

PUSH-BUTTON SWITCH ASSEMBLY, AND OPERATIONAL PART

INCORPORATION BY REFERENCE

- [0001] The following publications are referred to in the present application:
- [0002] PCT/AU12014/000545 entitled “Electrical Connector, System and Method”
- [0003] PCT/AU12014/000544 entitled “Batten Holder, Connector, System and Method”
- [0004] PCT/AU12011/001675 entitled “Touch Switch”
- [0005] PCT/AU2013/001274 entitled “General Power Outlet and Remote Switch Module”
- [0006] Co-pending Australian Provisional Patent Application entitled “Inductive Power Transfer In an Electrical Outlet”
- [0007] Co-pending Australian Provisional Patent Application entitled “Connection System and Method for Electrical Outlets”
- [0008] Co-pending Australian Provisional Patent Application entitled “Electrical System, Apparatus and Method”
- [0009] Co-pending Australian Provisional Patent Application entitled “Switch Assembly, System and Method”
- [0010] Co-pending Australian Provisional Patent Application entitled “Switch Assembly with Rotatable Operational Part”
- [0011] The entire content of each of these documents is hereby incorporated by reference.

PRIORITY

- [0012] The present application claims priority from the following applications:

Australian Provisional Patent Application No 2014905210 entitled “Electrical System, Apparatus and Method”

Australian Provisional Patent Application No 2014905212 entitled “Inductive Power Transfer In an Electrical Outlet”

Australian Provisional Patent Application No 2014905211 entitled “Connection System and Method for Electrical Outlets”

Australian Provisional Patent Application No 2014905209 entitled “Switch Assembly, System and Method”

Australian Provisional Patent Application No 2014905213 entitled “Push Button Switch Assembly”

Australian Provisional Patent Application No 2014905203 entitled “Switch Assembly with Rotatable Operational Part”

Chinese Patent Application No 201410795485.8 entitled “Hybrid Switch Mechanism”

Chinese Patent Application No 201410795482.4 entitled “Switch Assembly With Rotatable Operational Part”

Chinese Patent Application No 201410795430.7 entitled “Push-Button Switch Assembly and Operational Part”.

[0013] The entire content of each of these documents is hereby incorporated by reference.

TECHNICAL FIELD

[0014] The present application relates to electrical switch assemblies and in one application, to wall switch assemblies.

BACKGROUND

[0015] In plate switch assemblies (including sockets having switch assemblies), there are switch products with various appearances and styles, such as thumb switches, large plate switches, square switches and round switches. There is also a large range of types of switches, such as rocker switches, push-button switches, rotary switches, and toggle switches. Conventionally, there is no relationship among switch assemblies with different types or appearances. Once a switch assembly with a specific type and appearance is installed, if a user desires to change the type or appearance of the switch assembly, the user must replace the original switch assembly as a whole with a new switch assembly. This incurs a higher cost to the user and is difficult to customize switch assemblies according to various requirements of the user. Because update of a certain part in the switch assembly means update of the whole switch assembly, management and update of the switch assembly products are complicated.

SUMMARY

[0016] The present application provides a push-button switch assembly and an operational part for the push-button switch assembly.

[0017] According to one aspect, there is provided a push-button switch assembly comprising:

a functional part; and an operational part for actuation by a user and for controlling the functional part via an interface between the operational part and the functional part, wherein the interface in use, translates linear force imparted by the operational part when actuated by the user, to rocking force applied to the functional part; and wherein the operational part is configured to apply the linear force to the interface when the operational part is in any one of at least two different orientations with respect to the interface.

[0018] In one embodiment, the operational part comprises a first driver having a first orientation with respect to the interface, a second driver having a second orientation with respect to the interface, different to the first orientation of the first driver; a first driver spring, extending substantially parallel to the first driver, and a second driver spring extending substantially parallel to the second driver.

[0019] In one embodiment, when the operational part is in the first orientation with respect to the interface, the first driver applies the linear motion to the interface; and

when the operational part is in a second orientation with respect to the interface, the second driver applies the linear force to the interface.

[0020] In one embodiment, the operational part further comprises a push button spring, a carrier and a push button, the push button spring cooperating with the push button to provide resilience to the push button upon actuation by the user, the carrier for, in use, retaining the push button, the push button spring, the first driver, the second driver, the first driver spring, and the second driver spring to a cover unit.

