

## **ELECTRICAL SYSTEM, APPARATUS AND METHOD**

### **INCORPORATION BY REFERENCE**

[0001] The following publications are referred to in the present application:

PCT/AU12014/000545 entitled “Electrical Connector, System and Method”

PCT/AU12014/000544 entitled “Batten Holder, Connector, System and Method”

PCT/AU12011/001675 entitled “Touch Switch”

PCT/AU2013/001274 entitled “General Power Outlet and Remote Switch Module”

PCT Application No. PCT/AU2011/001532 published as WO2012/068635 entitled “USB Outlet Charger”

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

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

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

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

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

[0002] The entire content of each of these documents is hereby incorporated by reference.

### **PRIORITY**

[0003] 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”.

[0004] The entire content of each of these documents is hereby incorporated by reference.

## **TECHNICAL FIELD**

[0005] The present application relates to electrical wall box arrangements, power outlets and faceplates.

## **BACKGROUND**

[0006] Many buildings have one or more electrical outlets, wall boxes and/or switch plates which allow a user in the building to access electrical power to operate electrical devices such as vacuum cleaners, computers or televisions, or to control one or more electrical devices such as lights.

[0007] As building automation becomes more prevalent, more control functionality becomes available.

[0008] Currently, once installed, electrical installations such as power outlets and faceplates are generally fixed and are difficult to change or modify without the use of appropriately qualified personnel. This limits the options available to a user and increases costs and complexity if any modifications are required to be made.

## SUMMARY

[0009] According to one aspect, there is provided a base unit comprising:

- a mounting region for mounting to a surface;
- a base connector for connecting the base unit to a cover unit;
- a base supply power input for receiving supply power;
- a base power converter for converting the received supply power to an output power; and
- a base power output for outputting the output power to the cover unit.

[0010] In one form, the base connector comprises at least one retaining element for retaining the cover unit to the base.

[0011] In one form, the retaining element is a recess.

[0012] In one form, the retaining element is a protrusion.

[0013] In one form, the retaining element is a tab.

[0014] In one form, the retaining element is a magnet.

[0015] In one form, the base power output, in use, transmits the output power to the cover unit.

[0016] In one form, the base power output is a radiating element.

[0017] In one form, the base further comprises a base switch interface for interfacing with a rear of a switch on the cover unit.

[0018] In one form, the base unit further comprises a base data input for receiving data.

- [0019] In one form, the base unit further comprises a base data output for outputting data.
- [0020] In one form, the base data input is for receiving data from the cover unit.
- [0021] In one form, the base data output is for outputting data to the cover unit.
- [0022] In one form, the base unit further comprises a base supply power output for outputting supply power.
- [0023] In one form, the base power output and the base connector are provided by the same element.
- [0024] According to a second aspect, there is provided a cover unit comprising:  
a cover connector for connecting the cover to the base unit of the first aspect.
- [0025] In one form, the cover unit further comprises a cover power input for receiving the output power from the base power output of the base unit.
- [0026] In one form, the cover connector and the cover power input are provided by the same element.
- [0027] In one form, the cover unit further comprises a user interface.
- [0028] In one form, the cover unit further comprises a data input.
- [0029] In one form, the cover unit further comprises a data output.
- [0030] In one form, the cover unit further comprises functional circuitry.
- [0031] In one form, the cover unit further comprises a power supply.
- [0032] In one form, the cover unit further comprises a cover switch interface for interfacing with the base switch interface of the base unit.
- [0033] According to a third aspect, there is provided a system comprising:  
the base unit according to the first aspect; and

the cover unit according to the second aspect.

[0034] In one form, the system further comprises a plurality of cover units according to the second aspect that are interchangeable and wherein at least two of the plurality of cover units provide different functionality from each other.

[0035] According to a fourth aspect, there is provided a method of installing a cover unit according to the second aspect, the method comprising:

connecting the cover unit to a base unit according to the first aspect.

[0036] In one form the step of connecting the cover unit to the base unit comprises:  
aligning the cover connector with the base connector of the base unit; and  
connecting the cover connector and the base connector to thereby retain the cover unit to the base unit.

[0037] In one form, the method further comprises providing power to the cover unit by engaging the cover power input with the base power output.

## **BRIEF DESCRIPTION OF DRAWINGS**

[0038] Embodiments of the various aspects described herein will be detailed with reference to the accompanying drawings in which:

[0039] Figure 1A – shows a perspective front view of a generic embodiment of a base unit according to one aspect;

[0040] Figure 1B – shows a perspective rear view of the base unit of Figure 1A;

[0041] Figure 2 – shows an example of one type of power converter suitable for use with one embodiment of the base unit;

[0042] Figure 3A – shows a side view of the base unit with power input;

[0043] Figure 3B – shows a front perspective view of the base unit with an embodiment of a transmitter coil;

[0044] Figure 3C – shows a front perspective view of the base unit with another embodiment of the transmitter coil;

[0045] Figure 4 – shows a system block diagram of a first side of an inductive power transfer system according to one embodiment;

[0046] Figure 5 - shows a system block diagram of a first side of an inductive power transfer system according to another embodiment;

- [0047] Figure 6 – shows a base unit according to another embodiment, including a base supply power output;
- [0048] Figure 7 – shows a perspective rear view of a cover unit according to one embodiment;
- [0049] Figure 8A – shows a perspective rear view of a cover unit according to another embodiment;
- [0050] Figure 8B - shows a perspective rear view of a cover unit according to another embodiment;
- [0051] Figure 9 – shows a systems block diagram of a second side of the inductive power transfer according to one embodiment;
- [0052] Figure 10 – shows a systems block diagram of a second side of the inductive power transfer according to another embodiment with communications functionality;
- [0053] Figure 11 – shows a side view of a cover unit connected to base unit to allow power and/or data to be transferred between the two units inductively;
- [0054] Figure 12 – shows a systems block diagram of the first side and the second side of the inductive power transfer system according to one aspect;
- [0055] Figure 13 – shows an embodiment of the base unit with a base switch interface;
- [0056] Figure 14A - shows a generalised exploded view of the two sub-assembly of a switch assembly according to one aspect;
- [0057] Figure 14B – shows a generalised exploded view of the main components of the two sub-assemblies of the switch assembly of Figure 14A;
- [0058] Figure 15A - is a perspective front view of one embodiment of a switch system with assembly (push-button switch assembly) according to a first aspect;
- [0059] Figure 15B - is a perspective rear view of the embodiment of Figure 15A;
- [0060] Figure 16A - is a perspective front view of another embodiment of a switch system with switch assembly (rocker switch assembly) ;
- [0061] Figure 16B - is a perspective rear view of the embodiment of Figure 16A;
- [0062] Figure 17 - is a perspective top view of an interface included in the switch assembly;
- [0063] Figure 18 - is a cross-sectional view, along line A-A' in Figure 15A, of a combination of a functional part, the interface and an operational part within the embodiment of Figure 15A;
- [0064] Figure 19 - is a cross sectional view of the switch system along the line A-A' of Figure 16A including the base unit and cover unit;
- [0065] Figure 20A - is a cross-sectional view, along line B-B' in Figure 16A, of a combination of a functional part, the interface and an operational part in the embodiment of Figure 16A;
- [0066] Figure 20B - is a perspective top view of the interface in Figure 20A for reference;

