the present disclosure, there is provided a panel switch. The panel switch comprises: a cover comprising a pressing region; a support frame comprising a peripheral frame and at least one actuation sheet body pivotally connected thereto at a side of the peripheral frame, the actuation sheet body comprising a pivot joint at the side and a free end at a side opposing to the pivot joint, and a switch module adapted to be actuated by the actuation sheet body; wherein the actuation sheet body is adapted to pivot in response to a press on the pressing region, to at least partly press the switch module through pivoting of the actuation sheet body, so as to switch ON and OFF states of the switch module.

[0005] With the actuation sheet body hinged to the peripheral frame at a side of the peripheral frame, the panel switch in accordance with embodiments of the present disclosure may provide a moving stroke of the actuation sheet body required for actuating the switch module in a simple way. The panel switch in accordance with embodiments of the present disclosure has a simple structure and high control sensitivity.

[0006] In some embodiments, the actuation sheet body is hinged to the peripheral frame via a hinged portion.

[0007] In some embodiments, the cover and the support frame are mounted to be movable to

each other, and the cover and the support frame are configured to move relative to each other in a pressing direction of the cover.

[0008] In some embodiments, the cover may comprise at least one first protrusion protruding from a bottom surface of the cover, and the support frame comprises at least one opening mating with the at least one first protrusion, wherein the first protrusion can move along a pressing direction of the cover with respect to the opening.

[0009] In some embodiments, the cover also may comprise a limiting portion adapted to restrict movement of the cover in a direction perpendicular to the pressing direction.

[0010] In some embodiments, the limiting portion may comprise at least one second protrusion protruding from a bottom surface of the cover, the second protrusion protruding into a gap between the at least one actuation sheet body and the peripheral frame and being adapted to contact an abutment portion of the at least one actuation sheet body.

[0011] In some embodiments, the actuation sheet body and the cover interact with each other via shaft-hole fit, to enable the actuation sheet body to move in response to a press on the cover.

[0012] In some embodiments, the cover may comprise at least one protrusion portion protruding from a bottom surface of the cover, the protrusion portion comprising a hole for a shaft, and the actuation sheet body comprises at least one opening and a shaft extending across the at least one opening, the shaft and the hole correspondingly forming the shaft-hole fit.

[0013] In some embodiments, a corresponding part against which the pivot protrusion portion abuts may be arranged away from the free end and close to a side of the hinged portion.

[0014] In some embodiments, the support frame may comprise at least one pair of actuation sheet bodies arranged opposing to each other, wherein adjacent ends of one pair of actuation sheet bodies in the at least one pair of actuation sheet bodies are respectively formed into free ends.

[0015] In some embodiments, the panel switch may further comprise a mounting panel mounted with the support frame, wherein the mounting panel is provided with a pivot protrusion portion that is arranged to protrude towards the actuation sheet body to abut against the actuation sheet body when the actuation sheet body is moving in response to a press on

the pressing region, so as to form a pivoting axis of the actuation sheet body.

[0016] In some embodiments, the hinged portion is such configured that the actuation sheet body protrudes more towards the cover compared to the peripheral frame.

[0017] In some embodiments, the actuation sheet body may be pivotally connected to the support frame via a rotary shaft.

[0018] In some embodiments, the panel switch may further comprise an elastic element disposed between the actuation sheet body and the support frame, to keep the actuation sheet body protruding towards the cover.

[0019] In some embodiments, the switch module is arranged adjacent to a side where the free end is located.

[0020] In some embodiments, the panel switch also may comprise a plurality of switch modules, the switch module being a microswitch module and being arranged in a region between the free end and the hinged portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Through the following detailed description with reference to the accompanying drawings, the above and other objectives, features, and advantages of embodiments of the present disclosure will become more apparent. Several example embodiments of the present disclosure will be illustrated by way of example but not limitation in the drawings.

[0022] Fig. 1 illustrates an overall schematic diagram of the panel switch in accordance with embodiments of the present disclosure.

[0023] Fig. 2 illustrates an exploded view of the panel switch of Fig. 1.

[0024] Fig. 3 illustrates a schematic structure view of the cover in accordance with embodiments of the present disclosure from one perspective.

[0025] Fig. 4 illustrates a schematic structure view of the support frame in accordance with embodiments of the present disclosure from another perspective.

