

TOUCH SWITCH

TECHNICAL FIELD

5 The present disclosure relates to electrical switches and in particular, to electrical switches that are actuated by touch or proximity.

PRIORITY

10 The present application claims priority from Australian Provisional Patent Application No 2010905667 filed on 24 December 2010 entitled "Touch Switch".

The entire content of this document is hereby incorporated by reference.

INCORPORATION BY REFERENCE

15 The following documents are referred to in the present application:

- International Patent Application No. PCT/AU2011/001532 entitled "USB Outlet Charger" in the name of Clipsal Australia Pty Ltd.

20 The entire content of this document is hereby incorporated by reference.

BACKGROUND

25 There are a range of switches known as touch or proximity switches. These work by closing a switch circuit by the mere touch or proximity of a user. The switch detects a difference in the capacitance of a plate when it is touched by a finger for example. In other forms, the touch switch detects a change in resistance of a part of the circuit when touched by a finger.

SUMMARY

30 According to one aspect, there is provided a touch switch module for use with a switch faceplate, the module comprising;

a housing;

a touch switch circuit within the housing; and

a touch switch interface for interfacing between the touch switch circuit and the switch faceplate when installed.

35 In one form, the touch switch module further comprises a biasing element disposed between the touch switch interface and the touch switch circuit for biasing the touch switch interface towards the switch faceplate when installed.

In one embodiment, the biasing element is a spring.

In one form, the touch switch interface comprises a conductive element.

5 In one form, the conductive element is a conductive plate.

In one form, the conductive plate is supported by a conductive element support.

10 In one form, the touch switch module further comprises electrical terminals for connection to supply wires.

In one form, the touch switch module further comprises a switching circuit.

15 In one form, the touch switch module further comprises a dimmer circuit.

In one form, the touch switch module further comprises a transmitter for transmitting a switch command to a remote receiver.

20 In one form, the housing comprises a touch switch interface cover covering the touch switch interface.

According to another aspect, there is provided a touch switch assembly comprising:

the touch switch module of the first aspect; and

a switch faceplate operatively connected to the touch switch module.

25 In one form, the touch switch assembly comprises the switch faceplate and the touch switch module of the first aspect, operatively connected to the switch faceplate, the switch faceplate comprising:
a piece of nonconductive material; and
a connector for connecting to the touch switch module.

30 In one form, the switch faceplate comprises at least one indentation for receiving a part of a user's finger to operate the touch switch circuit in the touch switch module.

35 In one form, the switch faceplate comprises at least one marking on a surface of the switch faceplate to indicate a region for a user to touch the faceplate to operate the touch switch circuit in the touch switch module.

In one form, the switch faceplate comprises 2, 3, 4, 5, 6, 7 or 8 indentations for receiving a part of a user's finger to operate the touch switch circuit in the touch switch module.

According to a third aspect, there is provided a method of installing a touch switch module behind a switch faceplate, the method comprising:

securing the touch switch module to a switch faceplate assembly; and
securing the switch faceplate assembly to a surface so as to cover an aperture in the surface.

In one form, the method further comprises the step of connecting electrical terminals of the touch switch module to supply wires prior to the step of securing the switch faceplate assembly to the surface.

According to a fourth aspect, there is provided a housing for a touch switch module for use with a switch faceplate, the housing comprising:

an access port for inserting a touch switch circuit within the housing; and
a touch switch interface cover for covering a touch switch interface interfacing between the touch switch circuit and the switch faceplate.

In yet a further aspect there is provided a touch switch module with a circuit providing touch switch functionality, housed within a casing, and an interface for allowing a user to actuate the circuit.

DRAWINGS

Figure 1 – shows a front perspective view of a touch switch module;

Figure 2 – shows a rear perspective view of the touch switch module of Figure 1;

Figure 3 – shows an exploded view of a touch switch module;

Figure 4A – shows a first side view of the touch switch module;

Figure 4B – shows a bottom end view of the touch switch module;

Figure 4C – shows a top end view of the touch switch module;

Figure 4D – shows a second side view of the touch switch module;

Figure 4E – shows a third side view of the touch switch module;

Figure 4F – shows a cross sectional view along the line A-A of Figure 4D;

Figure 5 – shows a close up detail view of the spring mechanism shown in Figure 4F;

Figure 6 – shows a block diagram of the touch switch circuit;

Figure 7 – shows a circuit schematic of the touch switch circuit;