[0067] Figure 21 - is a cross sectional view of the switch system along the line B-B' of Figure 16A including the base unit and cover unit;

[0068] Figure 22A - 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;

[0069] Figure 22B - 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 22A;

[0070] Figure 23 - is a front perspective view of a cover unit or switch plate with a rotary switch;

[0071] Figure 24 - is a perspective side view of the switch assembly with rotary switch from a different angle to that shown in Figure 22A;

[0072] Figure 25A - is a front perspective view of the switch system with a toggle switch according to another embodiment;

[0073] Figure 25B - is a rear perspective view of the switch system with a toggle switch of Figure 25A;

[0074] Figure 26 - 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 25;

[0075] Figure 27A - is an exploded perspective front view of a switch assembly (a push-button switch assembly) according to another aspect;

[0076] Figure 27B - is an exploded perspective rear view of the switch assembly according to the embodiment of Figure 27A;

[0077] Figure 28A - is an exploded perspective front view of a switch assembly (a rocker switch assembly) according to another aspect;

[0078] Figure 28B - is an exploded perspective rear view of the switch assembly according to the embodiment of Figure 28A;

[0079] Figure 29 - shows an example of a round rocker switch being converted to a square rocker switch;

[0080] Figure 30 - shows a front perspective view of a base unit with a data input;

[0081] Figure 31 - shows a front perspective view of a base unit with a base data output;

[0082] Figure 32 - shows a front perspective view of a base unit with a base supply power output;

[0083] Figure 33 - shows a cover unit with a cover connector;

[0084] Figure 34 - shows a cover unit with a cover power input;

[0085] Figure 35 - shows a cover unit with a user interface;

[0086] Figure 36 - shows a cover unit with a cover data input;

[0087] Figure 37 - shows a cover unit with a cover data output;

- [0088] Figure 38 - shows a cover unit with a cover switch interface;
- [0089] Figure 39 – shows a system according to one embodiment; and
- [0090] Figure 40 – shows a system according to another embodiment.

## DESCRIPTION OF EMBODIMENTS

[0091] In one aspect described herein, there is provided a base unit 100 for mounting to a surface and for electrical connection to a mains or supply power. Figure 1A shows a front perspective view of a general embodiment of base unit 1A and Figure 1B shows a rear perspective view of the base unit 100 of Figure 1A. In one aspect, the base unit 100 comprises a mounting region 110 for mounting the base unit 100 to the surface. In some embodiments, the surface is a wall. In some other embodiments, the surface is a floor. In some other embodiments, the surface is a wall of a box or other enclosure. In other embodiments, the surface is frame for supporting the base unit.

[0092] In some embodiments, the mounting region 110 is itself a surface which will come into contact with the surface to which the base unit 100 is to be mounted. In other embodiments, the mounting region 110 is a pin, tab or other connector.

[0093] As shown in Figure 1A, base unit 100 also comprises a base connector 120 for connecting the base unit to a cover unit 200 as will be described in more detail below. The base connector is shown generically in Figure 1A but can take on any form that allows connection of the cover unit to the base unit 100. Such forms include a recess for receiving a protrusion from the cover unit, a protrusion for being received in a corresponding recess in the cover unit, a clipping arrangement, or a magnet for attracting and retaining a region of the cover unit. In other embodiments, the base connector is an adhesive, or a loop-hook connector such as a product sold under the trade mark Velcro® by Velcro Industries B.V. In this embodiment, base connector 120 can be either the loop component of the connector or the hook component.

[0094] Base unit 100 also comprises a base supply power input 130 for electrically connecting the base unit 100 to a supply or mains power supply (see Figure 1A). In some countries, the mains, or supply power is provided as an alternating current (AC) electrical signal of about 240V (for example between about 220V and 260V) and about 50Hz frequency. In other countries, mains or supply power is provided as an AC signal of between about 100V and 130V. Some systems use a frequency of about 50Hz while others use a frequency of about 60Hz. Some supply power systems are single phase and others may be three-phase. It will be understood that any electrical power that

would be considered to be supply or mains power can be used.

[0095] In some embodiments, base unit 100 will also comprise a base power output 150 (see Figure 1A) for providing output power to the cover unit 200 when cover unit 200 is connected to base unit 100.

[0096] Base power output 150 can be provided by any suitable means including a direct plug/socket arrangement with a recess provided in base unit 100 leading to conductive elements which make electrical connection with a corresponding electrically conductive element of a cover unit power input 210 (see below), or can be provided by a radiating element that transfers power from base unit 100 to cover unit 200 by induction or other means. An example of this embodiment is described in more detail below. Any other form of power transfer can also be used.

[0097] In some embodiments, base power output 150 and base connector 120 can be provided by the same element. In one such embodiment, the connection of cover power input to the base power output 150 will also provide sufficient support to retain cover unit 200 to base unit 100 without a further additional base connector 120 or other connection arrangement.

[0098] In some embodiments, base unit 100 will also comprise a power converter 140 which converts the supply input power received at the base supply power 130 input to the output power provided by the base power output 150 to provide useable power to the cover unit 200 when in use.

[0099] In some embodiments, the base power output will be shielded or otherwise protected so that no electrically-live element is easily accessible by a user when the base unit 100 is installed. In some embodiments, the default state of the base power output is to an OFF state and is electrically isolated from the mains or supply power, and/or from the output of the power converter 140. In such an embodiment, only when the cover unit 200 is in place will the base power outlet be electrically connected to the mains or supply power and/or the output of the power converter 140.

[00100] Any suitable power converter circuitry can be used as will be apparent to the person skilled in the art. One example of a suitable power converter 140 is shown in Figure 2. There shown is power converter 140 comprising input terminals for connection to mains or supply power, for example 240V AC, and providing an output of 5 to 12 V DC. This output is electrically isolated from the mains or supply power. This output can be provided directly for use by the cover unit 200 via base power output 150.

[00101] In another embodiment, base power output is provided by a Universal Serial Bus (USB) charger. Any suitable form of USB charger can be used, such as one described in PCT

Application No. PCT/AU2011/001532 published as WO2012/068635 entitled “USB Outlet Charger”, previously incorporated by reference.

[00102] As described above, in some embodiments, base power output 150 is provided by an inductive power transfer system.

[00103] Figure 3A shows a side view of a base unit 100 for mounting to a surface, and for connection to a source of power, such as mains or supply power. In this aspect, the base unit 100 comprises base supply power input 130 provided by an input terminal block for receiving mains or supply power 50, a first side 410 of an induction power transfer system 400 connected to the base supply power input 130 for receiving power from the supply power 50 and for radiating energy from a coil of the first side. In this arrangement, first side 410 also acts as power converter 140 in that it receives mains or supply power at its input and outputs power in a different form as will be described in more detail below.