[0026] In each drawing, same or corresponding reference signs indicate same or corresponding parts.

DETAILED DESCRIPTION OF EMBODIMENTS

[0027] Preferred embodiments of the present disclosure will be described in more details below with reference to the drawings. Although the drawings show the preferred embodiments of the present disclosure, it should be understood that the present disclosure can be implemented by various manners and should not be limited to the embodiments explained herein. On the contrary, the embodiments are provided for a more thorough and complete understanding of the present disclosure and to fully convey the scope of the present disclosure to those skilled in the art.

[0028] As used herein, the term “comprises” and its variants are to be read as open-ended terms that mean “comprises, but is not limited to.” The term “or” is to be read as “and/or” unless the context clearly indicates otherwise. The term “based on” is to be read as “based at least in part on.” The terms “one example embodiment” and “one embodiment” are to be read as “at least one example embodiment.” The term “another embodiment” is to be read as “at least one another embodiment”. The terms indicating placement or positional relation, such as “up”, “down”, “front”, “back” and the like, depend on orientational or positional relations illustrated in the drawings and are provided merely for explaining the principle disclosed herein, rather than indicating or suggesting that the specified element must have the particular orientation or be constructed or operated according to the particular orientation. These terms should not be interpreted as limitations to the present disclosure.

[0029] For conventional panel switches, when the cover is formed to a large scale or a full scale, its operation sensitivity will decrease. The term “large size” or “full size” here indicates a cover switch with a significantly large cover dimension. For example, the cover may be sized to 88mm×88mm or 86mm×86mm etc. The panel switch may include one or more switch modules, which one or more switch modules may be operated by pressing any regions on a control surface of the cover. The panel switch in accordance with embodiments of the present disclosure gains an improved control performance by improving the structure of the support frame and providing a hinged actuation sheet body structure to the support frame. The panel switch in accordance with embodiments of the present disclosure is to be described below in details with reference to the drawings.

[0030] As shown in Figs. 1 and 2, the switch panel 100 include: a cover 10, a support frame 20, a mounting panel 30 and a switch module 40.

[0031] The cover 10 may include a pressing region. In some embodiments, the entire surface of the cover 10 may be formed as a pressing region for operation. In some

embodiments, a part of a predetermined region of the surface of the cover 10 may be formed into a pressing region for operation.

[0032] The mounting panel 30 typically may be secured in a fixed body, such as walls etc. In the illustrated embodiments, the mounting panel 30 may include an opening, through which the switch module 40 may at least partly protrude. The mounting panel 30 may be secured into the fixed body by fasteners such as screws and the like. The support frame 20 may be mounted to the mounting panel, for example, by snap-fit. The mounting panel 30 may provide support for components such as the switch module 40, the cover 10 and the like. It is to be understood that the above is merely illustrative. The mounting panel 30 may be implemented into any other suitable forms.

[0033] As shown in Figs. 2 and 4, the support frame 20 may include a peripheral frame 26 and an actuation sheet body 25 hinged to the frame at one side of the peripheral frame 26. In some embodiments, the actuation sheet body 25 may be formed into a sheet-like shape. The actuation sheet body 25, for example, may be separated from the peripheral frame 26 via a gap 28, and is hinged, via a hinged portion 27, to the peripheral frame 26 at one side of the peripheral frame 26. The actuation sheet body 25 thus comprises a hinged portion 27 at the hinged side of the actuation sheet body 25 and a free end 28 at a side opposing to the hinged portion.

[0034] The actuation sheet body is adapted to pivot in response to a press on the pressing region, to at least partly press the switch module via the pivoting of the actuation sheet body 25, so as to switch between ON and OFF states of the switch module.

[0035] In some embodiments, the hinged portion 27 may be constructed in a form of articulation arm, e.g., M-shaped and arc-shaped etc. The articulation arm may add flexibility to the actuation sheet body 25 by allowing the actuation sheet body 25 to rotate relative to the peripheral frame 26. In some embodiments, the hinged portion 27 between the actuation sheet body 25 and the peripheral frame 26 may be arranged to enable the actuation sheet body 25 to protrude more towards the cover 10 in comparison to the peripheral frame 26. Therefore, the actuation sheet body 25 and the cover 10 always remain in contact, to provide a satisfactory sense of touch during control.