Figure 8 – shows an exploded view of a faceplate/touch switch combination or assembly with 2 switches;

- Figure 9 – shows an exploded view of a faceplate/touch switch combination or assembly with a variety of switch combinations;
- Figure 10 – shows a close up of the touch switch module/faceplate interface;
- Figure 11A – shows a range of faceplates with a spherical indentation “button”;
- 5 Figure 11B – shows a cross-sectional view of the buttons of Figure 11A;
- Figure 12 – shows a range of faceplates with an oval indentation “button”;
- Figure 12B – shows a cross-sectional view of the buttons of Figure 12A;
- Figure 13A – shows a range of faceplates with round flat-bottom indentation “button”;
- Figure 13B – shows a cross-sectional view of the buttons of Figure 13A;
- 10 Figures 14A to 14C – show a range of faceplates with other differently-shaped indentation buttons;
- Figure 15 – shows an exploded view of a faceplate/touch switch combination with 2 switches using a flat faceplate;
- Figure 16 – shows a flow chart of a method of installing a touch switch module; and
- Figure 17 – shows a flow chart of the method of Figure 16 with an additional step.

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DESCRIPTION

Figure 1 shows a front perspective view of a touch switch module 100 according to one aspect as described herein. In this example, touch switch module 100 comprises a housing 10 including a touch switch interface cover 11. The touch switch interface cover 11 covers a touch switch interface

20 (not visible in this view) as will be described in more detail below. Also shown in this view is connector element 12 for securing the touch switch module 100 to a faceplate grid as will be described in more detail below.

Figure 2 shows a rear perspective view of the touch switch module 100. In the embodiment shown in

25 this example, the rear of the touch switch module 100 provides electrical terminals 71, 72 and 73 for connection to respective mains or supply wires from inside a wall recess for example. In other embodiments, the terminals may be provided on the side of the module 100. In yet other embodiments, when there is no need to connect touch switch module 100 to mains or supply wires, no terminals are provided. Examples of such an embodiment include the touch switch module acting

30 solely as a touch switch to provide switch commands, which can then be transmitted wirelessly to another switching arrangement remotely located.

Figure 3 shows an exploded view of the components of a touch switch module 100 according to one embodiment. Shown is touch switch housing 10 which provides a housing or casing for the internal

35 components. An access port 13 is provided to allow the other components to be inserted into the housing, such as the touch switch circuit 30. In this embodiment, the access port 13 is covered by cover 11 which also acts as a touch switch interface cover 11 which covers the touch switch

interface 20. In other embodiments, access port 13 may be provided in another location and/or covered by a cover that does not also act as touch switch interface cover 11.

5 The components of the touch switch module 100 include a touch switch circuit 30 which in the embodiment shown here, is laid out on touch switch circuit support 40. In some embodiments, touch switch circuit support 40 is a Printed Circuit Board (PCB). The example in Figure 3 shows two distinct circuits, one on a front face and one on a side face. In some embodiments, the touch switch circuit 30 is spread out onto both or more faces. In some embodiments, the touch switch circuit 30 is located on the front face, and other circuits such as a switching circuit, dimming circuit and/or
10 transmitting circuit are provided on other faces.

Electrical terminals 71, 72 and 73 are also shown at a back end of circuit support 40.

15 In one aspect, the touch switch interface 20 is provided by conductive element 21. In one embodiment, conductive element 21 is a conductive plate 21. In some embodiments, touch switch interface 20 also has a conductive element support 22 and in some embodiments, touch switch interface 20 also has a biasing element 23, which acts to bias the conductive element 21 towards the touch switch interface cover 11. In some embodiments, biasing element 23 is conductive, and in some embodiments, is a spring. The function of the touch switch interface will be described in more
20 detail below with reference to Figure 5.

Figure 4A shows a first side view of touch switch module 100 with electrical terminal 71. Figure 4B shows a bottom end view of touch switch module 100 showing all three electrical terminals for remote or neutral 71, load 72 and active 73.

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Figure 4C shows a top end view of touch switch module 100, showing touch switch interface cover 11. Figure 4D shows a second side view and Figure 4E shows a third side view.

30 Figure 4F shows a cross section along the line A-A of Figure 4D showing various internal components including the touch switch interface 20, and circuit support 40. As can be seen in this view, various circuits can be supported on different faces of circuit support 40 within touch switch module 100.

