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ABSTRACT

A service outlet floor box includes a frame (1) and a connector module (2) mountable in the frame at a plurality of depths within the frame (1). The connector module (2) has a first fixing configuration in which a fastening part (16,17) of the first module projects outwardly for engagement with the frame (1) to mount the module (2) in the frame, and a second released configuration, the module (2) being able to be secured in the frame at a selected one of the plurality of depths within the frame when it is in the first fixing configuration with the fastening part (16,17) of the module projecting outwardly and engaging a selected part of the frame to ostruct removal of the module (2) from the frame (1), and being releasable from the frame by changing the module into the second released configuration in which the fastening part (16,17) of the module no longer obsructs removal of the module from the frame.

Service Outlet Floor Box with Depth Adjustment

The present invention relates to service outlet floor boxes, and in particular to a service outlet floor box with a connector module mountable in the floor box at different depths.

Service outlet floor boxes are typically used in offices, factories or other commercial premises in which electrical or electronic services are required at a variety of different locations. The electrical or electronic services available from such service outlet boxes may for example include telephone, Internet, network and other telecommunication- or data-related services, and electric power. Service outlet boxes for installation within the floor space are particularly beneficial in offices or buildings that require flexible usage of the space within the building. Providing such service outlet boxes in several locations in a floor space may for example enable the floor space to be partitioned with quick-to-fit partition walls and to be readily used without needing to route cables through or from walls in the partitioned space.

A first type of outlet box for use on screed floors is often referred to as a screed floor outlet box. It is used when cables are to be laid in a screed laid over a floor substrate. Before the screed is deposited, cable ducts are laid on the floor substrate and screed floor outlet boxes placed at desired locations at junctions of the ducts. A box may be placed at the end of a single duct or at a junction of two, three or four ducts as may be required. The ducts and the floor boxes are secured to the floor substrate with ends of the ducts inserted into openings in side faces of the boxes. Thereafter a screed, for example of concrete, is deposited over the floor substrate covering over the ducts but leaving the tops of the screed floor outlet boxes exposed.

A second type of outlet box for use on raised floors is often referred to as a raised floor outlet box. It is used when cables are to be laid below a raised floor. In this case holes are formed in the floor at the locations where the raised floor outlet boxes are required and cables are laid under the floor to make the required connections to the outlet boxes. Ducts are not necessarily provided under the floor because the cables can simply lie freely in the space below the floor. The raised floor outlet box can be attached to the floor with its base simply suspended from the floor.

Raised floor boxes commonly comprise a frame in which one or more connector modules providing enclosures for sockets or other connector units are detachably mounted. In a screed floor outlet box, the frame is often a housing closed at its bottom and on all sides, whilst in a raised floor box the frame is often open at the bottom. Thus connector modules tend to be used in raised floor boxes rather than screed floor boxes. Each connector module typically includes a casing of generally hollow cuboidal shape with a top of the casing mounting one or more connector units that each presents an upwardly facing connection facility, for example, an electric power socket, to which connection can be made during use of the floor box.

The depth of a connector module within a floor box is a significant feature of the box. In some applications it will be desirable for the connector module to be positioned well below the top of the floor box, for example, to allow a large plug to be plugged into a socket in the module with the lid still able to close over the top of the plug. In other applications it will be desirable for the connector module to be positioned near the top of the floor box to make it more accessible and/or to enable the overall depth of the floor box to be reduced. Thus, it is useful to be able to mount a connector module at a plurality of depths within a floor box.

In a known floor box, the frame of the floor box is provided with resiliently deformable sides which have slots in which projecting parts of the module can be fitted. Slots are provided at different heights enabling the module to be mounted at different depths. In order to fit the module into the slots, the sides of the frame are deformed outwardly and they then return to their undeformed state once the module is fitted. An arrangement of this kind has been known for many years but we have found it does have a significant disadvantage: in order to enable the sides of the frame to deform sufficiently to accommodate the module, they must be relatively easy to deform. Consequently, there is a risk of the module becoming detached inadvertently from the frame during ordinary use. That will at best be inconvenient and may also be dangerous.

The present invention seeks to mitigate or remove the above-mentioned disadvantage.