[0021] In one embodiment, the second orientation is substantially perpendicular to the first orientation.

[0022] According to a second aspect, there is provided an operational part for in use, applying a linear force to an interface of a functional part, the interface for converting the linear force into a rocking force for applying to the functional part, the operational part comprising:

a first driver having a first orientation; a second driver having a second orientation different to the first orientation of the first driver; a first driver spring disposed substantially parallel to the orientation of the first driver; and a second driver spring disposed substantially parallel to the orientation of the second driver.

[0023] In one embodiment, the operational part further comprises a push button spring, a carrier and a push button, the push button spring cooperating with the push button to provide resilience to the push button upon actuation by the user, the carrier for, in use, retaining the push button, the push button spring, the first driver, the second driver, the first driver spring, and the second driver spring to a cover unit.

[0024] In one embodiment, the second orientation is substantially perpendicular to the first orientation.

BRIEF DESCRIPTION OF DRAWINGS

[0025] Embodiments of the various aspects described herein will be detailed with reference to the accompanying drawings in which:

[0026] Figure 1A - shows a generalised exploded view of two sub-assembly parts of a switch assembly according to one aspect;

[0027] Figure 1B – shows a generalised exploded view of the main components of the two sub-assemblies of the switch assembly of Figure 1A;

[0028] FIG. 2A is a perspective front view of one embodiment of a switch system with assembly (push-button switch assembly) according to a first aspect;

[0029] FIG. 2B is a perspective rear view of the embodiment of Figure 2A

[0030] FIG. 3 is a rear view of the operational part in the switch assembly in FIG. 2;

[0031] FIG. 4 is an exploded perspective view of the operational part of FIG. 3;

[0032] FIG. 5 is a perspective top view of an interface included in the switch assembly;

[0033] FIG. 6 is a cross-sectional view, along line A-A' in FIG 2A, of a combination of a functional part, the interface and an operational part within the embodiment of FIG.2A, with the perspective top view of the interface shown for reference;

[0034] FIG. 7 is a cross sectional view of the switch system along the line A-A' of FIG 2A including the base unit and cover unit;

[0035] FIG. 8 is a cross-sectional view of an operational part including two drivers within a switch assembly according to a second aspect;

[0036] FIG. 9 is an exploded perspective view of the operational part including two drivers as shown in FIG. 8;

- [0037] FIG. 10 is a rear view of the operational part including two drivers as shown in FIG. 8;
- [0038] FIG. 11 is a perspective view of a push-button switch assembly including the above operational part which is in a first orientation with respect to the interface;
- [0039] FIG. 12 is a rear view of a first state of the operational part in the first orientation;
- [0040] FIG. 13 is a rear view of a second state of the operational part in the first orientation;
- [0041] FIG. 14 is a perspective view of a push-button switch assembly including the above operational part which is in a second orientation;
- [0042] FIG. 15 is a rear view of a first state of the operational part in the second orientation;
- [0043] FIG. 16 is a rear view of a second state of the operational part in the second orientation;
- [0044] FIG. 17 is a perspective view of the second driver of the two drivers.

DESCRIPTION OF EMBODIMENTS

[0045] Various embodiments will now be described in detail in accordance with the accompanying drawings. The relative arrangement of components and shapes of devices in the embodiments are described merely as examples, and are not intended to limit the scope of the invention to these examples. Further, similar reference numerals and letters refer to similar items in the figures, and thus once an item is defined in one figure, it need not be discussed for following figures.

[0046] FIGs. 1A and 1B show a general representation of the components of an embodiment of a switch assembly 500 according to one aspect. Broadly, in this aspect, switch assembly 500 comprises two sub-assemblies, being base unit switch part 510 and operational part 200. As shown in FIG. 1A, base unit switch part 510 comprises a functional part 100 and an interface 300. Operational part 200 is for actuation by a user and for controlling the functional part 100, via the interface 300, for interfacing the functional part 100 and the operational part 200.

[0047] It will be noted that the operational part 200 is not fixed to the interface 300 or the functional part and is able to move freely with respect thereto, for reasons as will be described further below.

[0048] Figure 1B shows a further exploded general view of an embodiment of the switch assembly 500 of Figure 1A, in which it can be seen that in this embodiment, operational part 200 itself comprises two parts, namely user interface 201 and carrier 202. In some embodiments, the user interface 201 and the carrier 202 are fixed together and in other embodiments, the user interface 201

and the carrier 202 are separable as will be described in more detail below.