[00104] In this embodiment, base power output 150 is provided by a coil 414 disposed, in one embodiment, around the periphery of base unit 100 as shown in Figure 3B, which shows a perspective front view of the base unit 100. In other embodiments, coil 414 is provided in a smaller region as shown in Figure 3C. In one embodiment, coil 414 is provided as a printed coil on a Printed Circuit Board (PCB). This implementation ensures high reproducibility and reduces costs. In other embodiments, coil 414 is provided by physical windings of wire around a ferrite core.

[00105] Figure 4 shows a system block diagram of one embodiment of first side 410. In this embodiment, first side 410 comprises a power input 411 for receiving power (e.g. from a mains or supply source via input terminal block or other source). In one embodiment, power input 411 is a 5W isolated AC/DC flyback converter. Input 411 is connected to a rectifier 412, in one embodiment a half bridge rectifier, and in a more specific embodiment, a half bridge rectifier constructed of Metal Oxide Semiconductor Field Effect Transistors (MOSFETs).

[00106] Rectifier 412 is connected to a resonant network 413. The output of resonant network 413 is connected to transmitting coil 414 for radiating the energy as output power.

[00107] In one embodiment, there is also provided a magnetic flux concentrator 415 such as a ferrite core.

[00108] The input power to the AC/DC flyback stage can be between about 110V to about 240V AC, and about 50Hz to 60Hz. The output of this stage is about 12V DC between about 6W and about 10W. The other role of this power stage is to provide electrical isolation between the mains or supply power network input to the power stage and the data input stage (see Figure 5 and related description below).

[00109] Figure 5 shows another embodiment of first side 410, which provides data communication capabilities. In this embodiment, a data input 416 (for example a digital data input) for receiving data from an external source such as another device communicating with input 416 wirelessly by any suitable protocol such as Bluetooth®, BLE® or ZigBee®, or for receiving data directly from the mains power source 50 using modulation of the current carried by the mains power conductors.

[00110] The output of data modulator 416 is applied to the input of controller 417 which generates modulating signals to modulate the output of transmitter coil 414 in accordance with the data, as will be described in more detail below. This allows data to be transmitted by modulating the energy radiated by transmitting coil 414. All other elements in Figure 5 are as previously described in Figure 4.

[00111] In some embodiments as shown in Figure 6, base unit 200 comprises a base supply power output 190 for providing supply power directly to an electrical device such as a heater, fan, radio, television. In this embodiment, base 100 may have two power outputs, being base power output 150 for providing output power to the cover unit 200 and base supply power output 190 for providing supply power to an external device other than the cover unit 200. In this embodiment, base supply power output 190 is connected directly to base supply power input 130 to provide mains or supply power to the user. In one embodiment, base supply power output 190 is a socket for receiving a plug of an electrical device such as a vacuum cleaner. In some embodiments, cover unit 100 will have an aperture to allow direct access to base supply power output 190, or may have its own input for receiving a plug from an external device, such as a series of one, two or three or more apertures which receive a respective plug and which align with sockets of base supply power output 190.

[00112] In another aspect, there is provided a cover unit 200 as shown in Figure 7. In a broad embodiment, cover unit 200 comprises a cover connector 220 for connecting the cover unit 200 to the base unit 100. In some embodiments, cover connector 220 engages with base connector 120 to connect cover unit 200 to base unit 100.

[00113] The cover connector 220 is shown generically in Figure 7 but can take on any form that allows connection of the cover unit 200 to the base unit 100. Such forms include a recess for receiving a protrusion from the base unit 100, a protrusion for being received in a corresponding recess in the base unit 100, a clipping arrangement, or a magnet for attracting and retaining a region of the base unit 100. In other embodiments, the cover connector is an adhesive, or a loop-hook connector such as a product sold under the trade mark Velcro® by Velcro Industries B.V. In this embodiment, cover connector 220 can be either the loop component of the connector or the hook component.

[00114] Cover unit 200 further comprises a cover power input 210 for receiving power output from base unit 100. Cover unit 200 can also comprise functional circuitry 280 which can receive power from cover power input 210.

[00115] According to another aspect described herein, cover power input 210 is a second side 420 of the inductive power transfer system 400. Figure 8A shows cover unit 200 with cover power input 210 provided by a receiving coil 424 of second side 420. Functional electronics 280 is connected to second side 420 to receive power to power any components of the functional circuitry.

[00116] Figure 8B shows another embodiment in which receiving coil 424 is provided in a more compact area.

[00117] It will be appreciated that functional circuitry 280 can be any of one or more electrical components which react to receiving power from cover power input 210. In one simple embodiment, functional circuitry 280 is a light or a light such as an incandescent light, fluorescent light, or light emitting diode (LED), which lights up upon receiving power from cover power input 210. These devices may also have supporting circuitry. In other embodiments, functional circuitry 280 comprises many components and may include integrated circuits, microcontrollers, memory devices and analog and digital circuitry, display units or screens, and electro-mechanical devices such as speakers or actuators, to perform any desired functions.

[00118] Figure 9 shows an embodiment of second side 420 of inductive power transfer system 400. In this embodiment, second side 420 comprises receiving coil 424 for receiving energy radiated by transmitting coil 414 of first side 410. The received energy is provided to the input of rectifier and filter block 422, which rectifies and filters the received signal and provides the rectified and filtered signal to the input of voltage regulator 421 to provide a regulated voltage as an output of second side 420. This output can then be connected to functional circuitry 280 to provide power to functional

circuitry 280 to allow it to operate. In one embodiment, this output is 5V DC with 500mA current, providing 2.5W of power.

[00119] In another embodiment, second side 240 comprises communications functionality as shown in Figure 10. In this embodiment, which cooperates with the embodiment of the first side 410 as shown in Figure 6, receiving coil 424 receives the radiated energy from transmitting coil 414 of first side 410, upon which is modulated a data signal as previously described. The received signal at receiving coil 424 is applied to the input of rectifier and filter 422 to provide power processing as previously described, but is also provided at the input of signal demodulator 425 to extract the data signal from the received signal. The demodulated signal is provided at the output of signal demodulator 425 to be applied to functional circuitry 280. In this way, the operation of functional circuitry 280 can be controlled by data sent from base unit 100.

[00120] In one embodiment, the method of transmitting data from the primary side (i.e. base unit 100 to the secondary side (i.e. cover unit 200) is by way of modulation of the excitation frequency of the primary coil in accordance with the input data. This modulation may be done using analogue techniques in one embodiment, but may also be done via a microcontroller in other embodiments.

[00121] In some embodiment, the data transferred between the cover unit 200 and the base unit 100 is encrypted. This can increase the likelihood that only authentic cover units 200 can operate with an installed base unit. A further authentication protocol may also be carried out in some embodiments, to further ensure that only authorised cover units 200 can be used with installed base units 100.

[00122] In one embodiment, the method of transmitting data from the secondary side (i.e., the cover unit 200) to the primary side (i.e. base unit 100) is by way of amplitude modulation by applying modulation signals on the LC resonant circuit in accordance with the data input to the cover unit 200. Such data may be input by any suitable means, including by the user actuating one or more user inputs such as a button on the cover unit, or by remote means which transmit data wirelessly to cover unit 200.