35 Figure 5 shows a close up detail view of the top part of Figure 4F, and in particular, the touch switch interface 20 arrangement. As can be seen in this view, touch switch interface cover 11 covers touch switch interface 20 and in particular, conductive element or plate 21 which is shown pressed up against the inside of cover 11. Plate 21 is supported by conductive element support 22 which

includes a central aperture 22a to receive spring 23. Spring 23 is itself electrically conductive and is in electrical connection with plate 21 and touch switch circuit 30. Circuit 30 is supported by circuit support 40.

- 5 As can be seen in this view, plate 21 is biased against cover 11 by spring 23. This provides for a better interaction between the plate 21 and a user's finger when the user actuates the touch switch by touching a switch faceplate (not shown in this view) as will be described further below. It will be appreciated that minimising any gap between conductive element or plate 21 and the cover 11 will allow more efficient operation of the touch switch in detecting a change in the capacitance of the
- 10 plate 21 when a user's finger is near the plate 21 as compared to the parasitic capacitance of the plate 21 on its own. This results in actuation of the touch switch as will be understood by the person skilled in the art.

- In other embodiments, the biasing element 23 may be provided by another component such as a
- 15 tensioned metallic element or in other embodiments, the biasing element need not be conductive and a separate conductive path such as a wire can be used to electrically connect plate 21 to circuit 30. The use of a conductive spring conveniently provides all functions thereby simplifying the construction of the device.

- 20 Figure 6 shows a block diagram of the major components of a touch switch circuit 30 with touch switch interface 21 (in this case plate 21) as an input. This circuit illustrates a touch activated toggle switch mechanism. In this embodiment, plate 21 is electrically connected to touch sense detector IC 31, which detects when the touch switch is activated by the user upon touching a switch faceplate by detecting a change in capacitance input to IC 31. In response to a touch detection, IC 31 generates a
- 25 switch command which in this embodiment, actuates a relay 32. Relay 32 is in turn connected between the active terminal 73 and load terminal 72 to switch power on and off to a connected load (such as a light or fan – not shown in this view). In this embodiment, touch switch circuit 30 also has power supply 33 which in this case is derived from the connected supply or mains wires connected to the terminals 71, 72 and 73. In other embodiments, circuit 30 may be powered by a stand-alone
- 30 power source such as a battery or other power source.

- As will be appreciated, if the touch switch is used to control a dimmer circuit rather than simply turning on and off power to the load, the output of IC 31 may be provided to a dimmer circuit to control the degree of power provided to a load such as a light or a fan. In other embodiments, the
- 35 output of IC 31 may be provided to a transmitter to wirelessly transmit the output to a remotely located switch or dimmer circuit associated with a load.

Accordingly, while the circuit in Figure 6 shows touch switch circuit 30 as including the touch sense plate 21, the touch sense detector IC 31, relay 32 and power supply 33, in some embodiments, touch switch circuit 30 will comprise only touch sense plate 21 and touch sense detector IC 31 and in other embodiments will comprise only touch sense detector IC 31.

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Figure 7 shows a schematic of an example circuit embodying the arrangement of Figure 6.

The function and description of components are as follows:

10 C1 – is a line voltage dropping capacitor to establish low voltage supply current. In this example, C1 is 220nF;

R1 – is a current limiting resistor for line voltage transients and in this example is 470 ohms;

DB1 – provides full-wave rectification of the low voltage supply current;

C2 – provides smoothing of the resulting full-wave low voltage supply and in this case is 47uF;

15 Z1 – provides voltage limiting regulation for the relay coil voltage and is provided by a BZD27C47 diode for example.

Components C1, R1, DB1, C2 and Z1 provide the power supply element 33 shown in Figure 6.

20 RLY1 – is a relay (element 32 in Figure 6) to control the connected load and is provided by a RTS3T048 relay as an example;

R2 – is a current limiting resistor of, for example, 47k for the touch sense IC shunt voltage regulator IC1;

IC1 – is the shunt voltage regulator IC for the touch sense IC supply rail and is provided in this example by a ZR431 diode;

25 C3 – is an AC bypass capacitor of 100nF for the touch sense IC supply rail;

IC2 – is the touch sense detector (element 30 in Figure 6) IC provided by an AT42QT1012 device in this example with inputs/outputs 1, 2, 3, 4, 5 and 6;

C4 – is a touch sense IC sensitivity adjustment capacitor of for example 22nF;

R3 – is a current limiting resistor of, for example, 10k for the relay coil drive transistor Q1; and

30 Q1 – is a relay coil drive transistor provided by a BC846B device in this example.

Upon detection of a user touching the faceplate and causing a change in detected capacitance of plate 21 as detected by IC2, IC2 generates a switch command at its output (output 1 in this example).