[0049] FIG. 2A is an exploded perspective front view of a switch system 1000, comprising a base unit 1100 and a cover unit or switch plate 1200. The switch assembly 500 (push-button switch assembly in this embodiment) is shown distributed between the base unit 1100 and cover unit or switch plate 1200, with the base unit switch part 510 being provided in the base unit 1100 and the functional part 200 (of which only the user interface 201 is visible in this view) being provided in the cover unit or switch plate 1200. FIG. 2B is an exploded perspective rear view of the switch system 1000. As shown in FIG. 2A, the switch assembly 500 includes the functional part 100, which in an embodiment is a switch mechanism, the operational part 200 which in this embodiment is a push button, and the interface 300.

[0050] As can be seen in Figures 2A and 2B, the operational part 200 can be freely removed from the base unit switch part (specifically the interface 300) and/or the functional part 100 as there is no connection between the operational part 200 and the interface 300/functional part 100.

[0051] In this embodiment, the operational part 200 comprises a user interface 201 (in this embodiment, a push-button 201A) and a carrier 202, as shown in FIG. 2A and 2B. The operational part 200 is engaged in the plate 1200 through the carrier 202 which can be fitted into the plate 1200, as shown in FIG. 2B. The push-button 201A is operated by a user to effect a switch on/off operation. FIG. 2B shows one embodiment of the engagement of the carrier 202 to the plate 1200. However, a person skilled in the art will understand that the engagement of the operational part 200 and the plate 1200 can be provided in any way which can connect the operational part 200 and the plate 1200 together.

[0052] When the cover unit or plate 1200 is connected to the base unit 1100, the functional part 100 and interface 300 are located behind the operational part 200 when viewed from the side of the cover unit 1200. The functional part 100 is controlled by the actuation of the operational part 200 to implement switch on/off operation through the interface 300. The functional part 100 is connected to the base unit 1100. This connection is by any suitable means including bonding, clipping, friction fit, gluing or by a means employing a sliding connector as described in co-pending patent application entitled "Connection System and Method for Electrical Outlets" previously incorporated by reference.

[0053] The interface 300 is disposed between the operational part 200 and the functional part 100, and is connected with the functional part 100 as described further below. Interface 300 is for

interfacing the functional part 100 and the operational part 200 so as to transfer the user's actuation operation (such as pushing the button or actuating the dolly) on the operational part 200 to the functional part 100.

[0054] In a conventional switch assembly, the operational part 200, especially, the push button 201 is fixed to the functional part 100 and cannot be removed or detached from the functional part 100.

[0055] However, according to an aspect described herein, as shown in FIG. 2A and 2B, the operational part 200 is not fixed or connected to the interface 300 or to the functional part 100, but can be removed from the functional part 100 or the interface 300. For example, the operational part 200 can be caused to contact or engage with the functional part 100 or the interface 300 by only connecting the plate 1200 to the base unit 1100. Similarly, the operational part 200 can be removed or disengaged from the functional part 100 or the interface 300 by simply separating the plate 1200 from the base unit 1100. The details of the relationship of the three parts and principles of how the switch assembly 500 works will be explained later with reference to FIGs. 3-7.

[0056] FIG. 3 is a rear view of the operational part 200 in the switch assembly in FIG. 2. FIG. 4 is a perspective exploded view of the operational part 200 of FIG. 3. FIG. 5 is a perspective top view of an interface 300 included in the switch assembly. FIG. 6 is a cross-sectional view, along line A-A' in FIG 2A, of a combination of a functional part 100, the interface 300 and an operational part 200 within the embodiment of FIG. 2A, with the perspective top view of the interface 300 shown for ease of reference. FIG. 7 is a cross sectional view of the switch system 1000 along the line A-A' of FIG 2A including the base unit 1100 and cover unit 1200.

[0057] As shown in FIG. 3, the operational part 200 includes one driver 203. As shown in the exploded perspective view of FIG. 4, the operational part 200 includes push button 201A, driver spring 206, rod 205, driver 203, push-button spring 204 and carrier 202. The push button 201A is operated by a user to implement switching on and off. There is a protrusion at each of the two ends, on the side close to push button 201A, of the driver 203. The driver spring 206 is accommodated within the two protrusions. There are two through holes at the two protrusions, respectively. The rod 205 is inserted into the two through holes. The driver spring 206, the rod 205, and the driver 203 work together to be driven by the user to transfer the user's operation to the functional part. The circular push-button spring 204 is around the driver spring 206, the rod 205, and the driver 203, and work together with push button 201A to achieve resilience of the push button 201A. The carrier 202

carries the push button 201, driver spring 206, rod 205, driver 203, and the push-button spring 204.

