

SWITCH ASSEMBLY, SYSTEM AND METHOD

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 “Push Button Switch Assembly”
- [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 and general power outlets having switch assemblies), there are switch products with various appearances and styles, such as 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.

[0016] Once a switch assembly of a specific type and appearance is installed, a user has to replace the switch assembly with a completely new assembly if the user wishes to change the type or appearance of the switch assembly. Management and updates of switch assembly products in a

factory is also difficult because an update of a certain part of a switch assembly means an update of the switch assembly as a whole.

[0017] Furthermore, if a user wishes to change his or her current switch types, it is necessary to have a professional or certified person, such as an electrician, to perform the work. This can be expensive for the user.

SUMMARY

[0018] According to a first aspect, there is provided a switch assembly comprising:
a functional part; an operational part for actuation by a user and for controlling the functional part; and an interface for interfacing the functional part and the operational part; wherein the operational part is not fixed to the interface or to the functional part.

[0019] According to a second aspect, there is provided an interface for interfacing an operational part and a functional part of a switch assembly, the interface configured to, in use, transfer rocking motion from the operational part to the functional part when the operational part is a rocker switch wherein the operational part is not fixed to the interface.

[0020] According to a third aspect, there is provided a switch sub-assembly comprising a functional part and an interface for engaging with an operational part for controlling the functional part, wherein the interface is configured to transfer movement from the operational part without being fixed to the operational part.

[0021] According to a fourth aspect, there is provided a method of forming a switch assembly comprising a sub-assembly and an operational part, the sub-assembly comprising a functional part and an interface and connected to a base unit; the method comprising:

connecting a plate having connected thereto the operational part to the base unit, thereby causing the operational part to engage with the interface of the sub-assembly to allow the operational part to control the functional part.

[0022] According to a fifth aspect, there is provided, in a switch arrangement comprising an operational part for controlling the function of a functional part, the operational part connected to a plate connected to a base unit, a method of replacing the operational part with an operational part of a different type, the method comprising:

removing the plate from the base unit;

disconnecting the operational part from the plate;
 connecting the operational part of a different type to the plate; and
 replacing the plate on the base unit.

BRIEF DESCRIPTION OF DRAWINGS

[0023] Embodiments of the various aspects described herein will be detailed with reference to the accompanying drawings in which:

[0024] Figure 1A - shows a generalised exploded view of the two sub-assembly parts of a switch assembly according to one aspect;

[0025] Figure 1B – shows a generalised exploded view of the main components of the two sub-assemblies of the switch assembly of Figure 1A;

[0026] 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;

[0027] FIG. 2B is a perspective rear view of the embodiment of Figure 2A;

[0028] FIG. 3A is a perspective front view of another embodiment of a switch system with switch assembly (rocker switch assembly) ;

[0029] FIG. 3B is a perspective rear view of the embodiment of Figure 3A;

[0030] FIG. 4 is a perspective top view of an interface included in the switch assembly;

[0031] FIG. 5 is a cross-sectional view, along line 6-6 in FIG 2A, of a combination of a functional part, the interface and an operational part within the embodiment of Figure 2A, with the perspective top view of the interface for reference;

[0032] FIG. 6 is a cross sectional view of the switch system along the line 6-6 of FIG 2A including the base unit and cover unit;

[0033] FIG. 7 is a cross-sectional view, along line 8-8 in FIG. 3B, of a combination of a functional part, the interface and an operational part in the embodiment of Figure 3, with the perspective top view of the interface for reference;

[0034] FIG. 8 is a cross sectional view of the switch system along the line 8-8 of FIG 3B including the base unit and cover unit;

[0035] FIG. 9A is a perspective top view of a combination of a functional part, an interface and an operational part included in a rotary switch assembly according to another embodiment;

[0036] FIG. 9B is a perspective side view of a combination of the functional part, the interface and an operational part included in the switch assembly of Figure 9A;

[0037] FIG. 10 is a front perspective view of a cover unit or switch plate with a rotary switch;