35 In this example circuit, this switch command is applied to transistor Q1 to actuate relay RLY1 to switch power to the connected load (not shown in this figure). Upon a second touch, IC2 will again detect the touch and generate another switch command to again actuate relay RLY1 to remove power from the load terminal and thus the connected load.

As previously described, it will be appreciated that the output of IC2 can be applied to a more complicated switching circuit, or can be applied to the input of a dimmer circuit to control the amount of power delivered to the load to dim the intensity of light if the load is a light or to vary the speed of a fan if the load is a fan.

Alternatively, the output of IC2 can be applied to a transmitter to wirelessly transmit the switch command to a switching circuit or dimmer circuit remotely located and associated with a load.

In further embodiments, there may be multiple sense plates 21, including 2, 3, 4, 5, 6, 7, 8, 9, 10 or more. Each sense plate will provide an input to IC2 which can be programmed to generate output switch commands according to any combination of actuations of the one or more sense plates.

Figure 8 shows another aspect described herein. In this aspect, the touch switch module 100 is used in combination with a faceplate 210 to form a touch switch assembly 200. In one embodiment, a touch switch assembly is provided comprising switch faceplate 210, faceplate back 220 and faceplate grid 230.

In the embodiment illustrated here, touch switch faceplate assembly 200 is constructed by securing touch switch module 100 to faceplate grid 230 such that touch switch interface cover 11 passes through grid aperture 231. Module 100 is secured to grid 230 via connector elements 12 around the periphery of module 100. These connector elements 12 lock into corresponding recesses in grid 230 (not visible in this view). Grid 230 is then connected to faceplate back 220 via any suitable means such as a clip arrangement. Faceplate back 220 is then secured about an aperture in a surface such as a wall via any suitable means such as screw means through screw apertures 221.

At this stage, touch switch interface cover 11 is protruding from grid 230. Switch faceplate 210 is then secured to faceplate back 220 by any suitable means such as a snap fit, such that the inner face of switch faceplate 210 becomes operatively connected to the touch switch module 100. In one embodiment, switch faceplate 210 is operatively connected to the touch switch module when the inner face of switch faceplate 210 abuts against the surface of cover 11. In another embodiment, switch faceplate 210 is operatively connected to the touch switch module when the inner face of switch faceplate 210 is sufficiently close to the touch switch interface 21 (whether or not there is a touch switch interface cover 11 such that a user touching the switch faceplate 210 actuates the touch switch circuit within the touch switch module 100. When a user wishes to actuate the touch switch, the user touches the switch faceplate 210 at a designated region such as indentation 211. The designated region and the touch switch module together effectively provide the touch switch. As will

be understood by the person skilled in the art, the act of touching faceplate 210 at indentation 211 changes the capacitance at plate 21 (see Figure 6 for example) which is sensed by IC 31 to generate the switch command.

- 5 In the example shown in Figure 8 there are two touch switch modules 100 and 100' with like-numbered elements. Touch switch module 100' is located behind indentation 211' and actuated by touching the indentation 211'.

Figure 9 shows a variety of faceplate combinations providing a range of touch switches. There is
10 shown faceplate 210 with 1, 2 and 6 switches provided by the corresponding number of indentations or designated regions. Figure 9 also shows the corresponding grid 230 with the corresponding number of grid apertures 231. As can be seen in these examples, touch switch modules 100 are secured to grid 230 with touch switch interface cover 11 protruding through grid apertures 231. In the main example, grid 230 is shown secured to faceplate back 220 with switch faceplate 210 about
15 to be secured over the faceplate back 220.

It will be appreciated that any other combination of switch numbers may be provided, including 3, 4, 5, 7, 8, 9, 10 or more.

- 20 Figure 9 illustrates one advantage of the present system. In particular, in one aspect, the described system provides great flexibility in being able to tailor the number of touch switches required, and is able to be retro-fitted to existing switch faceplate assemblies. In some examples, the touch switch modules can be mixed with other types of modular mechanisms such as switch mechanisms, dimmer mechanisms and/or USB charging mechanisms. One example of a suitable USB charging
25 mechanism is described in PCT Patent Application No. PCT/AU2011/001532, filed in the name of the present applicant. The entire content of this document is hereby incorporated by reference.