[0058] The details of the interface and how the switch assembly according to the first embodiment works will now be described in detail with reference to FIG. 5 to FIG. 7.

[0059] FIG. 5 is a perspective top view of an embodiment of interface 300 included in the switch assembly 500 according to the first embodiment described previously.

[0060] As shown in FIG. 5, the interface 300 comprises first protrusion 301A and second protrusion 301B, first surface 302A, second surface 302B, and first top surface 303A and second top surface 303B. The protrusions 301A and 301B are located at each side of a centre 306 of the interface 300, respectively. In this embodiment, interface 300 also comprises first surface 302A and second surface 302B. In this embodiment, first surface 302A is outside the first protrusion 301A with respect to the centre 306 and second surface 302B is outside the second protrusion 301B with respect to the centre 306. First top surface 303A is disposed at the top of the first protrusion 301A. Second top surface 303B is at the top of the second protrusion 301B. As can be seen, the first surface 302A and second surface 302B are planar surfaces each disposed a first distance from the centre 306 of the interface 300 and the first top surface 303A and second top surface 303B are disposed above the first surface 302A and the second surface 302B, each at a second distance from the centre 306 of the interface. In one embodiment, the first distance is greater than the second distance. In another embodiment, (not shown), the first distance is less than the second distance.

[0061] FIG. 6 shows how a push-button switch assembly of the first embodiment works. FIG. 6 is a cross-sectional view, along line A-A' in FIG 2A, of the switch assembly 500, being a combination of the functional part 100, the interface 300 and the operational part 200, with the perspective top view of the interface 300 also shown for ease of reference.

[0062] As shown in FIG. 6, the push button 201A included in the operational part 200 is above the interface 300. In one embodiment, the interface 300 is connected to an actuating member 305. In some other embodiments, actuating member 305 is a part of, or integrated with, interface 300. The switching element 102 within the functional part 100 is under the actuating member 305 and is for making and breaking contact between terminals 103, 104 and 105 which in use, are connected to respective electrical conductors (not shown) carrying electrical current such as mains or supply current or current from another source. The effect of switching element 102 being rocked from one side to another is to create an electrical path between terminals 103 and 104 and breaking the electrical path between terminals 104 and 105, thereby effecting an on/off switching function

under actuation of the actuating member 305as will be understood by the person skilled in the art.

[0063] In the view of Figure 6, at the initial state, the push button 201A (specifically a corresponding surface of driver 203) contacts with the first top surface 303A located at the top of the first protrusion 301A. When the user pushes the push button 201A downwards, the first protrusion 301A of the interface 300 is pressed down, causing the actuating member 305 to swing towards the right side, since interface 300 is connected to functional part 100 via a pivot point 307 at centre 306. The switching element 102 is actuated correspondingly to change switching on/off status of the switch assembly 100 as previously described. At the same time, the second protrusion 301B moves up so that the second top surface 303B makes contact with the push button 201A. When the push button 201A is pressed again in the position of contact with the second top surface 303B of second protrusion 301B, the second protrusion 301B is pressed down, causing the actuating member 305 to swing toward the left side. The switching element 102 is actuated correspondingly to change the switching on/off status of the switch assembly 100. At the same time, the first protrusion 301A moves up so that the first top surface 303A makes contact with the push button 201A. The same process is repeated when the user presses the push button 201A again.

[0064] As can be seen from FIG. 6, the push button 201A moves linearly in an up and down motion, while through the transfer of the interface 300, the switching element 102 makes a rocker motion. That is, the interface 300 is configured to, in use, convert linear motion or force from the first operational part 200 into rocking motion or force to the functional part 100 when the operational part 200 is or includes a push button 201A.

[0065] Figure 7 shows the cross-sectional view of switch system 1000 along the line A-A' of Figure 2A, including the base unit 1100 and the cover unit or plate 1200. It can be seen in this view how operational part 200 is brought into non-fixed but touching engagement with base unit switch part 510 (and in particular in this embodiment, interface 300), when cover unit or plate 1200 is connected to base unit 1100. The operational part 200 and the base unit switch part 510 are separated (and in particular separated from interface 300 in this embodiment) simply by removing cover unit or plate 1200 from base unit 1100.