According to the invention there is provided a service outlet floor box including a frame and a connector module mountable in the frame at a plurality of depths within the frame, the connector module having a first fixing configuration in which a fastening part of the module projects outwardly for engagement with the frame to mount the module in the frame, and a second released configuration, the module being able to be secured in the frame at a selected one of the plurality of depths within the frame when it is in the first fixing configuration with the fastening part of the module projecting outwardly and engaging a selected part of the frame to obstruct removal of the module from the frame, and being releasable from the frame by changing the module into the second released configuration in which the fastening part of the module no longer obstructs removal of the module from the frame.

By arranging for the module to have first and second configurations which differ it becomes possible to mount the module securely in the frame by changing the module from the second released configuration into the first fixing configuration. The frame need not deform during this alteration to the configuration of the module and therefore a rigid frame can be provided. Consequently a strong construction is facilitated.

The module may be of elongate shape and the fastening part may project outwardly in the longitudinal direction when the module is in the first fixing configuration. The fastening part of the module is preferably movably mounted on a casing of the module for movement between an extended position defining the first fixing configuration of the frame and a retracted position defining the second released configuration of the frame. The fastening part of the module is preferably slidably mounted on the casing of the module for movement between the extended and retracted positions. The provision of a slidably mounted fastening part provides a convenient way of changing the module from the first configuration into the second configuration.

The service outlet floor box may include locking means for locking the fastening part in the outwardly projecting position. Such locking means may be provided by a screw clamping the fastening part to the rest of the module.

The service outlet floor box may include resilient biasing means for biasing the fastening part into the outwardly projecting position. In that case a user may not have to take any action to move the fastening part into the projecting position, but is simply required to move the fastening part against the bias of the resilient biasing means when the fastening part is to be moved back from the outwardly

projecting position. The resilient biasing means may be provided by a spring, preferably a compression spring.

A side of the frame is preferably provided with a plurality of openings at different depths and the fastening part of the module is able to project into a selected one of the openings in the first configuration of the module to obstruct removal of the module from the frame. The openings in the frame may be generally in the form or a horizontally extending slot. The fastening part may include an outwardly projecting part of a cross-section generally matched to the shape of the slot. Whilst other forms of engagement may of course be employed, we have found that the use of horizontal slots engaged by a projecting part of the fastening part represents an advantageous form of engagement.

Preferably the fastening part of the module is provided at a first end of the module and a further fastening part is provided at a second end of the module opposite the first end, the further fastening part being engageable with a further selected part of the frame to obstruct removal of the module from the frame when the module is in the first fixing configuration. The further fastening part may also be movably mounted on the module but preferably it is a fixed part of the module because it is necessary to provide a moving part at one end only. In a preferred arrangement, described below with reference to the accompanying drawings, a further side of the frame opposite the first mentioned side is provided with a plurality of further openings at different depths and the further fastening part of the module is able to project into a selected one of the further openings to obstruct removal of the module from the frame when the module is in the first configuration. Each of the further openings in the frame may be generally in the form of a horizontally extending slot and the further fastening part may include an

outwardly projecting part of a cross-section generally matched to the shape of the further slot.

The service outlet floor box may be of any kind, but the invention is of particular relevance to raised floor boxes.

According to the invention there is also provided a method of mounting a connector module in the frame of a service outlet floor box as defined above, the method comprising the following steps:

holding the module in a frame at a selected depth, with the module in the second, released, configuration, and

converting the module into the first fixing configuration to cause the fastening part of the module to project outwardly and engage with the frame to mount the module in the frame at the selected depth.

The step of holding the module in the frame at a selected depth preferably includes the step of placing the further fastening part of the module in engagement with a further part of the frame opposite the part of the frame to be engaged by the first mentioned fastening part.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings of which:

Fig. 1 is an exploded view of a raised floor box including a connector module and embodying the invention;

Fig. 2 is an exploded view of the connector module shown in Fig. 1;

Fig. 3 is an isometric view of the connector module in its assembled state;

Fig. 4A shows a first part of the connector module with the end of a flexible conduit connected thereto;

Fig. 4B shows the first part of the connector module and conduit of Fig. 4A (the end of a cable projecting from the conduit also being shown);

Fig. 4C shows the first part of the connector module and the cable of Figs 4A and 4B, being fastened to a second part of the connector module;