[00123] Figure 11 shows cover unit 200 connected to base unit 100 via base connector 120 and cover unit connector 220, to provide system 300. In this view, base unit 100 is mounted to surface 40, in this embodiment, a wall. In this arrangement, receiving coil 424 of second side associated with cover unit 200 is placed sufficiently close to the transmitting coil 414 of the first side

410 to provide the inductive power transfer system 400 as shown in Figure 12.

[00124] The distance between the receiving coil 424 and the transmitting coil 414 can range from substantially 0mm up to about 10mm or more, including 1mm, 2mm, 3mm, 4mm, 5mm, 6mm, 7mm, 8mm and 9mm and intervals therebetween. The operation of the inductive transfer system will vary depending upon the distance between the transmitting coil 414 and the receiving coil 424.

[00125] Further technical details are described in a co-pending Australian Provisional Patent Application entitled “Inductive Power Transfer In An Electrical Outlet”, previously incorporated by reference in its entirety.

[00126] In other embodiments, base unit 200 also comprises a base switch interface 160 for interfacing with a switch element of the cover unit 200, to allow actuation of a switch on the cover unit 200 to be effected on the base unit 100. Figure 13 shows a base unit 100 with base switch interface 160. In some embodiments, base switch interface 160 is an electrical interface such as a radio frequency (RF) receiver for receiving RF signals from a switch on the cover unit 200 when actuated. In some embodiments, base switch interface 160 is an infrared (IR) receiver for receiving IR signals from a switch of cover unit 200. In other embodiments, base switch interface 160 is a component of a touch switch which actuates upon a user touching or near-touching a corresponding switch element on the cover unit 200. An example of such a touch switch arrangement is described in PCT patent application no. PCT/AU12011/001675 (published as WO 12012/083380) entitled “Touch Switch” previously incorporated by reference in its entirety.

[00127] In other embodiments, base switch interface 160 is a mechanical interface for engaging with a switch element or a cover switch interface of cover unit 200 as will now be described in more detail below.

[00128] Figures 14A and 14B 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 1200. As shown in Figure 14A, base unit switch part 510 comprises a functional part 1000 and a base switch interface 160. Operational part 1200 is for actuation by a user and for controlling the functional part 1000, via the base switch interface 160, for interfacing the functional part 1000 and the operational part 1200.

[00129] It will be noted that the operational part 1200 is not fixed to the base switch interface 160 or the functional part 1000 and is able to move freely with respect thereto, for reasons as will be described further below.

[00130] Figure 14B shows a further exploded general view of an embodiment of the switch assembly 500 of Figure 14A, in which it can be seen that in this embodiment, operational part 1200 itself comprises two parts, namely user interface 1201 and carrier 1202. In some embodiments, the user interface 1201 and the carrier 1202 are fixed together and in other embodiments, the user interface 1201 and the carrier 1202 are separable as will be described in more detail below.

[00131] Figure 15A is an exploded perspective front view of a system 300, comprising a base unit 100 and a cover unit or switch plate 200. The switch assembly 500 (push-button switch assembly in this embodiment) is shown distributed between the base unit 100 and cover unit or switch plate 200, with the base unit switch part 510 being provided in the base unit 100 and the operational part 1200 (of which only the user interface 1201 is visible in this view) being provided in the cover unit or switch plate 200. Figure 15B is an exploded perspective rear view of the system 300. As shown in Figure 15A, the switch assembly 500 includes the functional part 1000, which in an embodiment is a switch mechanism, the operational part 1200 which in this embodiment is a push button, and the base switch interface 160.

[00132] As can be seen in Figures 15A and 15B, the operational part 1200 can be freely removed from the base unit switch part (specifically the base switch interface 160) and/or the functional part 1000 as there is no connection between the operational part 1200 and the base switch interface 160/functional part 1000.

[00133] In this embodiment, the operational part 1200 comprises a user interface 1201 (in this embodiment, a push-button 1201A) and a carrier 1202, as shown in Figures 15A and 15B. The operational part 1200 is engaged in the plate 200 through the carrier 1202 which can be fitted into the plate 200, as shown in Figure 15B. The push-button 1201A is operated by a user to effect a switch on/off operation. Figure 15B shows one embodiment of the engagement of the carrier 1202 to the plate 200. However, a person skilled in the art will understand that the engagement of the operational part 1200 and the plate 200 can be provided in any way which can connect the operational part 1200 and the plate 200 together. The details of the connection between the plate 200 and the operational part 1200 will be described in more detail later with reference to Figures 27A and 27B and Figures 28A and 28B.

[00134] When the cover unit or plate 200 is connected to the base unit 100, the functional part 1000 and base switch interface 160 are located behind the operational part 1200 when viewed from the side of the cover unit 200. The functional part 1000 is controlled by the actuation of the operational part 1200 to implement switch on/off operation through the base switch interface 160. The functional part 1000 is connected to the base unit 100. 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.

[00135] The base switch interface 160 is disposed between the operational part 1200 and the functional part 1000, and is connected with the functional part 1000 as described further below. Base switch interface 160 is for interfacing the functional part 1000 and the operational part 1200 so as to transfer the user's actuation operation (such as pushing the button or actuating the dolly) on the operational part 1200 to the functional part 1000. An enlarged view of the interface 160 is shown in Figure 17.

[00136] In a conventional switch assembly, the operational part 1200, especially, the push button 1201 is fixed to the functional part 1000 and cannot be removed or detached from the functional part 1000.

[00137] However, according to an aspect described herein, as shown in Figures 15A and 15B, the operational part 1200 is not fixed or connected to the base switch interface 160 or to the functional part 1000, but can be removed from the functional part 1000 or the base switch interface 160. For example, the operational part 1200 can be caused to contact or engage with the functional part 1000 or the base switch interface 160 by only connecting the plate 200 to the base unit 100. Similarly, the operational part 1200 can be removed or disengaged from the functional part 1000 or the base switch interface 160 by simply separating the plate 200 from the base unit 100. 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 Figures 18, 20, 24 and 26.

[00138] Figures 16A and 16B illustrate another embodiment of the system 300 with switch assembly 500, with the operational part 1200 being provided by a rocker switch or dolly 1201B. Figure 16A is an exploded perspective front view of this embodiment of the system 300 with switch assembly (rocker switch assembly). Figure 16B is an exploded perspective rear view of the system 300 with switch assembly 500 according to this embodiment.

[00139] The switch assembly 500 in Figures 16A and 16B includes the functional part 1000, the operational part 1200, and the base switch interface 160. The difference between the rocker switch assembly in Figure 16 and the push-button switch assembly in Figure 15 lies only in the operational part 1200 in this embodiment.

[00140] In this embodiment, the operational part 1200 includes a dolly 1201B and a carrier 1202, as shown in Figures 16A and 16B. The operational part 1200 is engaged in the cover unit or switch plate 200 through the carrier 1202 which can be fitted into the plate 200, as shown in Figure 16B. The dolly 1201B is operated by a user to effect switch on/off operation. Figure 16B shows the engagement implemented by the carrier 1202. However, it will be appreciated by the person skilled in the art that the engagement of the operational part 1200 and the plate 200 can be in any way which can connect the operational part 1200 and the plate 200 together, including the direct connection of the operational part to the plate without an intervening carrier.