[0066] By separating the functional part and the operational part, the above push-button switch assembly can be converted to a rocker switch assembly by only changing the operational part. Therefore, the type of the switch can be changed.

[0067] Due to the flexibility of the above system, it is also possible to transfer a cover unit with associated operational part, to a different base unit. In some circumstances, the desired different base unit may be oriented differently to the original base unit. For example, the original base unit may be installed horizontally on a wall, and the new, desired base unit may be installed vertically on a wall. Thus, with the arrangement described above, it may not be possible to use the cover unit 1200 on the differently-orientated new base unit because the driver surfaces of the operational part 200 may no longer align to allow use of the operational part to effect switching. In one embodiment, the operational part may be rotated to align with the orientation of the interface in the new base unit 1200. Such an arrangement is described in a co-pending patent application titled "Switch Assembly with Rotatable Operational Part" previously incorporated by reference. In another aspect however, there is provided a switch assembly, system and operational part in which the user does not need to manually rotate the operational part even if the installation direction of the push-button switch assembly is changed. For example, when the cover unit is converted from horizontal installation to vertical installation, the push-button switch assembly can operate normally even without manual operation of the user to rotate the operational part.

[0068] The push-button switch assembly according to the second aspect will be described with reference to FIGs. 8 to 17. In the second aspect of the push-button switch assembly, two drivers are included.

[0069] FIG. 8 is a cross-sectional view of an operational part including two drivers within a switch assembly according to a second aspect.

[0070] FIG. 9 is an exploded perspective view of the operational part including two drivers as shown in FIG. 8.

[0071] As shown in FIGs. 8 and 9, the operational part 400 includes a carrier 407, a push-button spring 408, a first driver 401 disposed in a first orientation, a second driver spring 403 whose axis is vertical to a second installation direction, a second driver 406 extending in a direction substantially perpendicular to the first orientation, a rod 402, a first driver spring 405 whose axis extends substantially parallel to the first orientation, and a push button 404. In one embodiment, the first driver spring 405 is the same as the second driver spring 403. Although it is shown in the embodiment above that the second driver extends substantially perpendicularly to the direction in which the first driver extends (or its orientation), it will be appreciated that in other embodiments, the first driver and the second driver can be angled with respect to each other at any desired angle, including between 1° and 5°, between 4° and 10°, between 9° and 25°, between 24° and 45°, between

44° and 90°, between 89° and 180° and including 45°, 90° and 135°.

[0072] As compared with the operational part 200 shown in FIG. 4, the second driver spring 403 and the second driver 406 are added into the operational part 400. As shown in the figure, the second driver spring 403 and the second driver 406 are located between the first driver 401 and the rod 402. As compared with the second driver spring 403, the second driver spring 403 is closer to the first driver 401. The first driver 401 and the first driver spring 405 work together to drive the functional part. The second driver 406 and the second driver spring 403 work together to drive the functional part. FIG. 10 is a rear view of the operational part 400 including two drivers, as shown in FIG. 8. In this embodiment, the first driver 401 is under the second driver 406, when the push button is on the top.

[0073] The function of the push-button switch assembly in a first orientation with respect to the interface 300 will now be described with reference to FIGs. 11 to 13. This situation reflects the first installation direction of the cover unit 1200 with respect to the base unit 1100, or the orientation of the operational part 200 with respect to the interface 300. In one example, the base unit and cover part are installed in a horizontal direction or orientation.

[0074] FIG. 11 is a perspective view of a push-button switch assembly including the above operational part 400 which is in a first orientation (or installation direction) with respect to the interface 300.