[0038] FIG. 11 is a perspective side view of the switch assembly with rotary switch from a different angle to that shown in Figure 9B;

[0039] Figure 12A is a front perspective view of the switch system with a toggle switch according to another embodiment;

[0040] FIG. 12B is a rear perspective view of the switch system with a toggle switch of FIG. 12A;

[0041] FIG. 13 is a sectional view of a combination of a functional part, an interface and an operational part included in a toggle switch assembly according to the embodiment of Figure 12;

[0042] FIG. 14A is an exploded perspective front view of a switch assembly (a push-button switch assembly) according to another aspect;

[0043] FIG. 14B is an exploded perspective rear view of the switch assembly according to the embodiment of FIG 14A;

[0044] FIG. 15A is an exploded perspective front view of a switch assembly (a rocker switch assembly) according to another aspect;

[0045] FIG. 15B is an exploded perspective rear view of the switch assembly according to the embodiment of FIG 9A;

[0046] FIG. 16 shows an example of a round rocker switch being converted to a square rocker switch;

[0047] FIG. 17 shows a flowchart of a method of forming a switch assembly; and

[0048] FIG. 18 shows a flowchart of a method of removing a user interface from a switch assembly.

DESCRIPTION

[0049] 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.

[0050] Figures 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 Figure 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.

[0051] 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.

[0052] 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.

[0053] 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. 1B is an exploded perspective rear view of the switch system 1000. As shown in Figs 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.

[0054] 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.

[0055] 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 1000 through the carrier 202 which can be fitted into the plate 1000, 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. The details of the connection between the plate 1200 and the operational part 200 will be described in more detail later with reference to FIGs. 14A, 14B and FIG. 15A, 15B.

[0056] 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.

[0057] 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 pushing the button or actuating the dolly) on the operational part 200 to the functional part 100. An enlarged view of the interface 400 is shown in FIG. 4.

[0058] 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.

[0059] 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. 5, 7, 11 and 13.

[0060] FIG. 3A and 3B illustrate another embodiment of the switch system 1000 with switch assembly 500, with the operational part 200 being provided by a rocker switch or dolly 201B. FIG. 3A is an exploded perspective front view of this embodiment of the switch system 1000 with switch assembly (rocker switch assembly). FIG. 3B is an exploded perspective rear view of the switch system 1000 with switch assembly 500 according to this embodiment.

[0061] The switch assembly 500 in FIG. 3A and 3B includes the functional part 100, the operational part 200, and the interface 300. The difference between the rocker switch assembly in FIG. 3 and the push-button switch assembly in FIG. 2 lies only in the operational part 200 in this

embodiment.

[0062] In this embodiment, the operational part 200 includes a dolly 201B and a carrier 202, as shown in FIG. 3A and 3B. The operational part 200 is engaged in the cover unit or switch plate 1200 through the carrier 202 which can be fitted into the plate 1200, as shown in FIG. 3B. The dolly 201B is operated by a user to effect switch on/off operation. FIG. 3B shows the engagement implemented by the carrier 202. However, it will be appreciated by the person skilled in the art that the engagement of the operational part 200 and the plate 1200 can be in any way which can connect the operational part 200 and the plate 1200 together, including the direct connection of the operational part to the plate without an intervening carrier.

[0063] As with the embodiment shown in FIG. 2A and 2B, the operational part 200 is not fixed to the base unit switch part 510 and in particular, to interface 300 or to the functional part 100, but can be removed or separated from the base unit switch part 510 being the functional part 100 or the interface 300. For example, the operational part 200 can be engaged with the functional part 100 through the interface 300 by only connecting the plate 1200 on the base 1100. Similarly, the operational part 200 can be disengaged or removed from the functional part 100 or the interface 300 by simply separating the plate 1200 from the base 1100. The details of the relationship of the three parts and principles of how the switch assembly works in this embodiment will be explained later with reference to FIG. 7.