[00141] As with the embodiment shown in Figures 14A and 15B, the operational part 1200 is not fixed to the base unit switch part 510 and in particular, to base switch interface 160 or to the functional part 1000, but can be removed or separated from the base unit switch part 510 being the functional part 1000 or the base switch interface 160. For example, the operational part 1200 can be engaged with the functional part 1000 through the base switch interface 160 by only connecting the plate 200 on the base 100. Similarly, the operational part 1200 can be disengaged or removed from the functional part 1000 or the base switch interface 160 by simply separating the plate 200 from the base 100. 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 Figure 20.

[00142] Since the functional part 1000 in Figure 15 is the same as that in Figure 16 and the operational part 1200 can be removed from the same functional part 1000, the push-button switch assembly as shown in Figure 15 can be converted to the rocker switch assembly as shown in Figure 16 simply by replacing the functional part 1200 with push-button switch 1201A with the functional part with the rocker switch 1201B. Such replacement can be done by a user himself/herself without assistance of a professional or qualified tradesperson.

[00143] 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 Figures 17 to 19.

[00144] Figure 17 is a perspective top view of an embodiment of base switch interface 160 included in the switch assembly 500 according to the first embodiment described previously.

[00145] As shown in Figure 17, the base switch interface 160 comprises first protrusion 1601A and second protrusion 1601B, first surface 1602A, second surface 1602B, and first top surface 1603A and second top surface 1603B. The protrusions 1601A and 1601B are located at each side of a centre 1606 of the base switch interface 160, respectively. In this embodiment, base switch interface 160 also comprises first surface 1602A and second surface 1602B. In this embodiment, first surface 1602A is outside the first protrusion 1601A with respect to the centre 1606 and second surface 1602B is outside the second protrusion 1601B with respect to the centre 1606. First top surface 1603A is disposed at the top of the first protrusion 1601A. Second top surface 1603B is at the top of the second protrusion 1601B. As can be seen, the first surface 1602A and second surface 1602B are planar surfaces each disposed a first distance from the centre 1606 of the base switch interface 160 and the first top surface 1603A and second top surface 1603B are disposed above the first surface 1602A and the second surface 1602B, each at a second distance from the centre 1606 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.

[00146] Figure 18 shows how a push-button switch assembly of the first embodiment works. Figure 18 is a cross-sectional view, along line A-A' in Figure 15A, of the switch assembly 500, being a combination of the functional part 1000, the base switch interface 160 and the operational part 1200, with the perspective top view of the base switch interface 160 also shown for ease of reference.

[00147] As shown in Figure 18, the push button 1201A included in the operational part 1200 is above the base switch interface 160. In one embodiment, the base switch interface 160 is connected to an actuating member 1605. In some other embodiments, actuating member 1605 is a part of, or integrated with, base switch interface 160. The switching element 1102 within the functional part 1000 is under the actuating member 1605 and is for making and breaking contact between terminals 1103, 1104 and 1105 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 1102 being rocked from one side to another is to create an electrical path between terminals 1103 and 1104 and breaking the electrical path between terminals 1104 and 1105, thereby effecting an on/off switching function under actuation of the actuating member 1605 as will be understood by the person skilled in the art.

[00148] In the view of Figure 18, at the initial state, the push button 1201A contacts with the first top surface 1603A located at the top of the first protrusion 1601A. When the user pushes the push button 1201A downwards, the first protrusion 1601A of the base switch interface 160 is pressed down, causing the actuating member 1605 to swing towards the right side, since base switch interface 160 is connected to functional part 1000 via a pivot point 1607 at centre 1606. The switching element 1102 is actuated correspondingly to change switching on/off status of the switch assembly 100 as previously described. At the same time, the second protrusion 1601B moves up so that the second top surface 1603B makes contact with the push button 1201A. When the push button 1201A is pressed again in the position of contact with the second top surface 1603B of second protrusion 1601B, the second protrusion 1601B is pressed down, causing the actuating member 1605 to swing toward the left side. The switching element 1102 is actuated correspondingly to change the switching on/off status of the switch assembly 100. At the same time, the first protrusion 1601A moves up so that the first top surface 1603A makes contact with the push button 1201A. The same process is repeated when the user presses the push button 1201A again.

[00149] As can be seen from Figure 18, the push button 1201A moves linearly in an up and down motion, while through the transfer of the base switch interface 160, the switching element 1102 makes a rocker motion. That is, the base switch interface 160 is configured to, in use, convert linear motion from the first operational part 1200 into rocking motion to the functional part 1000 when the operational part 1200 is or includes a push button 1201A.

[00150] Figure 19 shows the cross-sectional view of system 300 along the line A-A' of Figure 2A, including the base unit 100 and the cover unit or plate 200. It can be seen in this view how operational part 1200 is brought into non-fixed but touching engagement with base unit switch part 510 (and in particular in this embodiment, base switch interface 160), when cover unit or plate 200 is connected to base unit 100. The operational part 1200 and the base unit switch part 510 are separated (and in particular separated from base switch interface 160 in this embodiment) simply by removing cover unit or plate 200 from base unit 100.

[00151] Figure 20 shows how a switch assembly 500 of the second embodiment of Figure 16 functions. Figure 20 is a cross-sectional view, along line B-B' in Figure 16A, of a combination of the functional part 1000, the base switch interface 160 and the operational part 1200, with the perspective top view of the base switch interface 160 also shown for ease of reference.

[00152] As shown in Figure 20, the dolly 1201 included in the operational part 1200 is above the base switch interface 160. As in the arrangement shown in Figure 20, in one embodiment, the

base switch interface 160 is connected to an actuating member 1605. In some other embodiments, actuating member 1605 is a part of, or integrated with, base switch interface 160. The switching element 1102 within the functional part 1000 is under the actuating member 1605 and is for making and breaking contact between terminals 1103, 1104 and 1105 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 1102 being rocked from one side to another is to create an electrical path between terminals 1103 and 1104 and breaking the electrical path between terminals 1104 and 1105, thereby effecting an on/off switching function under actuation of the actuating member 1605 as will be understood by the person skilled in the art.

[00153] In the view of Figure 20, at the initial state, the dolly 1201B makes contact with the first surface 1602A and the second surface 1602B, via legs 1201B-1 and 1201B-2 associated with dolly 1201B. In this embodiment the first surface 1602A and the second surface 1602B are located farther from the centre 1606 as compared with the first top surface 1603A and second top surface 1603B. When a user actuates the dolly 1201B, the dolly 1201B causes the first surface 1602A of the base switch interface 160 to be pressed down, which makes the actuating member 1605 swing toward right side in the view shown. The switching element 1102 is actuated to change switching on/off status of the switch assembly. At the same time, the second surface 1602B moves up. When the dolly 1201B is actuated again, the dolly 1201B causes the second surface 1602B of the base switch interface 160 to be pressed down, which makes the actuating member 1605 swing toward the left side in this view. The switching element 1102 is actuated to change the switching on/off status of the switch assembly. At the same time, the first surface 1602A moves up. The same process is repeated when the user actuates the dolly 1201B again.