[0036] In the illustrated embodiments, each actuation sheet body 25 may be hinged to the peripheral frame 26 via a pair of hinged portions 27. It is to be understood that this is just

exemplary. Other numbers of hinged portions 27 may be provided, such as one or more.

[0037] It is to be understood that it is just an example that the actuation sheet body 25 is pivotally connected to the support frame via the hinged portion 27 in the illustrated embodiments. The actuation sheet body 25 may be pivotally connected to the support frame via other pivoting means. For example, in some embodiments not shown, the actuation sheet body may be pivotally connected to the support frame or other fixed bodies of the cover switch via a rotary shaft. In some embodiments, the panel switch may include an elastic element, which elastic element, for example, may be disposed between the actuation sheet body and the support frame, to keep the actuation sheet body protruding towards the cover. When the cover is pressed to pivot the actuation sheet body 25, the elastic element thus is compressed; after the force applied to the cover is removed, the actuation sheet body 25 recovers its initial position via the elastic element, to continue abutting against the cover.

[0038] In the illustrated embodiments, the support frame 20 may include a pair of actuation sheet bodies 25 arranged relative to each other. Each actuation sheet body in the pair of the actuation sheet bodies 25 is hinged to the peripheral frame 26 via the hinged portion 27 respectively. Respective free ends 28 of the pair of actuation sheet bodies 25 are arranged close to each other. With this structure, the entire surface of the cover 10 may be used as operating region and the touch sense over the entire operating region in the control process is guaranteed. In some embodiments, a pair of actuation sheet bodies 25 may be arranged symmetrically. In some embodiments, a plurality of pairs of actuation sheet bodies 25 may be disposed in the support frame 20 to form a plurality of panel switches.

[0039] In the illustrated embodiments, the mounting panel 30 also may include a pivot protrusion portion 31, which is arranged to protrude towards the actuation sheet body 25 of the support frame 20. As such, if a user presses the cover 10, the actuation sheet body 25 moves downward in response to a press on the pressing region so as to abut against the pivot protrusion portion 31. As such, the pivot protrusion portion 31 serves as a pivoting axis for pivotal movement of the actuation sheet body 25, enabling the actuation sheet body 25 to rotate about the pivot protrusion portion 31 as the pivoting axis. By the arrangement of the pivot protrusion portion 31, the stroke of the actuation sheet body in the pressing direction can be more conveniently controlled. In some embodiments, the pivot protrusion portion 31 may be disposed adjacent to the peripheral frame 26 and away from the free end 28.

[0040] In the illustrated embodiments, the actuation sheet body 25 may include one or more

protruding sheets 21. The protruding sheet 21 of the actuation sheet body 25 may abut against the pivot protrusion portion 31, to serve as the pivoting axis. The form of protruding sheet 21 may further optimize rigidity and force transmission characteristics of the actuation sheet body 25. In the illustrated embodiments, two pivoting axes may be provided for each actuation sheet body 25. It is to be understood that this is only exemplary and one or more pivoting axes may be provided.

[0041] In some embodiments, the switch module 40 may be arranged adjacent to the free end 28 as shown in Figs. 2 and 4. In the embodiments shown in Figs. 2 and 4, the switch module 40 may include a push-button 42, which makes contact with a region 252 (denoted by dotted line) where the free end 28 is located and may be pressed by the actuation sheet body 25 to actuate the switch module. A maximum stroke of the actuation sheet body 25 may be realized in the region 252. The above arrangement may increase the moving stroke of the actuation sheet body 25 at the free end 28 to the greatest level. As a result, the actuation push-button 42 on the switch module 40 may be conveniently pressed to carry out switching acts on the panel switch.

[0042] In some embodiments (not shown), the panel switch may include a plurality of microswitch modules. The term “microswitch module” has its general meaning and here refers to a switch module having a dimension smaller than the ordinary switch module and being actuated by a short moving stroke only. Considering that only a short moving stroke of the actuation sheet body 25 is required for actuating the microswitch module, the microswitch module may be disposed in a region between the free end 28 and the hinged portion 27, e.g., an intermediate region of the free end 28 and the hinged portion 27. For example, in the embodiment illustrated by Fig. 4, the push-button of the microswitch module may contact a region 254 (indicated with dotted line) of the actuation sheet body 25. In such case, the panel switch shown in Fig. 4, for example, may drive four microswitch modules. It is to be understood that this is just an example. Based on the teaching provided herein, the microswitch module may be arranged in other ways.