Fig. 5 is an isometric view showing the connector module of Figs. 2 and 3 during a first stage of being mounted in a frame of the floor box;

Fig. 6 is an isometric view showing the connector module of Figs. 2 and 3 during a second stage of being mounted in a frame of the floor box;

Fig. 7 is a plan view of the floor box showing three connector modules mounted in the frame of the box;

Fig. 8A is a sectional view in diagrammatic form of the floor box of Fig. 1 with a connector module according to Figs. 2 and 3 mounted in the box at a minimum depth; and

Fig. 8B is a sectional side view in diagrammatic form of the floor box of Fig. 1 with the connector module according to Figs. 2 and 3 mounted in the box at a maximum depth.

Referring first to Figs. 1 to 3, the raised floor box shown generally comprises a frame 1 and a connector module 2. As is conventional practice, a lid is pivotally mounted at one side of the frame 1 to close the opening in the top of the frame, but that lid is omitted from the drawings (apart from Figs. 8A and 8B) to make it easier to see the special features of the box embodying the invention.

The frame 1 is made of metal and is of generally rectangular shape having four perpendicular sides 3A, 3B, 3C and 3D, around the top of which an outwardly projecting flange 4 is defined. Each of the opposite sides 3A and 3C is provided with three downwardly extending portions 5 in each of which a series of horizontally extending slots 6 are formed, the slots in each portion 5 being positioned in a column one above another. In the illustrated example each downwardly extending portion 5 has six slots 6.

Whilst in Figs. 1 to 3, only one connector module 2 is shown, the frame 1 is able to accommodate up to three modules 2 positioned side-by-side and, as will be clear from the description below, each of the three downwardly extending portions 5 on the side 3A and each of the three downwardly extending portions 5 on the side 3C is provided for mounting respective ends of a respective one of the three modules.

The connector module 2 shown in Figs. 2 and 3 includes a casing of generally hollow cuboidal shape. The casing generally comprises a lower metal part 7, an upper metal part 8 and a top frame 9 of plastics material. The lower metal part 7 provides a bottom 10, and two opposite sides 11A and 11B of the casing, whilst the upper metal part 8 provides a top 12 and two opposite ends 13A and 13B of the casing. The top frame 9 clips over the upper metal part 8 and provides the module with a tidy appearance and a top face free of sharp edges or any openings apart from those for accommodating sockets and switches as described below.

In Fig. 1, the module 2 is shown with two connector units comprising electric power sockets 14 secured to the top 12 and with a switch unit 15, comprising two electric switches, also secured to the top 12, but those units are omitted in Figs. 2 and 3 which instead show the openings in the top 12 for accommodating those units. The module 2 further includes a fastening part comprising a sliding bracket 16. The underside of the sliding bracket 16 comprises two small channels (not shown) into which the ends of the top frame 9 are received. Such an arrangement allows the bracket to slide relative to the frame 9 (thus the bracket is slidably mounted on the top of the module at one end thereof). The sliding bracket 16 includes a lug 17 of elongate rectangular cross-section that projects longitudinally outwardly from the module and has a cross-section matched to the shape of the slots 6 in the frame 1.

At the end of the module opposite the end carrying the sliding bracket 16, a further lug 18 is formed on the top frame 9 projecting longitudinally outwardly from the module. Like the lug 17, the lug 18 is of an elongate rectangular cross-section matched to the shape of the slot 6 in the frame 1, but, whereas the lug 17 is slidably mounted, the lug 18 is fixed. A screw 19 that is in screw threaded engagement with a hole 19A on the top 12 of the module passes through a slot in the sliding bracket 16 and can be screwed down onto the sliding bracket to fix the bracket to the body of the module.

The two opposite ends 13A and 13B of the module 2 are provided with holes 20 at their bottom ends and the bottom 10 of the module is provided with upstanding tabs 21 at each of its opposite ends (only one of which is visible in the drawings) in which holes 22 are provided. When the upper and lower parts (7, 8) of the module are assembled together, screws (not shown) can be passed through the holes 20 in the opposite ends 13A and 13B of the module 2 and screwed into the holes 22 thereby fastening together the upper and lower parts of the module. The connection of the upper and lower parts 7, 8 in this way is also sufficient to provide a reliable electrical connection between the parts and avoid the need for any separate earth connection to the lower part 7.