[0064] Since the functional part 100 in FIG. 2 is the same as that in FIG. 3 and the operational part 200 can be removed from the same functional part 100, the push-button switch assembly as shown in FIG. 2 can be converted to the rocker switch assembly as shown in FIG. 3 simply by replacing the functional part 200 with push-button switch 201A with the functional part with the rocker switch 201B. Such replacement can be done by a user himself/herself without assistance of a professional or qualified tradesperson.

[0065] 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. 4 to FIG. 6.

[0066] FIG. 4 is a perspective top view of an embodiment of interface 300 included in the switch assembly 500 according to the first embodiment described previously.

[0067] As shown in FIG. 4, 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.

[0068] FIG. 5 shows how a push-button switch assembly of the first embodiment works. FIG. 5 is a cross-sectional view, along line 6-6 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.

[0069] As shown in FIG. 5, 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.

[0070] In the view of Figure 5, at the initial state, the push button 201A contacts with the first top surface 303A located at the top of the protrusion portion 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.

[0071] As can be seen from FIG. 5, 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 from the first operational part 200 into rocking motion to the functional part 100 when the operational part 200 is or includes a push button 201B.

[0072] Figure 6 shows the cross-sectional view of switch system 1000 along the line 6-6 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.

[0073] FIG. 7 shows how a switch assembly 500 of the second embodiment of Figure 3 functions. FIG. 7 is a cross-sectional view, along line 8-8 in FIG. 3A, of 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.

[0074] As shown in FIG. 7, the dolly 201 included in the operational part 200 is above the interface 300. As in the arrangement shown in FIG. 5, 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 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 305 as will be understood by the person

skilled in the art.

[0075] In the view of FIG. 7, at the initial state, the dolly 201B makes contact with the first surface 302A and the second surface 302B, via legs 201B-1 and 201B-2 associated with dolly 201B. In this embodiment the first surface 302A and the second surface 302B are located farther from the centre 306 as compared with the first top surface 303A and second top surface 303B. When a user actuates the dolly 201B, the dolly 201B causes the first surface 302A of the interface 300 to be pressed down, which makes the actuating member 305 swing toward right side in the view shown. The switching element 102 is actuated to change switching on/off status of the switch assembly. At the same time, the second surface 302B moves up. When the dolly 201B is actuated again, the dolly 201B causes the second surface 302B of the interface 300 to be pressed down, which makes the actuating member 305 swing toward the left side in this view. The switching element 102 is actuated to change the switching on/off status of the switch assembly. At the same time, the first surface 302A moves up. The same process is repeated when the user actuates the dolly 201B again.

[0076] In the above embodiment, the dolly 201B makes contact with the first surface 302A and the second surface 302B of the interface 300 which are planar. In another embodiment, the rocker or dolly switch 201B may make contact with the first slanted surface 304A and second slanted surface 304B of the protrusions 301A and 301B. In other embodiments, the first surface 302A, the second surface 302B, the first slanted surface 304A and/or the second slanted surface 304B can be curved or non-planar.

[0077] As can be seen from FIG. 7, the interface 300 transfers rocking motion from the operational part 200 to the functional part 100, when the operational part 200 is a dolly 201B.

[0078] Although in the above embodiment, two protrusions 301A and 301B are shown as an example, a person skilled in the art will appreciate that three or more protrusions can be applied to enforce switching effect. Furthermore, any other surface configurations can be used to effect the same translational functions as the exemplary embodiments described above.

[0079] From FIG. 5 and FIG.7, it will be appreciated that the push-button switch assembly 500 can be converted to a rocker switch assembly simply by replacing the operational part 200 being a push button 201A, with an operational part 200 being a dolly 201B.

[0080] Such replacement can be done by a user himself/herself without assistance of a professional or qualified tradesperson. Therefore, costs to an end-user are reduced. Furthermore, production costs of the switch assembly 500 are reduced because when a part of the switch assembly

is updated or modified, only that part is needed to be produced, without affecting other parts.