Figure 10 shows a cross sectional view of the switch faceplate assembly 200 focusing on the switch module 100/switch faceplate 210 interface and in particular, the relationship between the "button" or
30 indentation 211 of switch faceplate 210 and the conductive element or plate 21. Figure 10 shows how switch module 100 is secured to the faceplate grid 230 via connector 12, with touch switch interface cover 11 located within the touch switch grid aperture 231 to be protruding through grid aperture 231.

- 35 When switch faceplate 210 is placed over faceplate grid 230 and faceplate back 220 (not shown in this view), the inside surface of switch faceplate 210 lies substantially flat against the surface of touch switch interface cover 11. In some embodiments, there can be a small gap therebetween.

The designated region, in this case, indentation 211, is located over the cover 11 so that when the user places his finger in indentation 211 to actuate the switch, the user's finger is placed close to plate 21. In the absence of a user's finger, plate 21 has a set parasitic capacitance, but when the user's finger is close to plate 21, the capacitance changes. This change in capacitance is detected by the IC 2 as previously described with reference to Figures 6 and 7.

In this view, it can also be seen how spring 23 biases plate 21 towards the cover 11 and indentation 211 of faceplate 210 to improve the above interaction.

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Figure 11A shows a range of faceplates where the designated region is provided by a circular indentation "button". Shown there are a variety of switch faceplates 210 with corresponding "buttons" or indentations 211, including 1, 2, 3, 4, 5 and 6 indentations. In this example, the indentations or buttons are circular with a semi-spherical indentation as shown in the cross section view of Figure 11B.

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Figure 12A shows a range of faceplates with an oval indentation "button". Shown there are a variety of switch faceplates 210 with corresponding "buttons" or indentations 211, including 1, 2, 3, 4, 5 and 6 indentations. In this example, the indentations or buttons are oval with a semi-spherical indentation as shown in the cross section view of Figure 12B.

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Figure 13A shows a range of faceplates with a round flat-bottom indentation "button". Shown there are a variety of switch faceplates 210 with corresponding "buttons" or indentations 211, including 1, 2, 3, 4, 5 and 6 indentations. In this example, the indentations or buttons are round with a flat-bottom indentation as shown in the cross section view of Figure 13B.

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Figures 14A, 14B and 14C shows a range of switch faceplates 210 with indentations or buttons of different shapes. In Figure 14A, the indentation 211 is square with a flat-bottom indentation. Figure 14B is diamond-shaped with a flat-bottom indentation. In Figure 14C the indentation 211 is octagonal with a flat-bottom indentation.

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It will also be appreciated that the faceplate 210 shown on these figures can also be of any shape or configuration.

Figure 15 shows an exploded view of a faceplate/touch switch combination or assembly with two touch switch modules 100 and 100'. In this arrangement, faceplate 210 has no indentations. However, the regions behind the faceplate 210 that are over the covers 11 and 11' are able to act as

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touch switches when touched by a user. In this arrangement, the “active” or designated regions can be identified by a marking on the surface of faceplate 210 such as a line, pattern or colour patch over the active region.

- 5 In another embodiment, the designated region is indicated by a light located behind faceplate 210 and shining through a transparent or semi-transparent material of the faceplate 210.

Figure 16 shows a flowchart of a method of installing a touch switch module behind a switch faceplate which covers an aperture in a surface such as a wall. In the first step 400, the touch switch module 100 is operatively connected to a switch faceplate assembly 200 as illustrated for example in Figure 9. In step 410, the faceplate assembly 200 with operatively connected touch switch module 100 is connected or secured to a surface such as a wall, over an aperture in the surface or wall. This provides a faceplate with a touch switch functionality.

- 15 It will be appreciated that operative connection is any connection or relative placement of the touch switch module 100 and the faceplate 210 that allows the touch switch to be actuated by a user touching the designated region of the faceplate 210. It will also be appreciated that the step of operatively connecting the touch switch module 100 to or with the faceplate 210 can include via use of a faceplate grid and/or a faceplate back as previously described with reference to Figure 8 for example.