Each of the sides 11A and 11B and each of the ends 13A and 13B of the casing are provided with openings 23 through which an end of a cable may be passed into the module and connected to a socket and/or switch unit 15.

Referring now to Figs. 4A to 4C, the manner in which an end of a cable is connected to the module will now be described. In the particular example shown a flexible conduit 24 is provided for housing a cable and the conduit terminates at the end 13B of the module 2 in the opening 23. An end of the cable 25 projects from the conduit 24 through the opening 23

in the end 13B of the module (for the sake of clarity, the cable is not shown in Figure 4A).

In order to connect the cable 25, the upper part 8 and the lower part 7 of the module 2 are separated by unscrewing the screws that pass through the holes 20 in the opposite ends 13A and 13B and are screwed into the holes 22 in the tabs 21 (see Figs 1 and 2). Once the lower part 7 is separated and removed, the rear of the sockets 14 and the switch unit 15 can be easily accessed simply by rotating the upper part 8 through about 180 degrees about its longitudinal axis (thereby exposing the rear of the sockets (see Figs 4A and 4B). Once the end of the cable 25 has been connected as required the upper part 8 of the module can be rotated back through 180 degrees and the lower part 7 fastened to it by the screws that are screwed into the holes 22. In order to make the electrical connections, virtually no extra cable length is required and therefore there is no surplus cable to feed back into the flexible conduit 24.

Figs. 5 and 6 show how one module 2 is mounted in the frame 1 at a selected depth within the frame. As shown in Fig. 5, the fixed lug 18 is first inserted into one of the slots 6 in the frame 1 (in this example the highest slot). The end of the module 2 carrying the sliding bracket 16 with the lug 17 is then lowered into the frame with the bracket 16 in its retracted position. Once that end of the module is being held at the depth required (usually the same depth as the opposite end of the module) in the position shown in Fig. 6, the bracket 16 is slid outwardly moving the lug 17 into one of the slots 6 in the frame 1. The screw 19 is then screwed in to clamp the sliding bracket in a fixed position relative to the module 2, securing the module 2 in the frame 1 at a depth determined by which of the slots 6 the user has chosen to engage with the lugs 17, 18. To remove the module the operations just described are reversed.

In the example just described a single module is installed in the frame but it will often be the case that two or three modules are to be fitted side-by-side in the frame. In that case it will usually be preferred that all the modules are at the same depth, but this is not necessary: adjacent modules may be positioned at different depths if desired.

As shown in the drawings, the openings 23 and the ends 13A and 13B of the modules are offset from the lugs 17, 18 and gaps are provided between the downwardly extending slotted portions 5 of the frame 1. Thus conduits such as the conduit 24 shown in Figs. 4A to 4C can pass freely to the opening 23 in an end of the module through one of the gaps between the downwardly extending slotted portions 5 of the frame. Fig. 7 shows the floor box with three modules 2 mounted in the frame 1.

Figs. 8A and 8B show the range of depths at which a module 2 can be accommodated within the frame 1. In Fig. 8A, module 2 is shown with the lug 18 engaged in the uppermost slot 6 of a downwardly extending portion 5, whilst in Fig. 8B, the module 2 is shown with the lug 18 engaged in the lowermost slot 6 on a downwardly extending portion 5. Also shown in Figs. 8A and 8B, is a lid 30 extending across the top of the frame 1. As can be seen by comparing Figs. 8A and 8B, the lowermost position of the module 2 shown in Fig. 8B provides substantially more space between the top of the module and the lid 30, enabling a very large plug to be accommodated (as for example may be required if the plug incorporates a transformer) and/or allowing for a relatively large bending radius of cable extending upwardly from a plug inserted into the module. On the other hand that position of the module also requires a relatively deep free space below the floor to accommodate the module. In the position of the module shown in Fig. 8A, the space required below the floor to accommodate a module is much reduced but also the space between the top of

the module 2 and the lid 30 is reduced, restricting the size of plug that can be accommodated in the module 2 with the lid closed. As will be understood, although floor boxes have openable lids to allow access to the modules for making connections, it is usually preferred that the lid is closed during normal operation and there is usually an opening provided between the lid and the frame to allow a cable plugged into a socket in the floor box to pass out of the floor box even with the lid closed. In a particular example of the invention, when the module 2 is mounted in the frame 1 in its lowermost position, the overall height of the box is 124mm and the distance between the top 12 of the module 2 and the underside of the lid 30 about 65mm. On the other hand when the module is mounted in the frame 1 in its highest position, the overall height of the box is 84mm and the distance between the top of the module 2 and the underside of the lid is about 25mm.