[0075] As shown in FIG. 11, in the first orientation or installation direction, the first driver 401 (whose orientation is in line with the orientation of the interface 300, that is the first driver 401 extends in a direction substantially in line with the two protrusions 310A and 301B so as to be able to interact with them upon actuation of the push button 404 by the user in use) and the corresponding first driver spring 405 operate together. More specifically, the first driver 401 is above the interface 300. At the initial state, the first driver 401 contacts with the first top surface 303A at the top of the first protrusion 301A. When the user pushes the push button 404 downwards, the first driver 401 moves downwards. The first protrusion 301A of the interface 300 is pressed down, causing the actuating member 305 to swing towards the right side (see FIG. 7), since interface 300 is connected to functional part 100 via a pivot point 307 at centre 306. The switching element 102 is actuated correspondingly to change switching on/off status of the switch assembly 100 as previously described. At the same time, the second protrusion 301B moves up so that the second top surface 303B makes contact with the push button 201A. When the push button 404 is pressed again, the first driver 401 is pressed again in the position of contact with the second top surface 303B of second

protrusion 301B. The second protrusion 301B is pressed down, causing the actuating member 305 to swing toward the left side. The switching element 102 is actuated correspondingly to change the switching on/off status of the switch assembly 100. At the same time, the first protrusion 301A moves up so that the first top surface 303A makes contact with the push button 201A. The same process is repeated when the user presses the push button 404 again.

[0076] FIG. 12 is a rear view of a first state of the operational part 400 in the operation described above. FIG. 13 is a rear view of a second state of the operational part 400 in the arrangement described above. As shown in FIGs. 12 and 13, when the push-button switch assembly is in the first installation direction, the first driver 401 moves.

[0077] The movement of the first driver 401 is effected by the interaction of sloping surfaces 401A and 401B of the first driver 401 with the respective outwardly-facing first and second sloped surfaces 304A and 304B of first protrusion 301A and second protrusion 301B. Prior to the user depressing the push button 404, first driver 401 is centred above interface 300 with sloped surface 401A of first driver 401 in contact with the top of the first sloped surface 304A of first protrusion 301A. As the user begins to depress push button 404, causing first driver 401 to move downwards, the sloped surface 401A of first driver 401 slides over the first sloped surface 304A of the first protrusion 301A which causes first driver 401 to slide to the left, against the resilience of first driver spring 405. This action also causes first protrusion 301A to move downwards, causing interface 300 to swing about its pivot as previously described, actuating the switch. In this position, first driver is in the first state as shown in FIG. 12. As the user releases push button 404, push button 404 rises up due to the force of push button spring 408, disengaging sloped surface 401A of first driver 401 from the first sloped surface 304A of interface 300, allowing the resilience of first driver spring 405 to cause first driver 401 to return to its neutral centre position as shown in FIG. 10. In this position, interface 300 has tilted due the previous action, such that the sloped surface 401B is now in contact with the top of second sloped surface 305B of second protrusion 301B. As the user depresses push button 404, the cycle repeats itself with respect to the second side, to bring first driver 401 into the second state as shown in FIG. 13, prior to first driver 401 resuming its neutral central position as shown in FIG. 10.

[0078] When the user wishes to transfer the cover unit 1200 and associated operational part 400 from the base unit 1100 above (for example installed horizontally) to another base unit that is oriented differently (for example installed vertically), but where the orientation of the interface 300 remains the same, the operational part is still able to function according to this second aspect. The

positional relationship of the interface 300 and the operational part 400 is shown in FIG. 14.

[0079] FIG. 14 is a perspective view of a push-button switch assembly including the above operational part 400 which is in the second orientation or installation direction.

[0080] As shown in FIG. 14, when the operational part 400 is in the second installation direction, the second driver 406 (whose orientation is in line with the orientation of the interface 300, that is the second driver 406 extends in a direction substantially in line with the two protrusions 310A and 301B so as to be able to interact with them upon actuation of the push button 404 by the user in use) and the corresponding second driver spring 403 operate together. More specifically, the second driver 406 is above the interface 300. At the initial state, the second driver 406 contacts with the first top surface 303A at the top of the first protrusion 301A. When the user pushes the push button 404 downwards, the second driver 406 moves downwards. The first protrusion 301A of the interface 300 is pressed down, causing the actuating member 305 to swing towards the right side (see FIG. 7, since interface 300 is connected to functional part 100 via a pivot point 307 at centre 306. The switching element 102 is actuated correspondingly to change switching on/off status of the switch assembly 100 as previously described. At the same time, the second protrusion 301B moves up so that the second top surface 303B makes contact with the push button 201A. When the push button 404 is pressed again, the second driver 406 is pressed again in the position of contact with the second top surface 303B of second protrusion 301B. The second protrusion 301B is pressed down, causing the actuating member 305 to swing toward the left side. The switching element 102 is actuated correspondingly to change the switching on/off status of the switch assembly 100. At the same time, the first protrusion 301A moves up so that the first top surface 303A makes contact with the push button 404. The same process is repeated when the user presses the push button 404 again.