[0081] FIG. 8 shows the switch assembly of FIG. 7 with operational part 200 in cover unit or switch plate 1200, connected to base unit 1100, to form switch system 1000.

[0082] A third embodiment, in which a rotary switch assembly is implemented, is now described with reference to FIG. 9A and 9B.

[0083] FIG. 9A is a perspective top view of a combination of a functional part 100, an interface 300 and an operational part 200 included in a switch assembly (a rotary switch assembly) according to a third embodiment. FIG. 9B is a side view of the arrangement of FIG. 9A. FIG. 9A and 9B show the operational part 200 comprising a rotary switch 201, and an interface 300. The rotary switch 201 comprises a knob 201C as the user interface 201 and a first rod 201C-1 under the knob 201C. The knob 201C can rotate. When the knob 201C is rotated, the first rod 201C-1 swings accordingly. On the surface of the operational part 200, there are two indicators, first indicator 203 and second indicator 204. When the knob 201C aligns with the first indicator 203, it indicates that the switch is in an off state. When the knob 201C aligns with the second indicator 204, it indicates that the switch is in an on state. Of course, the indications of such states can be exchanged. For example, the first indicator 203 indicates switch on state, and the second indicator 204 indicates switch off state. Any other means of indicating the state of the switch can also be used, including the use of a light indicator that emits light when the switch is on and emits no light when the switch is off.

[0084] In this embodiment of interface 300 as shown in Figure 9B for ease of reference, a fork 308 with prongs 308A and 308B is added between the protrusions 301A and 301B, and is configured to accommodate the first rod 201C-1 in the gap between prongs 308A and 308B of fork 308.

[0085] At the initial state, the knob 201C aligns with the first indicator 203 on the surface of the rotary switch. When a user rotates the knob 201C to align with the second indicator 204, the first rod 201C-1 correspondingly moves from left side to the right side as seen in this view. This movement causes first rod 201C-1 to contact and/or act on the right prong 308B of fork 308. Since interface 300 is pivotally connected to functional part 100 as previously described, the left prong 308A of the fork 308 is forced to move up, and the right protrusion 308B of the fork 308 is forced to move down. Thus, such movement is transferred to the switching element 102 (not shown in FIG. 6B, but as shown in FIG. 5 and 7) to implement switching on/off. Then, when the knob 201C is

rotated from aligning with the second indicator 204 to aligning with the first indicator 203, the first rod 201C-1 correspondingly moves from the right side to the left side. The left protrusion 308A of the fork 308 is forced to move down, and the right protrusion 308B of the fork 308 is forced to move up. Thus, such movement is transferred to the switching element 102 to implement switching on/off.

[0086] Figure 10 shows the operational part 200 as a rotary switch 201C within a cover unit or switch plate 1200. As previously described, cover unit or switch plate 1200 can be connected to a base unit 1100 (not shown) to form a switch system 1000 (not shown). In this embodiment, the connection of the cover unit or switch plate 1200 to the base unit 1100 will cause the operational part 200, being in this embodiment, a rotary switch 201C to come into functional engagement with interface 300 of the base unit switch part 510 (comprising interface 300 and functional part 100) in the base unit 1100.

[0087] FIG. 11 shows this switch assembly 500 formed by the action of connecting the cover unit or switch plate 1200 to base unit 1100. In this view, cover unit or switch plate 1200 and base unit 1100 are not shown for clarity. This view shows operational part 200 including rotary switch 210C and carrier 202, interface 300 and operational part 100.

[0088] As can be seen from FIG. 9 to FIG.11, the knob 201C is rotated. Such rotation motion is converted to rocker motion by the rod 201C-1 and fork 308. By adding the fork 308 to the interface 300, the interface 300 is able to convert rotational motion from the operational part 200 into rocking motion to the functional part 100 when the operational part 200 is a rotary switch.

[0089] As can be seen from FIGs. 1 to 11, the type of the switch assembly can be converted between a push-button switch, a rocker switch, and a rotary switch.