[00154] In the above embodiment, the dolly 1201B makes contact with the first surface 1602A and the second surface 1602B of the base switch interface 160 which are planar. In another embodiment, the rocker or dolly switch 1201B may make contact with the first slanted surface 1604A and second slanted surface 1604B of the protrusions 1601A and 1601B. In other embodiments, the first surface 1602A, the second surface 1602B, the first slanted surface 1604A and/or the second slanted surface 1604B can be curved or non-planar.

[00155] As can be seen from Figure 20, the base switch interface 160 transfers rocking motion from the operational part 1200 to the functional part 1000, when the operational part 1200 is a dolly 1201B.

[00156] Although in the above embodiment, two protrusions 1601A and 1601B 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.

[00157] From Figure 18 and Figure 20, 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 1200 being a push button 1201A, with an operational part 1200 being a dolly 1201B.

[00158] 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.

[00159] Figure 21 shows the switch assembly of Figure 20 with operational part 1200 in cover unit or switch plate 200, connected to base unit 100, to form system 300.

[00160] A third embodiment, in which a rotary switch assembly is implemented, is now described with reference to Figures 22A and 22B.

[00161] Figure 22A is a perspective top view of a combination of a functional part 1000, an base switch interface 160 and an operational part 1200 included in a switch assembly (a rotary switch assembly) according to a third embodiment. Figure 22B is a side view of the arrangement of Figure 22A. Figures 22A and 22B show the operational part 1200 comprising a rotary switch 1201, and an base switch interface 160. The rotary switch 1201 comprises a knob 1201C as the user interface 1201 and a first rod 1201C-1 under the knob 1201C. The knob 1201C can rotate. When the knob 1201C is rotated, the first rod 1201C-1 swings accordingly. On the surface of the operational part 1200, there are two indicators, first indicator 1203 and second indicator 1204. When the knob 1201C aligns with the first indicator 1203, it indicates that the switch is in an off state. When the knob 1201C aligns with the second indicator 1204, 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 1203 indicates switch on state, and the second indicator 1204 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.

[00162] In this embodiment of base switch interface 160 as shown in Figure 22B for ease of reference, a fork 1608 with prongs 1608A and 1608B is added between the protrusions 1601A and 1601B, and is configured to accommodate the first rod 1201C-1 in the gap between prongs 1608A and 1608B of fork 1608.

[00163] At the initial state, the knob 1201C aligns with the first indicator 1203 on the surface of the rotary switch. When a user rotates the knob 1201C to align with the second indicator 1204, the first rod 1201C-1 correspondingly moves from left side to the right side as seen in this view. This movement causes first rod 1201C-1 to contact and/or act on the right prong 1608B of fork 1608. Since base switch interface 160 is pivotally connected to functional part 1000 as previously described, the left prong 1608A of the fork 1608 is forced to move up, and the right protrusion 1608B of the fork 1608 is forced to move down. Thus, such movement is transferred to the switching element 1102) to implement switching on/off. Then, when the knob 1201C is rotated from aligning with the second indicator 1204 to aligning with the first indicator 1203, the first rod 1201C-1 correspondingly moves from the right side to the left side. The left protrusion 1608A of the fork 1608 is forced to move down, and the right protrusion 1608B of the fork 1608 is forced to move up. Thus, such movement is transferred to the switching element 1102 to implement switching on/off.

[00164] Figure 23 shows the operational part 1200 as a rotary switch 1201C within a cover unit or switch plate 200. As previously described, cover unit or switch plate 200 can be connected to a base unit 100 (not shown) to form a system 300 (not shown). In this embodiment, the connection of the cover unit or switch plate 200 to the base unit 100 will cause the operational part 1200, being in this embodiment, a rotary switch 1201C to come into functional engagement with base switch interface 160 of the base unit switch part 510 (comprising base switch interface 160 and functional part 1000) in the base unit 100.

[00165] Figure 24 shows this switch assembly 500 formed by the action of connecting the cover unit or switch plate 200 to base unit 100. In this view, cover unit or switch plate 200 and base unit 100 are not shown for clarity. This view shows operational part 1200 including rotary switch 210C and carrier 1202, base switch interface 160 and operational part 1000.

[00166] As can be seen from Figure 22 to Figure 24, the knob 1201C is rotated. Such rotation motion is converted to rocker motion by the rod 1201C-1 and fork 1608. By adding the fork 1608 to the base switch interface 160, the base switch interface 160 is able to convert rotational motion from the operational part 1200 into rocking motion to the functional part 1000 when the operational part

1200 is a rotary switch.

[00167] As can be seen from Figures. 14 to 24, the type of the switch assembly can be converted between a push-button switch, a rocker switch, and a rotary switch.

[00168] It will be appreciated that by use of the base switch interface 160, 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.

[00169] Figure 25 shows a further embodiment in which the operational part 1200 comprises a toggle switch 1201D. Figure 25A is a front perspective view of an assembled system 300 with cover unit or switch plate 200 connected to base unit 100. Operational part 1200 is provided in this embodiment by a toggle switch 1201D. Figure 25B shows a rear view of the arrangement of Figure 25A, showing operational part 1000 behind the base unit 100.

[00170] Figure 26 is a cross-sectional view of the switch assembly 500, of Figure 25A along the line C-C'. As shown in Figure 26, the base switch interface 160 is the same as that in the first embodiment. The difference again lies only in the operational part 1200. The operational part 1200 in this embodiment comprises a toggle 1201D. When a user actuates the toggle 1201D, the lower part of the operational part 1200 makes the same movement as the movement of rocker switch.

[00171] It can be seen from Figure 26 and the above description, the switch assembly 500 can thus also be converted to a toggle switch assembly type.

[00172] 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 1200 which is not fixed to the base switch interface 160 or to the functional part 1000.

[00173] In the above various embodiments, the base switch interface 160 can comprises various features as required for the specific function. In one embodiment, base switch interface 160 comprises protrusions. In another embodiment, the base switch interface 160 comprises a planar surface. Correspondingly, the operational part 1200 including a push-button switch might be modified by including two protrusions to contact with the planar interface.

[00174] 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.

[00175] Figure 27A shows how a switch of one type (for example a round rocker switch assembly with a round-cornered plate) is changed into a switch of another type (for example square rocker switch assembly with a square-cornered plate) by only recombining an operational part with a dolly of one type (for example square dolly 1201B' – see Figure 29) and a corresponding plate of another type (for example square-cornered plate – see Figure 29).

[00176] The following describes how to fit or connect the operational part 1200 and the cover unit or switch plate 200.

[00177] Conventionally, an operational part 1200 with a specific shape and type can only be connected to a plate 200 with a corresponding specific shape and type. Consequently, when the operational part 1200 is to be changed in type or shape, the plate 200 has to be changed correspondingly.

[00178] According to another aspect, the operational part 1200 and the plate 200 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.

[00179] In one aspect then, the base unit 100 can be provided with a base switch interface 160 (and associated functional parts) such as the base switch interface 160 and functional part 1000 described herein which can interface with the cover switch interface (such as user interface 1201 (and associated operational part 1200) 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 100 of different designs while still allowing the ability to provide different operational parts 1200 for the cover unit 200.