[0043] In some embodiments, the cover 10 and the support frame 20 may be mounted to be movable to each other. The cover 10 and the support frame 20 can move relative to each other in the pressing direction of the cover 10. In such case, the moving stroke of the actuation sheet body 25 for the cover 10 may be further increased with respect to the support frame 20.

[0044] The movable arrangement of the cover 10 and the support frame 20 may include a plurality of implementation forms. In the embodiments shown in Figs. 2 and 3, the cover 10 comprises a first protrusion 12 protruding from the bottom surface, and the support frame 20 comprises an opening 22 mating with the first protrusion 12. The opening 22 may provide a sliding rail in the pressing direction of the first protrusion 12, such that the first protrusion 12 can move along the pressing direction of the cover 10 with respect to the opening 22. It is to be understood that the illustrated means is just exemplary. Other numbers of the first protrusion 21 and the opening 22 may be provided according to the needs and the first protrusion 21 and the opening 22 may be formed into other suitable shapes.

[0045] In some embodiments, the cover 10 also comprises a limiting portion adapted to restrict movement of the cover 10 in a direction perpendicular to the pressing direction. This may avoid random shaking of the cover 10. The limiting portion for restricting movement of the cover 10 in a direction perpendicular to the pressing direction may be implemented in various ways. In the embodiments shown by Figs. 2 and 3, the limiting portion may include a second protrusion 16 protruding from the bottom surface of the cover 10. The second protrusion 16 protrudes into a gap 29 between the actuation sheet body 25 and the peripheral frame 26 and makes contact with the actuation sheet body 25. As a result, the lateral movement of the cover 10 may be restricted by the contact between the second protrusion 16 and the actuation sheet body 25. In some embodiments, the actuation sheet body 25 also may include an abutment portion 262 that may be formed into a shape fitting with the second protrusion 16. The limiting power may be enhanced by the contact between the abutment 262 and the second protrusion 16. It is to be understood that the illustrated approach is only exemplary. Other numbers of the second protrusion 16 and the abutment portion 262 may be provided according to the needs, and the second protrusion 16 and the abutment portion 262 may be formed into other suitable shapes.

[0046] In some embodiments, the actuation sheet body 25 and the cover 10 interact with each other via shaft-hole fit, to enable the actuation sheet body 25 to move in response to the press on the cover 10.

[0047] In some embodiments, the cover 10 may include a protrusion portion 14 protruding from the bottom surface. The protrusion portion 14 may include a hole 142 for the shaft, and the actuation sheet body 25 comprises an opening 24 and a shaft 242 extending across the opening 24. The shaft 242 and the hole 142 correspondingly form the shaft-hole fit. This

structure may reduce the thickness occupied by the shaft-hole fit, and the pivotal actuation between the cover 10 and the actuation sheet body 25 can be implemented without affecting the actuation stroke. It is to be understood that the illustrated approach is exemplary only, and the shaft 242 and the hole 142 may be implemented in any other suitable forms. In addition, other numbers of the shaft 242 and the hole 142 may be provided according to the requirements, and the shaft 242 and the hole 142 may be formed into other suitable shapes.

[0048] Furthermore, although the respective operations are depicted in a particular order, it should be appreciated that the operations are not required to be completed in the particular order or in succession, or not all operations shown need to be executed to obtain the expected result. In some cases, multitasking or multiprocessing is also beneficial. Likewise, although the above discussion comprises some particular implementation details, they should not be interpreted as limitations over the scope of the present disclosure. Some features described separately in the context of the embodiments of the description can also be integrated and implemented in a single embodiment. Conversely, all kinds of features described in the context of a single embodiment can also be separately implemented in multiple embodiments or any suitable sub-combinations.

[0049] Although the subject matter has been described in languages specific to structural features and/or method actions, it should be understood that the subject matter defined in the attached claims is not limited to the above described particular features or actions. On the contrary, the above described specific features and actions are disclosed for implementing examples of the claims.