[0090] It will be appreciated that by use of the interface 300, comprising various features appropriate for the desired functions, the switch assembly 500 can be converted to any other type, as a further example, a toggle switch assembly.

[0091] FIG. 12 shows a further embodiment in which the operational part 200 comprises a toggle switch 201D. FIG. 12A is a front perspective view of an assembled switch system 1000 with cover unit or switch plate 1200 connected to base unit 1100. Operational part 200 is provided in this embodiment by a toggle switch 201D. FIG. 12B shows a rear view of the arrangement of FIG.12A, showing operational part 100 behind the base unit 1100.

[0092] FIG. 13 is a cross-sectional view of the switch assembly 500, of FIG. 12A along the line 13-13. As shown in FIG. 13, the interface 300 is the same as that in the first embodiment. The difference again lies only in the operational part 200. The operational part 200 in this embodiment comprises a toggle 201D and a second rod 201D-1 whose lower end is within a gap between the first protrusion 301A and the second protrusion 301B of the interface 300. When a user actuates the toggle 201D, the lower part of the second rod 201D-1 causes the surface in the gap between the protrusions 301A and 301B to swing. Such swinging is transferred into the rocker motion and actuates the switching element 102 to switch on/off.

[0093] It can be seen from FIG. 13 and the above description, the switch assembly 500 can thus also be converted to a toggle switch assembly type.

[0094] On the basis of the above description, a person skilled in the art will understand that a switch assembly can be easily changed to any type by only changing the operational part 200 which is not fixed to the interface 300 or to the functional part 100.

[0095] In the above various embodiments, the interface 300 can comprises various features as required for the specific function. In one embodiment, interface 300 comprises protrusions. In another embodiment, the interface 300 comprises a planar surface. Correspondingly, the operational part 200 including a push-button switch might be modified by including two protrusions to contact with the planar interface.

[0096] The various embodiments and principles described above provide a method and system for conveniently changing a switch assembly type. In another aspect, the switch assembly can be varied to change the appearance.

[0097] FIG. 14A shows that a round rocker switch assembly with a round-cornered plate is changed into a square rocker switch assembly with a square-cornered plate by only recombining an operational part with a square dolly 201B' and a corresponding square-cornered plate.

[0098] The following describes how to fit or connect the operational part 200 and the cover unit or switch plate 1200.

[0099] Conventionally, an operational part 200 with a specific shape and type can only be connected to a plate 1200 with a corresponding specific shape and type. Consequently, when the operational part 200 is to be changed in type or shape, the plate 1200 has to be changed

correspondingly.

[00100] According to another aspect, the operational part 200 and the plate 1200 can be separated and connected through a standard interface. Thus, different operational parts and different plates can be combined through the standard interface in any way to form different types and different outlooks. The standard interface can be provided by any suitable form including clips, friction fit, magnets, hook and loop arrangements and/or reusable adhesives.

[00101] In one aspect then, the base unit 1100 can be provided with a base switch interface 160 (and associated functional parts) such as the interface 300 and functional part 100 described herein which can interface with the cover switch interface (such as user interface 201 (and associated operational part 200) of different designs described herein. Thus, this aspect provides the advantage that only one base switch design need be provided in a base unit but which can interface with a plurality of operational parts. This reduces or eliminates the need to manufacture, store and install base units 1100 of different designs while still allowing the ability to provide different operational parts 200 for the cover unit 1200.

[00102] FIG. 14A is an exploded perspective front view of a switch system 1000 (with a push-button switch assembly 500 in this embodiment) according to another aspect described herein. FIG. 14B is an exploded perspective rear view of the switch system 1000 according to this aspect.

[00103] In this aspect, as shown in Figure 14B, a retaining portion 1203 is provided to retain the carrier 202 to the cover unit 1200. In the embodiment shown in Figure 14B, the retaining portion 1203 is a clip structure 1203A.