In the examples of the invention shown the connector units in the modules 2 are electric power sockets, but it will be understood that other connector units, for example, data or telecommunications sockets, or other terminals, may alternatively be provided.

Whilst the present invention has been described and illustrated with reference to a particular embodiment, it will be appreciated by those of ordinary skill in the art that the invention lends itself to many different variations not specifically illustrated herein. It will also be appreciated by the reader that integers or features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims.

Claims:

1. A service outlet floor box including a frame and a connector module mountable in the frame at a plurality of depths within the frame, the connector module having a first fixing configuration in which a fastening part of the module projects outwardly for engagement with the frame to mount the module in the frame, and a second released configuration, the module being able to be secured in the frame at a selected one of the plurality of depths within the frame when it is in the first fixing configuration with the fastening part of the module projecting outwardly and engaging a selected part of the frame to obstruct removal of the module from the frame, and being releasable from the frame by changing the module into the second released configuration in which the fastening part of the module no longer obstructs removal of the module from the frame.

2. A service outlet floor box according to claim 1, wherein the module is of elongate shape and the fastening part projects outwardly in the longitudinal direction when the module is in the first fixing configuration.

3. A service outlet floor box according to claim 1 or 2, wherein the fastening part of the module is movably mounted on a casing of the module for movement between an extended position defining the first fixing configuration of the frame and a retracted position defining the second released configuration of the frame.

4. A service outlet floor box according to claim 3, wherein the fastening part of the module is slidably mounted on the casing of the module for movement between the extended and retracted positions.

5. A service outlet floor box according to any preceding claim, including locking means for locking the fastening part in the outwardly projecting position.

6. A service outlet floor box according to any preceding claim, including resilient biasing means for biasing the fastening part into the outwardly projecting position.

7. A service outlet floor box according to any preceding claim, wherein a side of the frame is provided with a plurality of openings at different depths and the fastening part of the module is able to project into a selected one of the openings in the first configuration of the module to obstruct removal of the module from the frame.

8. A service outlet floor box according to any preceding claim, wherein each of the openings in the frame is generally in the form of a horizontally extending slot.

9. A service outlet floor box according to claim 8, wherein the fastening part includes an outwardly projecting part of a cross-section generally matched to the shape of the slot.

10. A service outlet floor box according to any preceding claim, in which the fastening part of the module is provided at a first end of the module and a further fastening part is provided at a second end of the module opposite the first end, the further fastening part being engageable with a further selected part of the frame to obstruct removal of the module from the frame when the module is in the first fixing configuration.

11. A service outlet floor box according to claim 10, in which the further fastening part is a fixed part of the module.

12. A service outlet floor box according to claim 10 or 11 when dependent upon claim 7, wherein a further side of the frame opposite the first mentioned side is provided with a plurality of further openings at different depths and the further fastening part of the module is able to project into a selected one of the further openings to obstruct removal of the module from the frame when the module is in the first configuration.

13. A service outlet floor box according to any preceding claim, wherein the floor box is a raised floor box.

14. A service outlet floor box substantially as described herein with reference to and as illustrated by the accompanying drawings.

15. A method of mounting a connector module in the frame of a service outlet floor box according to any preceding claim, the method comprising the following steps:

holding the module in a frame at a selected depth, with the module in the second, released, configuration, and

converting the module into the first fixing configuration to cause the fastening part of the module to project outwardly and engage with the frame to mount the module in the frame at the selected depth.

16. A method according to claim 15, wherein the step of holding the module in the frame at a selected depth includes the step of placing the further fastening part of the module in engagement with a further part of the frame opposite the part of the frame to be engaged by the first mentioned fastening part.

17. A method of mounting a connector module in the frame of a service outlet floor box, the method being substantially as described herein with reference to and as illustrated by the accompanying drawings.