[0050] Various embodiments of the present disclosure have been described above and the above description is only exemplary rather than exhaustive and is not limited to the embodiments of the present disclosure. Many modifications and alterations, without deviating from the scope and spirit of the explained various embodiments, are obvious for those skilled in the art. The selection of terms in the text aims to best explain principles and actual applications of each embodiment and technical improvements made in the market by each embodiment, or enable those ordinary skilled in the art to understand embodiments of the present disclosure.

I/We Claim:

1. A panel switch, comprising:
 - a cover (10) comprising a pressing region;
 - a support frame (20) comprising a peripheral frame (26) and at least one actuation sheet body (25) pivotally connected thereto at a side of the peripheral frame (26), the actuation sheet body (25) comprising a pivot joint at the side and a free end (28) at a side opposing to the pivot joint, and
 - a switch module adapted to be actuated by the actuation sheet body (25);wherein the actuation sheet body (25) is adapted to pivot in response to a press on the pressing region, to at least partly press the switch module via pivoting of the actuation sheet body (25), so as to switch ON and OFF states of the switch module.
2. The panel switch according to claim 1, wherein the actuation sheet body (25) is hinged to the peripheral frame via an hinged portion (27).
3. The panel switch according to claim 1, wherein the cover (10) and the support frame (20) are movably mounted with respect to each other such that the cover (10) and the support frame (20) are configured to move relative to each other in a pressing direction of the cover (10).
4. The panel switch according to any of claim 3, wherein the cover (10) comprises at least one first protrusion (12) protruding from a bottom surface of the cover, and the support frame (20) comprises at least one opening mating with the at least one first protrusion (12), the first protrusion (12) being configured to be movable along the pressing direction of the cover (10) with respect to the opening.
5. The panel switch according to claim 3, wherein the cover (10) also comprises a limiting portion adapted to restrict movement of the cover (10) in a direction perpendicular to the pressing direction.
6. The panel switch according to claim 5, wherein the limiting portion comprises at least one second protrusion (16) protruding from a bottom surface of the cover (10), the second protrusion (16) protruding into a gap between the at least one actuation sheet body (25)

and the peripheral frame (26) and being adapted to contact an abutment portion (262) of the at least one actuation sheet body (25).

7. The panel switch according to claim 1, wherein the actuation sheet body (25) and the cover (10) interact with each other via shaft-hole fit, to enable the actuation sheet body (25) to move in response to the press on the cover (10).

8. The panel switch according to claim 7, wherein the cover (10) comprises at least one protrusion portion (14) protruding from a bottom surface of the cover, the protrusion portion (14) comprising a hole (142) for a shaft, and the actuation sheet body (25) comprises at least one opening and a shaft (242) extending across the at least one opening, the shaft (242) and the hole (142) forming the shaft-hole fit.

9. The panel switch according to claim 2, wherein the hinged portion (27) is configured such that the actuation sheet body (25) protrudes more towards the cover (10) compared to the peripheral frame (26).

10. The panel switch according to claim 2, further comprising a mounting panel (30) mounted with the support frame (20), the mounting panel (30) being provided with a pivot protrusion portion (31) that is arranged to protrude towards the actuation sheet body (25) to abut against the actuation sheet body (25) when the actuation sheet body (25) is moved in response to the press on the pressing region, so as to act as a pivoting axis of the actuation sheet body (25).

11. The panel switch according to claim 10, wherein a corresponding part against which the pivot protrusion portion (31) abuts is arranged away from the free end (28) and close to a side of the hinged portion (27).

12. The panel switch according to any of claims 1-11, wherein the actuation sheet body (25) is pivotally connected to the support frame (20) via a rotary shaft.

13. The panel switch according to claim 12, further comprising an elastic element disposed between the actuation sheet body (25) and the support frame (20), to cause the

actuation sheet body (25) to protrude towards the cover.

14. The panel switch according to any of claims 1-11 and 13, wherein the support frame (20) comprises at least one pair of actuation sheet bodies (25) arranged opposing to each other, adjacent ends of one pair of actuation sheet bodies (25) in the at least one pair of actuation sheet bodies (25) forming free ends (28) respectively.

15. The panel switch according to any of claims 1-11 and 13, wherein the switch module is arranged adjacent to a side where the free end (28) is located.

16. The panel switch according to any of claims 2, 9 and 10, wherein the panel switch comprises a plurality of switch modules, the switch module being a microswitch module and being arranged in a region between the free end (28) and the hinged portion (27).