[00104] In this embodiment, the plate or cover unit 1200 in FIG. 14A and 14B includes a square clip 1203A around the aperture 1201 for receiving the, or part of the, operational part 200. The size of the clip 1203A can be made to match the size of the carrier 202 to retain the carrier 202 in a friction fit or other clipping means. The operational part 200 can be removed from plate or cover unit 1200 by pressing the clip 1203 so as to release or otherwise disengage from, the carrier 202.

[00105] FIG. 15A is an exploded perspective front view of a switch system 1000 with an operational part 200 being provided by a rocker or dolly 201B as the user interface 201 according to another embodiment. FIG. 15B is an exploded perspective back view of the switch system according to this embodiment.

[00106] In this embodiment, operational part 200 in FIG. 15 includes a dolly, instead of the push-button in FIG. 14. Although the dolly replaces the push button, the clip structure 1203A can be the same.

[00107] Thus, it can be seen that in this aspect, the operational part 200 of a push button 201A can be replaced with an operational part 200 being a rocker or dolly 201B, so as to convert the push-button switch assembly to the rocker switch assembly without changing the plate or cover unit 1200.

[00108] Therefore, when a user desires to change the operational part 200, he does not need to change the plate or cover unit 1200. This provides even greater flexibility for the user and even greater efficiencies in manufacture, storage and installation in that the user is able to simply change the specific parts required while maintaining the majority of the system 1000.

[00109] Although in FIGs. 14 and 15, the shape of the clip 1203A and the carrier 202 are square shaped, it will be appreciated that the clip 1203A and the carrier 202 can be different shapes, such as round, rectangular, hexagonal etc.

[00110] Furthermore, it will be appreciated that the retaining portion 1203 can be of any suitable form including but not limited to, a screw structure, a tight fitting or friction fit structure or a magnet.

[00111] Although FIG. 14 shows an embodiment of this aspect as a button switch assembly, and FIG. 15 shows an embodiment as rocker switch assembly, it will be appreciated that other forms of operational part 200 such as the rotary switch assembly in FIG. 11, and toggle switch assembly in FIG. 13 can be used, as can other switch types not explicitly described herein.

[00112] Furthermore, as shown in FIGs. 14 and 15, the plate or cover unit 1200 can be of any desired shape or appearance.

[00113] It will be understood that there can be any combination of different operational parts 200 and plates or cover units 1200. For example, a switch assembly 500 with a small dolly 201B might be converted to a switch assembly with a big dolly 201B by replacing the operational part 200 with a small dolly as described above. In another example, a switch assembly with a round push-button switch might be converted to a switch assembly with a square push-button/rocker switch by changing the operational part and the plate. In another combination, as shown in Figure 16, the appearance of switch system 1000 may be changed completely by changing the existing plate or

cover unit 1200 with a plate or cover unit 1200' of a different type. In one embodiment, the user interface 201 can be used, or a different user interface 201 can be used. In the example of Figure 16, the switch interface 201 is changed from a round dolly 201B to a square dolly 201B'.

[00114] The above has also provided many examples of methods of changing the operational part of a switch assembly, and in some other embodiments, changing a cover unit or switch face plate to provide different functionality and/or appearance.

[00115] In a broad aspect then, there is provided a method of forming a switch assembly comprising a sub-assembly and an operational part, the sub-assembly comprising a functional part and an interface and connected to a base unit; the method comprising:
connecting a plate having connected thereto the operational part to the base unit, thereby causing the operational part to engage with the interface of the sub-assembly to allow the operational part to control the functional part. Figure 17 shows this single step in the flow chart of this method, with step 2000 being the step of connecting a plate having connected thereto the operational part to the base unit, thereby causing the operational part to engage with the interface of the sub-assembly to allow the operational part to control the functional part.

[00116] According to another aspect, there is also provided, in a switch arrangement comprising an operational part for controlling the function of a functional part, the operational part connected to a plate connected to a base unit and the plate covering the functional part, a method of replacing the operational part with an operational part of a different type, the method comprising:
removing the plate from the base unit; disconnecting the operational part from the plate;
connecting the operational part of a different type; and replacing the plate on the base unit.