[0081] FIG. 15 is a rear view of a first state of the operational part 400 in the second orientation in the push-button switch assembly. FIG. 16 is a rear view of a second state of the operational part in the second orientation in the push-button switch assembly. As shown in FIGs. 15 and 16, when the push-button switch assembly is in the second orientation, the second driver 406 moves.

[0082] The movement of the second driver 406 is effected by the interaction of sloping surfaces 406A and 406B (see FIGs 15 and 16) of the second driver 406 with the respective outwardly-facing first and second sloped surfaces 304A and 304B of first protrusion 301A and second protrusion 301B in the same manner as described above with reference to the first driver 401.

[0083] FIG. 17 is a perspective view of the second driver 406. As shown in FIG. 17, the second driver 406 can be a plastic piece with two protrusions at two ends thereof, so as to cooperate with the interface 300.

[0084] The above described aspects provide for a push button switch assembly, an operational part, and a switch system, which allows convenient exchange of a cover unit from a base unit installed in one direction, to a base unit installed in another direction. Accordingly, when the installation direction of a push-button switch assembly is changed, it is not necessary for the user to change the direction of the operational part, which improves the user's experience and makes the installation and operation easy. It is also less necessary for the manufacturer to produce different cover units with operational parts to cater for all possible installation directions.

[0085] Although some specific embodiments of the various aspects have been demonstrated in detail with examples, it should be understood by a person skilled in the art that the above examples are only intended to be illustrative but not to limit the scope. It should be understood by a person skilled in the art that the above embodiments can be modified without departing from the scope and spirit of the various aspects described. The scope of the present invention is defined by the attached claims.

[0086] Throughout the specification and the claims that follow, unless the context requires otherwise, the words "comprise" and "include" and variations such as "comprising" and "including" will be understood to imply the inclusion of a stated integer or group of integers, but not the exclusion of any other integer or group of integers.

[0087] The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement of any form of suggestion that such prior art forms part of the common general knowledge.

CLAIMS

1. A push-button switch assembly comprising:

a functional part; and

an operational part for actuation by a user and for controlling the functional part via an interface between the operational part and the functional part, wherein the interface in use, translates linear force imparted by the operational part when actuated by the user, to rocking force applied to the functional part; and wherein

the operational part is configured to apply the linear force to the interface when the operational part is in any one of at least two different orientations with respect to the interface, wherein,

the operational part comprises a first driver having a first orientation with respect to the interface, a second driver having a second orientation with respect to the interface, different to the first orientation of the first driver; a first driver spring, extending substantially parallel to the first driver, and a second driver spring extending substantially parallel to the second driver.

2. A push-button switch assembly as claimed in claim 1, wherein,

when the operational part is in the first orientation with respect to the interface, the first driver applies the linear motion to the interface; and

when the operational part is in a second orientation with respect to the interface, the second driver applies the linear force to the interface.

3. A push-button switch assembly as claimed in any one of claims 1 or 2, wherein;

the operational part further comprises a push button spring, a carrier and a push button, the push button spring cooperating with the push button to provide resilience to the push button upon actuation by the user, the carrier for, in use, retaining the push button, the push button spring, the first driver, the second driver, the first driver spring, and the second driver spring to a cover unit.

4. A push-button switch assembly as claimed in any of claims 1-3, wherein

the second orientation is substantially perpendicular to the first orientation.

5. An operational part in a push-button switch assembly, the operational part, in use, applying a linear force to an interface of a functional part, the interface for converting the linear force into a rocking force for applying to the functional part, the operational part comprising:

a first driver having a first orientation;

a second driver having a second orientation different to the first orientation of the first driver;

a first driver spring disposed substantially parallel to the orientation of the first driver; and

a second driver spring disposed substantially parallel to the orientation of the second driver.

6. An operational part as claimed in claim 5 further comprising a push button spring, a carrier and a push button, the push button spring cooperating with the push button to provide resilience to the push button upon actuation by the user, the carrier for, in use, retaining the push button, the push button spring, the first driver, the second driver, the first driver spring, and the second driver spring to a cover unit.

7. An operational part as claimed in any one of claims 5 or 6 wherein the second orientation is substantially perpendicular to the first orientation.