[00180] Figure 27A is an exploded perspective front view of a system 300 (with a push-button switch assembly 500 in this embodiment) according to another aspect described herein. Figure 27B is an exploded perspective rear view of the system 300 according to this aspect.

[00181] In this aspect, as shown in Figure 27B, a retaining portion 1203 is provided to retain the carrier 1202 to the cover unit 200. In the embodiment shown in Figure 27B, the retaining portion 1203 is a clip structure 1203A.

[00182] In this embodiment, the plate or cover unit 200 in Figures 27A and 27B includes a square clip 1203A around the aperture 201 for receiving the, or part of the, operational part 1200. The size of the clip 1203A can be made to match the size of the carrier 1202 to retain the carrier 1202 in a friction fit or other clipping means. The operational part 1200 can be removed from plate or cover unit 200 by pressing the clip 1203 so as to release or otherwise disengage from, the carrier 1202.

[00183] Figure 28A is an exploded perspective front view of a system 300 with an operational part 1200 being provided by a rocker or dolly 1201B as the user interface 1201 according to another embodiment. Figure 28B is an exploded perspective back view of the switch system according to this embodiment.

[00184] In this embodiment, operational part 1200 in Figure 28 includes a dolly, instead of the push-button in Figure 27. Although the dolly replaces the push button, the clip structure 1203A can be the same.

[00185] Thus, it can be seen that in this aspect, the operational part 1200 of a push button 1201A can be replaced with an operational part 1200 being a rocker or dolly 1201B, so as to convert the push-button switch assembly to the rocker switch assembly without changing the plate or cover unit 200.

[00186] Therefore, when a user desires to change the operational part 1200, he does not need to change the plate or cover unit 200. 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 3000.

[00187] Although in Figures 27 and 28, the shape of the clip 1203A and the carrier 1202 are square shaped, it will be appreciated that the clip 1203A and the carrier 1202 can be different shapes, such as round, rectangular, hexagonal etc.

[00188] 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.

[00189] Although Figure 27 shows an embodiment of this aspect as a button switch assembly, and Figure 28 shows an embodiment as rocker switch assembly, it will be appreciated that other forms of operational part 1200 such as the rotary switch assembly in Figure 24, and toggle switch assembly in Figure 26 can be used, as can other switch types not explicitly described herein.

[00190] Furthermore, as shown in Figures 27 and 28, the plate or cover unit 200 can be of any desired shape or appearance.

[00191] It will be understood that there can be any combination of different operational parts 1200 and plates or cover units 200. For example, a switch assembly 500 with a small dolly 1201B might be converted to a switch assembly with a big dolly 1201B by replacing the operational part 1200 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 29, the appearance of system 300 may be changed completely by changing the existing plate or cover unit 200 with a plate or cover unit 200' of a different type. In one embodiment, the user interface 1201 can be used, or a different user interface 1201 can be used. In the example of Figure 29, the switch interface 1201 is changed from a round dolly 1201B to a square dolly 1201B'.

[00192] In other embodiments, as shown in Figure 30, base unit 100 also comprises a base data input 170 for receiving data. In one embodiment, the base data input 170 receives, in use, data from the cover unit 200. In other embodiments, base data input 170 receives in use, data from another external source such as a user-controlled remote device or from another transmitting device such as those described in PCT/AU12014/000545 entitled "Electrical Connector, System and Method" and PCT/AU12014/000544 entitled "Batten Holder, Connector, System and Method", previously incorporated by reference.

[00193] In some embodiments as shown in Figure 31, base unit 100 comprises a base data output 180 for outputting data to the cover unit 200 or an external device. In some embodiments, base data input 170 and base data output 180 are provided by the same element, such as a transceiver.

[00194] In some embodiments, base data input 170 and/or base data output 180 are provided by a mechanical data port in accordance with any suitable data transfer protocol. Such examples

include RJ-45 type connectors, RJ11, RJ14, RJ25, RJ48, RJ61, XLR connectors, XLD connectors, DIN connectors, BNC connectors and USB ports.

[00195] In some embodiments, base data input 170 and base data output are provided by the communications functionality of the inductive power transfer system 400 previously described.

[00196] In some embodiments as shown in Figure 32, base unit 200 comprises a base supply power output 190 for providing supply power directly to an electrical device such as a heater, fan, radio, television. In this embodiment, base 100 may have two power outputs, being base power output 150 for providing output power to the cover unit 200 and base supply power output 190 for providing supply power to an external device other than the cover unit 200. In other embodiments, base unit 200 has only base supply power output 190 and no base power output 180. In these embodiments, cover unit 200 does not receive power from base unit 200 but may have its own on-board power source such as a battery, or may only have mechanical or passive components and may not require any power to perform its function.

[00197] In another aspect, there is provided a cover unit 200 as shown in Figure 33. In a broad embodiment, cover unit 200 comprises a cover connector 220 for connecting the cover unit 200 to the base unit 100. In some embodiments, cover connector 220 engages with base connector 120 to connect cover unit 200 to base unit 100.

[00198] The cover connector 220 is shown generically in Figure 33 but can take on any form that allows connection of the cover unit 200 to the base unit 100. Such forms include a recess for receiving a protrusion from the base unit 100, a protrusion for being received in a corresponding recess in the base unit 100, a clipping arrangement, or a magnet for attracting and retaining a region of the base unit 100. In other embodiments, the cover connector is an adhesive, or a loop-hook connector such as a product sold under the trade mark Velcro® by Velcro Industries B.V. In this embodiment, cover connector 120 can be either the loop component of the connector or the hook component.

[00199] In other embodiments, cover unit 200 comprises a cover power input 210 for receiving power output from base unit 100 as shown in Figure 34.

[00200] Cover power input 210 can be provided by any suitable means including a direct plug/socket arrangement with a recess provided in cover unit 200 leading to conductive elements which make electrical connection with a corresponding electrically conductive element of a base unit

power output 150, or can be provided by a receiving element that receives power from base unit 100 by induction or other means. Any other form of power transfer can also be used.

[00201] In some embodiments, cover power input 210 and cover connector 220 can be provided by the same element. In one such embodiment, the connection of cover power input 210 to the base power output 150 will also provide sufficient support to retain cover unit 200 to base unit 100 without a further additional cover connector 220 or other connection arrangement.

[00202] In some embodiments, cover power input 210 is provided by the secondary side of the inductive power transfer system previously described.

[00203] In some embodiments as shown in Figure 35, cover unit 200 comprises a user interface 230 to allow a user to control one or more functional aspects of the cover unit 200 as will be described in more detail below. User interface 230 can take on any suitable form including mechanical switches, touch switches, motion detectors, audio detectors or motion capture devices. In some embodiments, user interface 230 is provided by the user interface 1201 described above with reference to the switch assembly.