[00117] FIG. 18 shows a flowchart of this method of replacing the operational part with an operational part of a different type. In step 3000, the plate is removed from the base unit. In step 3100, the operational part is disconnected from the plate. In step 3200, the operational part of a different type is connected to the plate and in step 3300, the plate is replaced on the base unit.

[00118] According to the various aspects described above with reference to multiple embodiments, a switch assembly is separated into a functional part and an operational part. These two parts can be combined and caused to engage through an interface. The switch assembly can be changed in type and appearance without changing the functional part attached to the base unit. A user can make such conversion without assistance of a professional installer. The production process

is simplified and the production cost is also reduced by producing each part separately.

[00119] 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.

[00120] 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.

[00121] 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 switch assembly comprising:
a functional part;
a changeable operational part for actuation by a user and for controlling the functional part; and
an interface for interfacing the functional part and the changeable operational part; wherein
the changeable operational part is not fixed to the interface or to the functional part; and
the interface is configured to, in use, transfer at least two of rocking motion, linear motion, rotational motion, and shift motion from the changeable operational part into rocking motion to the functional part.
2. The switch assembly as claimed in claim 1 wherein the interface is configured to, in use, transfer rocking motion from the changeable operational part to the functional part when the changeable operational part is a rocker switch.
3. The switch assembly as claimed in any one of claims 1 or 2 wherein the interface is configured to, in use, convert linear motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a push button.
4. The switch assembly as claimed in any one of claims 1 to 3 wherein the interface is configured to, in use, convert rotational motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a rotary switch.
5. The switch assembly as claimed in any one of claims 1 to 3 wherein the interface is configured to, in use, convert shift motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a toggle switch.
6. The switch assembly as claimed in claim 3 when dependent on claim 2 wherein the interface comprises a first surface for contacting the rocker switch and a second surface for contacting the push button.
7. The switch assembly as claimed in claim 6 wherein the first surface is a planar surface and the second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.
8. The switch assembly as claimed in claim 6 wherein the first surface is a slant surface and the

second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.

9. The switch assembly as claimed in claim 6 wherein the interface further comprises a third surface at the centre of the interface for contacting the rotary switch.
10. The switch assembly as claimed in any one of claims 1 to 7 wherein the interface further comprises an actuating member for contacting and actuating, in use, a switching element within the functional part to effect switching upon the user actuating the changeable operational part.
11. The switch assembly as claimed in any one of claims 1 to 8 wherein the changeable operational part is configured to connect with a plate through a carrier.
12. The switch assembly as claimed in claim 11 wherein the changeable operational part has a stop and the plate has a clip, the stop and the clip is configured, in use, to connect and separate the changeable operational part and the plate.
13. An interface for interfacing an changeable operational part and a functional part of a switch assembly, wherein the changeable operational part is not fixed to the interface, the interface configured to, in use, transfer at least two of rocking motion, linear motion, rotational motion, and shift motion from the changeable operational part into rocking motion to the functional part.
14. The interface as claimed in claim 13 wherein the interface is configured to, in use, transfer rocking motion from the changeable operational part to the functional part when the changeable operational part is a rocker switch.
15. The interface as claimed in claim 13 or 14 wherein the interface is configured to, in use, convert linear motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a push button.
16. The interface as claimed in any one of claims 13 to 15 wherein the interface is configured to, in use, convert rotational motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a rotary switch.