In some embodiments, where the touch switch module 100 is to be connected to mains or supply power, the method also includes the step of connecting the mains or supply wires, accessible through the aperture in the wall, prior to securing the switch faceplate to the wall to cover the aperture.

- 25 Figure 17 shows a flowchart of a method including this additional step. In this example, in the first step 500, the touch switch module 100 is operatively connected to a switch faceplate 210 as illustrated for example in Figure 9. In step 510, the touch switch module 100 is connected to mains or supply wires accessed from behind the surface for example. In one embodiment, the wires are connected to touch switch module 100 via terminals 71, 72 and 73 (see Figure 2 for example). In step 520, the faceplate 210 with operatively connected touch switch module 100 is connected or secured to a surface such as a wall, over an aperture in the surface or wall. This provides a faceplate with a touch switch functionality.

- 35 In another aspect described herein, there is provided a housing 10 for a touch switch module 100. In one embodiment, the housing 10 comprises an access port 13 for inserting a touch switch circuit 30 within the housing 10; and a touch switch interface cover 11 for covering a touch switch interface 20

interfacing between the touch switch circuit 30 and a switch faceplate. An example of this housing is illustrated in Figure 3.

5 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.

10 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.

15 While the various aspects described above have been described with reference to specific embodiments, it will be appreciated that many variations and modifications can be made within the scope of the appended claims.

CLAIMS:

1. A touch switch module for use with a switch faceplate assembly comprising a designated region on an outer face comprised of a non-conductive material, the module comprising:

a housing comprising a touch switch interface cover and a plurality of connectors which in use secure the housing with respect to the switch faceplate assembly;

a touch switch circuit within the housing;

a touch switch interface for interfacing between the touch switch circuit and the switch faceplate when installed, wherein the touch switch interface comprises a conductive element and

a biasing element disposed between the conductive element and the touch switch circuit for biasing the conductive element of the touch switch interface towards the touch switch interface cover, and when installed, the housing is secured so that the touch switch interface cover either abuts the inner face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to the designated region of the switch faceplate so that a user can actuate the touch switch by touching the designated region of the switch faceplate.

2. The touch switch module as claimed in claim 1 wherein the biasing element is a spring.

3. The touch switch module as claimed in claim 2 wherein the conductive element is a conductive plate.

4. The touch switch module as claimed in claim 3 wherein the conductive plate is supported by a conductive element support.

5. The touch switch module as claimed in any one of claims 1 to 4 further comprising electrical terminals for connection to supply wires.

6. The touch switch module as claimed in claim 5 further comprising a switching circuit.

7. The touch switch module as claimed in claim 5 further comprising a dimmer circuit.

8. The touch switch module as claimed in any one of claims 1 to 7 further comprising a transmitter for transmitting a switch command to a remote receiver.

9. The touch switch module as claimed in any one of claims 1 to 8, wherein the plurality of connector elements are located around the periphery of the housing, and the switch faceplate assembly comprises a switch faceplate, a faceplate grid, and a faceplate back and in use the switch faceplate is connected to the faceplate back that is secured about an aperture in a surface, and the

faceplate grid comprises at least one grid aperture and is secured to the faceplate back, and the connector elements engage with the faceplate grid to secure the touch switch module such that the touch switch interface cover protrudes through one of the at least one grid apertures.

- 5 10. A touch switch assembly comprising:
 - at least one touch switch module as claimed in any of claims 1 to 9; and
 - a switch faceplate assembly operatively connected to each of the at least one touch switch module comprising a switch faceplate comprising at least one designated region on an outer face comprised of a non-conductive material, wherein each of the at least one touch switch module is
 - 10 secured to the switch faceplate assembly so that a touch switch interface cover of each of the at least one touch switch module either abuts the inner face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to the designated region of the switch faceplate so that a user can actuate the touch switch by touching the designated region of the switch faceplate.
- 15 11. The touch switch assembly as claimed in claim 10, wherein the at least one touch switch module is as claimed in claim 9, and the switch faceplate assembly comprises:
 - a switch faceplate operatively connected to the touch switch module comprising at least one designated region on an outer face comprised of a non-conductive material;
 - 20 a faceplate back that in is secured about an aperture in a surface; and
 - a faceplate grid comprising at least one grid aperture for receiving a touch switch module, and the faceplate grid and switch faceplate are secured to the faceplate back, and each of the at least one touch switch module is secured in one of the at least one grid apertures such that the respective touch switch interface cover protrudes through the respective grid aperture to either abuts the inner
 - 25 face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to the respective at least one designated region of the switch faceplate.
- 30 12. The touch switch assembly as claimed in claim 11 wherein the at least one designated region comprises 2, 3, 4, 5, 6, 7 or 8 indentations for receiving a part of a user's finger to operate the touch switch circuit in the touch switch module, and the faceplate grid respectively comprises at least 2, 3, 4, 5, 6, 7 or 8 grid apertures.
- 35 13. A switch faceplate for a touch switch assembly comprising the switch faceplate and at least one touch switch module as claimed in any one of claims 1 to 9, the switch faceplate comprising:
 - a piece of nonconductive material comprising at least one designated region on an outer face; and