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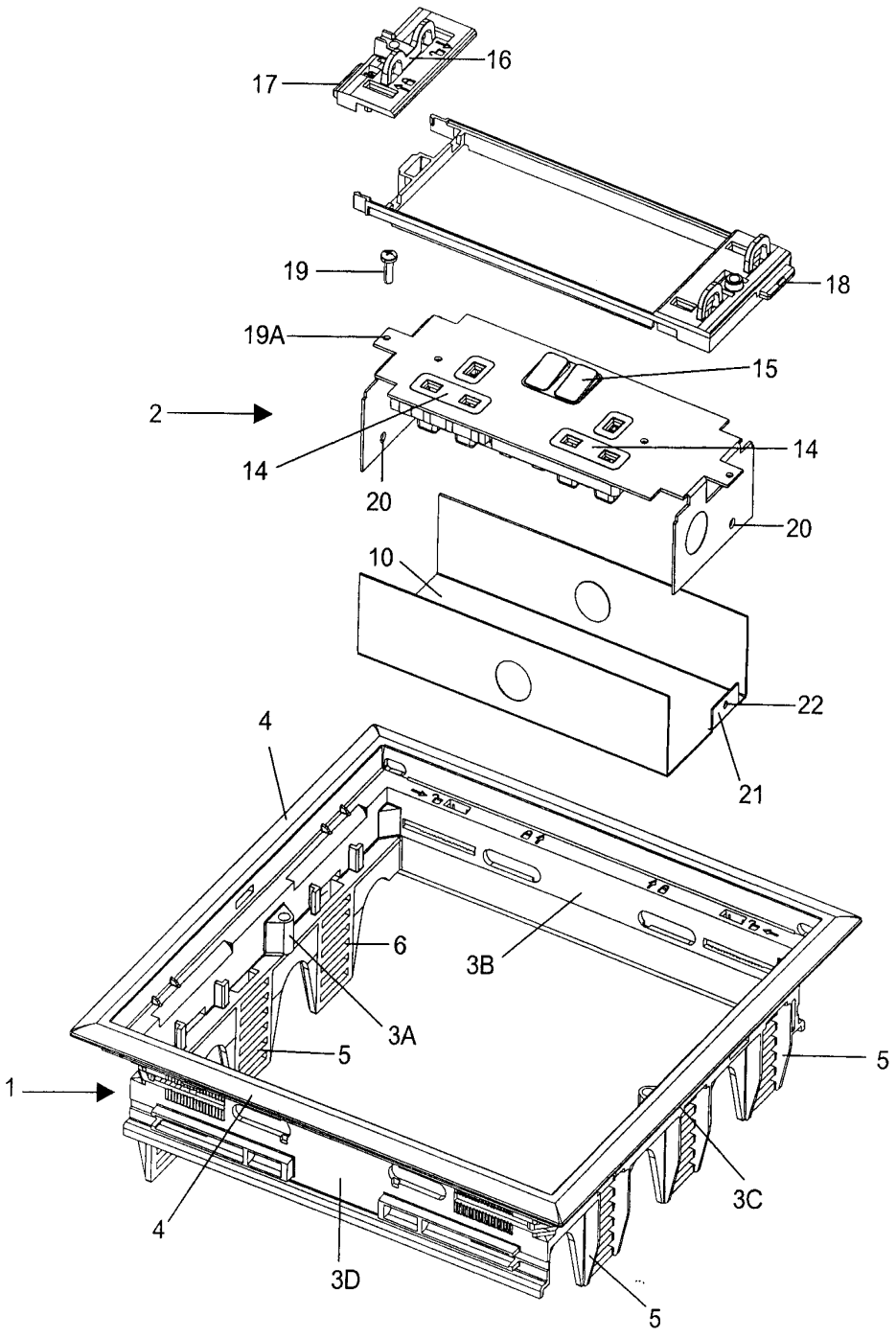