17. The interface as claimed in any one of claims 13 to 16 wherein the interface is configured to, in use, convert shift motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a toggle switch.
18. The interface as claimed in claim 15 when dependent on claim 14, wherein the interface comprises a first surface for contacting the rocker switch and a second surface for contacting the push button.
19. The interface as claimed in claim 18 wherein the first surface is a planar surface and the second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.
20. The interface as claimed in claim 18 wherein the first surface is a slant surface and the second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.
21. The interface as claimed in claim 16 wherein the interface further comprises a third surface at the centre of the interface for contacting the rotary switch.
22. The interface as claimed in claim 19 wherein the interface further comprises an actuating member for contacting and actuating in use, a switching element within the functional part to effect switching upon the user actuating the changeable operational part.
23. A switch sub-assembly comprising a functional part and an interface for engaging with a changeable operational part for controlling the functional part, wherein the changeable operational part is not fixed to the functional part, and the interface is configured to, in use, transfer at least two of rocking motion, linear motion, rotational motion, and shift motion from the changeable operational part into rocking motion to the functional part.
24. The switch sub-assembly as claimed in claim 23 wherein the interface is configured to, in use, transfer rocking motion from the changeable operational part to the functional part when the changeable operational part is a rocker switch.
25. The switch sub-assembly as claimed in any one of claims 23 or 24 wherein the interface is configured to, in use, convert linear motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a push button.

26. The switch sub-assembly as claimed in any one of claims 23 to 25 wherein the interface is configured to, in use, convert shift motion from the changeable operational part into rocking motion to the functional part when the changeable operational part is a toggle switch.
27. The switch sub-assembly as claimed in any one of claims 23 to 26 wherein the interface is configured to, in use, convert rotational motion from the changeable operational part into rocking motion to the functional part changeable when the operational part is a rotary switch.
28. The switch sub-assembly as claimed in claim 26 when dependent on claim 25 when being dependent on claim 24, wherein the interface comprises a first surface for contacting the rocker switch and a second surface for contacting the push button.
29. The switch sub-assembly as claimed in claim 28 wherein the first surface is a planar surface and the second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.
30. The switch sub-assembly as claimed in claim 28 wherein the first surface is a slant surface, and the second surface is disposed above the first surface, the second surface is closer to the centre of the interface, compared to the first surface.
31. The switch sub-assembly as claimed in claim 27 wherein the interface further comprise a third surface at the centre of the interface for contacting the rotary switch.
32. The switch sub-assembly as claimed in claim 29 wherein the interface further comprises an actuating member for contacting and actuating in use, a switching element within the functional part to effect switching upon the user actuating the changeable operational part.
33. A method of forming a switch assembly comprising a sub-assembly and a changeable operational part, the sub-assembly comprising a functional part and an interface and connected to a base unit; the method comprising:
 - connecting a plate having connected thereto the changeable operational part to the base unit, thereby causing the changeable operational part to engage with the interface of the sub-assembly to allow the changeable operational part to control the functional part;
 - wherein the changeable operational part is not fixed to the interface or to the functional part, and the interface is configured to, in use, transfer at least two of rocking

motion, linear motion, rotational motion, and shift motion from the changeable operational part into rocking motion to the functional part.

34. In a switch arrangement comprising a changeable operational part for controlling the function of a functional part, the changeable operational part connected to a plate connected to a base unit, a method of replacing the changeable operational part with an changeable operational part of a different type, the method comprising:
 - removing the plate from the base unit;
 - disconnecting the changeable operational part from the plate;
 - connecting the changeable operational part of a different type to the plate; and
 - replacing the plate on the base unit;
 wherein the interface is configured to, in use, transfer at least two of rocking motion, linear motion, rotational motion, and shift motion from the changeable operational part into rocking motion to the functional part.
35. The method as claimed in claim 34 wherein the changeable operational part is a rocker switch and the changeable operational part of a different type is a push button switch.
36. The method as claimed in claim 34 wherein the changeable operational part is a rocker switch and the changeable operational part of a different type is a rotary switch.
37. The method as claimed in claim 34 wherein the changeable operational part is a rocker switch and the changeable operational part of a different type is a toggle switch.
38. The method as claimed in any one of claims 34 to 36 wherein the step of connecting the changeable operational part of a different type includes connecting the changeable operational part of a different shape; and
 replacing the plate on the surface includes covering a plate of a shape corresponding to the different shape of the changeable operational part.
39. A base unit comprising at least one switch sub-assembly as claimed in any one of claims 23 to 32.