a connector for connecting each of the at least one touch switch module to the switch faceplate so that a touch switch interface cover of each of the at least one touch switch module either abuts the inner face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to a respective designated region of the switch faceplate so that a user can actuate the touch switch by touching the designated region of the switch faceplate.

14. A switch faceplate as claimed in claim 13 wherein the at least one designated region comprises at least one indentation for receiving a part of a user's finger to operate the touch switch circuit in one of the at least one touch switch module.

15. A switch faceplate as claimed in claim 13 wherein the at least one designated region comprises at least one marking on a surface of the switch faceplate to indicate a region for a user to touch the faceplate to operate the touch switch circuit in one of the at least one touch switch module.

16. A switch faceplate as claimed in claim 14 wherein the at least one designated region comprises 2, 3, 4, 5, 6, 7 or 8 indentations.

17. A switch faceplate as claimed in any one of claim 13 to 16, wherein the connector comprises a clip for connecting the switch faceplate to a faceplate back that in use is secured about an aperture in a surface, and a faceplate grid that also connects to the faceplate back, and the faceplate grid comprises at least one grid aperture for receiving a touch switch module, and each of the at least one touch switch modules is secured in one of the at least one grid apertures such that the respective touch switch interface cover of the each of the at least one touch switch module protrudes through the respective grid aperture to either abuts the inner face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to the respective at least one designated region of the switch faceplate.

18. A method of installing the touch switch assembly of any of claims 10 to 12, the method comprising:

securing each of the at least one touch switch module to a switch faceplate assembly; and
securing the switch faceplate assembly to a surface so as to cover an aperture in the surface.

19. The method as claimed in claim 18, wherein the step of securing each of the at least one touch switch module to the switch faceplate comprises:

securing each of the at least one touch switch module to the faceplate grid; and

securing the faceplate grid to the faceplate back;
and the step of securing the switch faceplate assembly to a surface so as to cover an aperture in the surface further comprises:

securing the faceplate back to a surface so as to cover an aperture in the surface; and

5 securing the switch faceplate to the faceplate back.

20. A method as claimed in claim 19 further comprising connecting electrical terminals of the at least one touch switch module to supply wires prior to the step of securing the faceplate back to the surface.

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21. A housing for a touch switch module as claimed in any one of claims 1 to 9 for use with a switch faceplate assembly comprising a designated region on an outer face comprised of a non-conductive material, the housing comprising:

an access port for inserting a touch switch circuit within the housing and a touch switch
15 interface;

a touch switch interface cover for covering a touch switch interface interfacing between the touch switch circuit and the designated region of the switch faceplate wherein the touch switch interface comprises a conductive element and a biasing element disposed between the conductive element and the touch switch circuit for biasing the conductive element of the touch switch interface
20 towards the touch switch interface cover; and

a plurality of connector elements which in use secure the housing with respect to the switch faceplate assembly, wherein when installed, the housing is secured so that the touch switch interface cover either abuts the inner face of the switch faceplate, or is sufficiently close to the inner face of the switch faceplate, so as to operatively connect the touch switch module to the designated region
25 of the switch faceplate so that a user can actuate the touch switch by touching the designated region of the switch faceplate.

22. The housing as claimed in claim 21, wherein the plurality of connector elements are located around the periphery of the housing, and the switch faceplate assembly comprises a switch faceplate, a faceplate grid, and a faceplate back and in use the switch faceplate is connected to the faceplate
30 back that is secured about an aperture in a surface, and the faceplate grid comprises at least one grid aperture and is secured to the faceplate back, and the connector elements engage with the faceplate grid to secure the touch switch module such that the touch switch interface cover protrudes through one of the at least one grid apertures.