[00204] In other embodiments, as shown in Figure 36, cover unit 200 also comprises a cover data input 240 for receiving data. In one embodiment, the cover data input 240 receives, in use, data from the base unit 100. In other embodiments, cover data input 240 receives in use, data from another external source such as a user-controlled remote device or from another transmitting device such as those described in PCT/AU12014/000545 entitled “Electrical Connector, System and Method” and PCT/AU12014/000544 entitled “Batten Holder, Connector, System and Method”, previously incorporated by reference. In this arrangement, cover data input 240 can also act as a user interface 230. In another embodiment, the data is received by a remote device as described in PCT/AU2013/001274 entitled “General Power Outlet and Remote Switch Module”, previously incorporated by reference in its entirety. In this embodiment, cover unit 200 can comprise elements of the power outlet described therein.

[00205] In some embodiments as shown in Figure 37, cover unit 200 comprises a cover data output 250 for outputting data to the base unit 100 or an external device. In some embodiments, cover data input 240 and cover data output 250 are provided by the same element, such as a transceiver.

[00206] In some embodiments, cover data input 240 and/or cover data output 250 are provided by a mechanical data port in accordance with any suitable data transfer protocol. Such examples include RJ-45 type connectors, RJ11, RJ14, RJ25, RJ48, RJ61, XLR connectors, XLD connectors, DIN connectors, BNC connectors and USB ports.

[00207] In some embodiments, cover data output 250 is provided by the secondary side of the inductive power transfer system previously described.

[00208] In some embodiments, cover unit 200 comprises a cover switch interface 260 as shown in Figure 38, for engaging with a corresponding base switch interface. In some embodiments, cover switch interface is provided by the user interface 1201 described above with reference to the switch assembly.

[00209] In some embodiments, cover unit 200 comprises functional circuitry 280 which is powered in some embodiments, by power received by cover power input 210. In other embodiments, functional circuitry 280 is powered by a cover power supply 290 in cover unit 200 such as a battery.

[00210] In some embodiments, functional circuitry 280 is controlled by user interface 230.

[00211] In some embodiments, cover unit 200 comprises a memory 270 for storing data.

[00212] In another aspect, there is provided a system 300 comprising the base unit 100 and the cover unit 200 as shown in Figure 39. In this embodiment, base unit 100 is mounted to surface 40 (for example a wall) via mounting region 110 and electrically connected to supply power 50 via base supply power input 130. Cover unit 200 is connected to base unit 100 via base connector 120 and cover connector 220.

[00213] In another embodiment of system 300, shown in Figure 40, cover unit 200 also receives power from base unit 100 via base power output 150 and cover power input 210 to power any functional circuitry that may be contained in cover unit 200.

[00214] It will be appreciated that the system 300 comprising base unit 100 and cover unit 200 allows easy connection of a cover unit 200 to base unit 100 by simply engaging the base connector 120 and cover connector 220. In this way, cover unit 200 can be easily installed, removed and replaced by any user without any need for electrical knowledge or certification.

[00215] Furthermore, the system 300 allows a plurality of different cover units 200 to be connected to base unit 100. This allows the user to replace the cover unit 200 with a cover unit 200 of a different functionality to thereby provide great flexibility to the user as the user's needs change over time.

[00216] For example, in one embodiment, cover unit 200 is a power socket and switch arrangement to allow system 300 to act as a conventional power socket for allowing the user to power devices such as vacuum cleaners, televisions etc. If the user then enters a stage in life where the user has a baby, the user may easily remove cover unit 200 by simply disengaging the base connector and the cover connector, and can then replace this cover unit 200 with a different cover unit 200 that provides a different functionality such as a baby monitor or a night light.

[00217] 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.

[00218] 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.

[00219] It will be appreciated by those skilled in the art that the invention is not restricted in its use to the particular application described. Neither is the present invention restricted in its preferred embodiment with regard to the particular elements and/or features described or depicted herein. It will be appreciated that the invention is not limited to the embodiment or embodiments disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the scope of the invention as set forth and defined by the following claims.

**CLAIMS**

1. A base unit comprising:
  - a mounting region for mounting to a surface;
  - a base connector for connecting the base unit to a cover unit;
  - a base supply power input for receiving supply power;
  - a base power converter for converting the received supply power to an output power; and
  - a base power output for outputting the output power to the cover unit.
2. A base unit as claimed in claim 1 wherein the base connector comprises at least one retaining element for retaining the cover unit to the base.
3. A base unit as claimed in claim 2 wherein the retaining element is a recess.
4. A base unit as claimed in claim 2 wherein the retaining element is a protrusion
5. A base unit as claimed in claim 2 wherein the retaining element is a tab.
6. A base unit as claimed in claim 2 wherein the retaining element is a magnet.
7. A base unit as claimed in any one of claims 1 to 6 wherein the base power output, in use, transmits the output power to the cover unit.
8. A base unit as claimed in claim 7 wherein the base power output is a radiating element.
9. A base unit as claimed in any one of claims 1 to 8 wherein the base further comprises a base switch interface for interfacing with a rear of a switch on the cover unit.
10. A base unit as claimed in any one of claims 1 to 9 further comprising a base data input for receiving data.
11. A base unit as claimed in claim 10 further comprising a base data output for outputting data.

12. A base unit as claimed in claim 10 wherein the base data input is for receiving data from the cover unit.
13. A base unit as claimed in claim 11 wherein the base data output is for outputting data to the cover unit.
14. A base unit as claimed in any one of claims 1 to 13 further comprising a base supply power output for outputting supply power.
15. A base unit as claimed in any one of claims 1 to 14 wherein the base power output and the base connector are provided by the same element.
16. A cover unit comprising:  
A cover connector for connecting the cover to the base unit of any one of claims 1 to 15.
17. A cover unit as claimed in claim 16 further comprising a cover power input for receiving the output power from the base power output of the base unit.
18. A cover unit as claimed in claim 17 wherein the cover connector and the cover power input are provided by the same element.
19. A cover unit as claimed in any one of claims 16 to 18 further comprising a user interface.
20. A cover unit as claimed in any one of claims 16 to 19 further comprising a data input.
21. A cover unit as claimed in any one of claims 16 to 20 further comprising a data output.
22. A cover unit as claimed in any one of claims 16 to 21 further comprising functional circuitry.
23. A cover unit as claimed in any one of claims 16 to 22 further comprising a power supply.
24. A cover unit as claimed in any one of claims 16 to 23 further comprising a cover switch interface for interfacing with the base switch interface of the base unit.

25. A system comprising:
- the base unit as claimed in any one of claims 1 to 15; and
  - the cover unit as claimed in any one of claims 16 to 24.
26. A system as claimed in claim 25 further comprising a plurality of cover units as claimed in any one of claims 16 to 24 that are interchangeable and wherein at least two of the plurality of cover units provide different functionality from each other.
27. A method of installing a cover unit as claimed in any one of claims 16 to 24, the method comprising:
- connecting the cover unit to a base unit as claimed in any one of claims 1 to 15.
28. A method as claimed in claim 27 wherein the step of connecting the cover unit to the base unit comprises:
- aligning the cover connector with the base connector of the base unit; and
  - connecting the cover connector and the base connector to thereby retain the cover unit to the base unit.
29. A method as claimed in any one of claims 27 or 28 further comprising providing power to the cover unit by engaging the cover power input with the base power output.