FIG. 1

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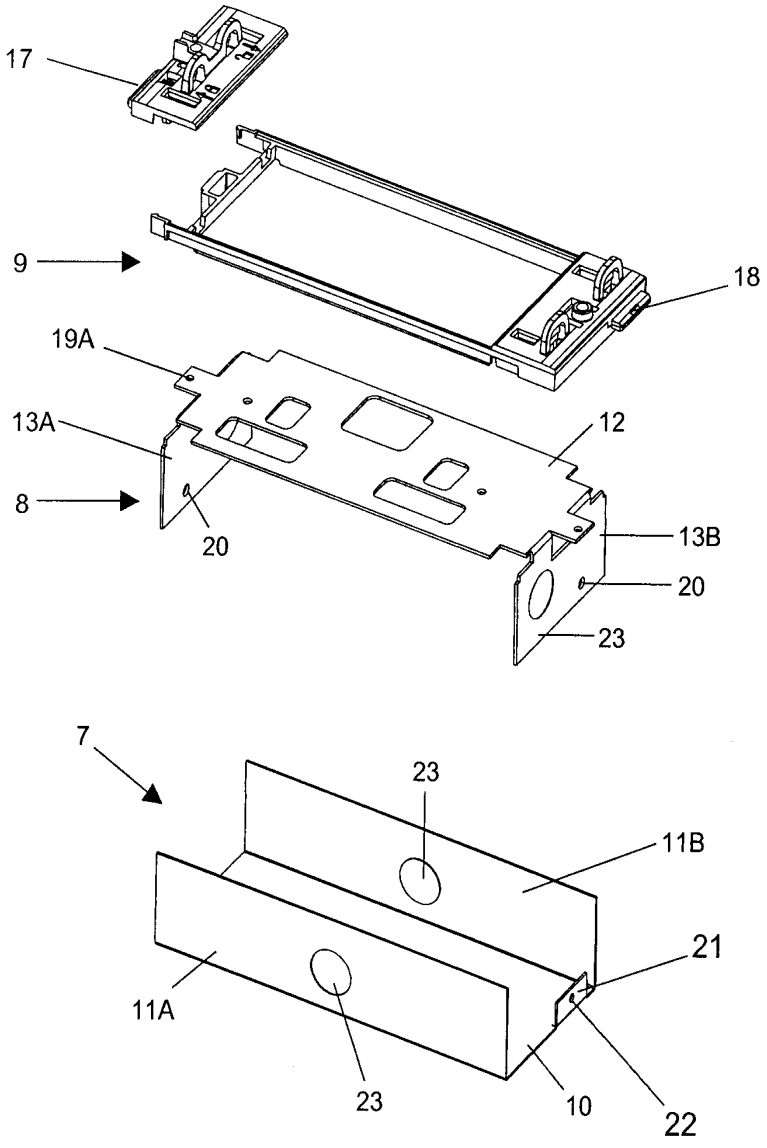

FIG. 2

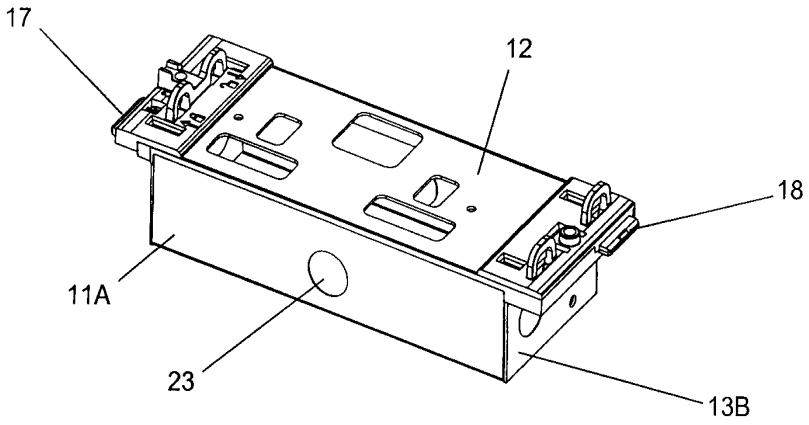

FIG. 3

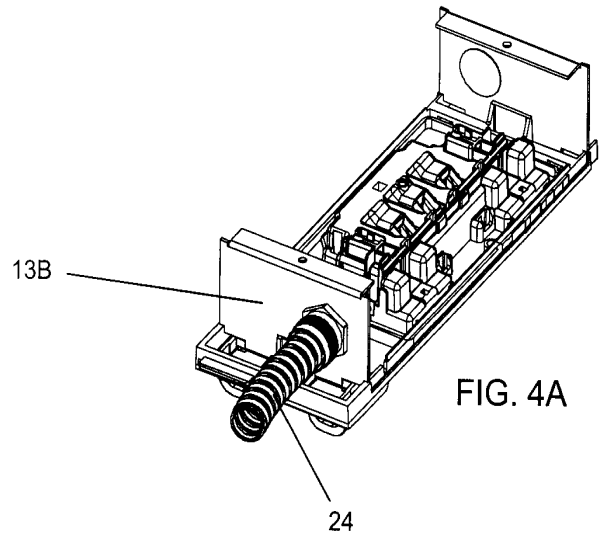

FIG. 4A

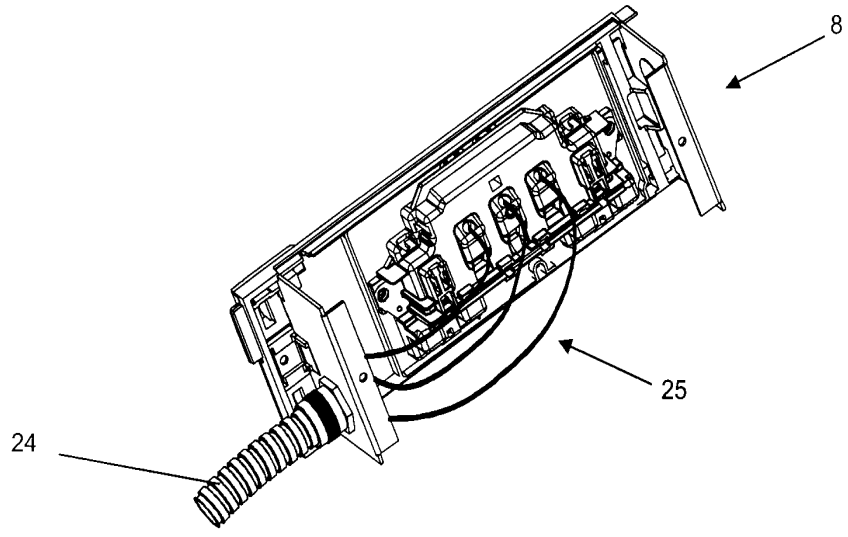

FIG. 4B

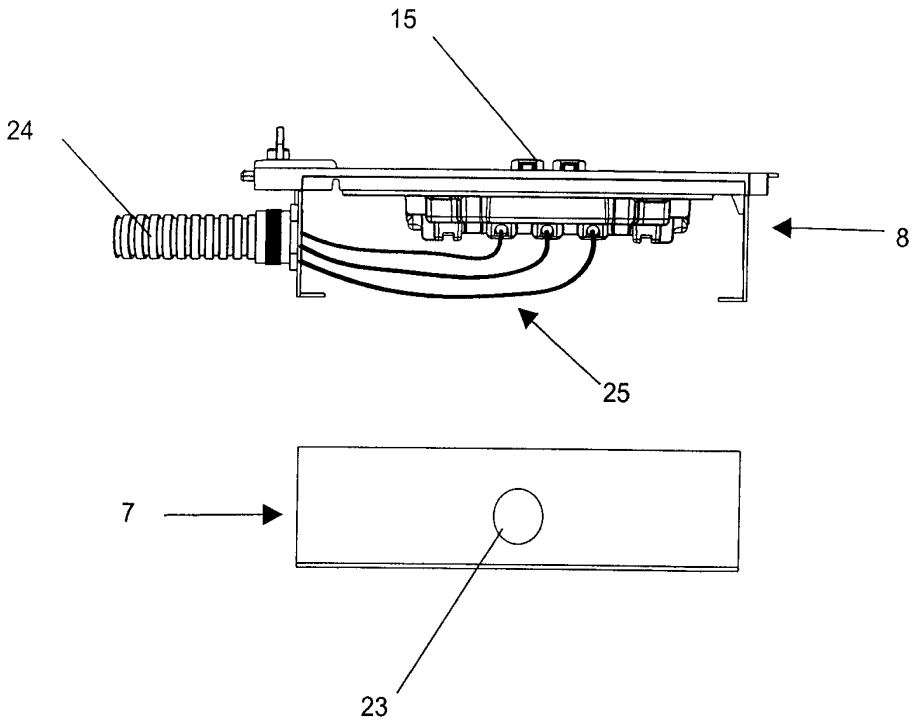

FIG. 4C

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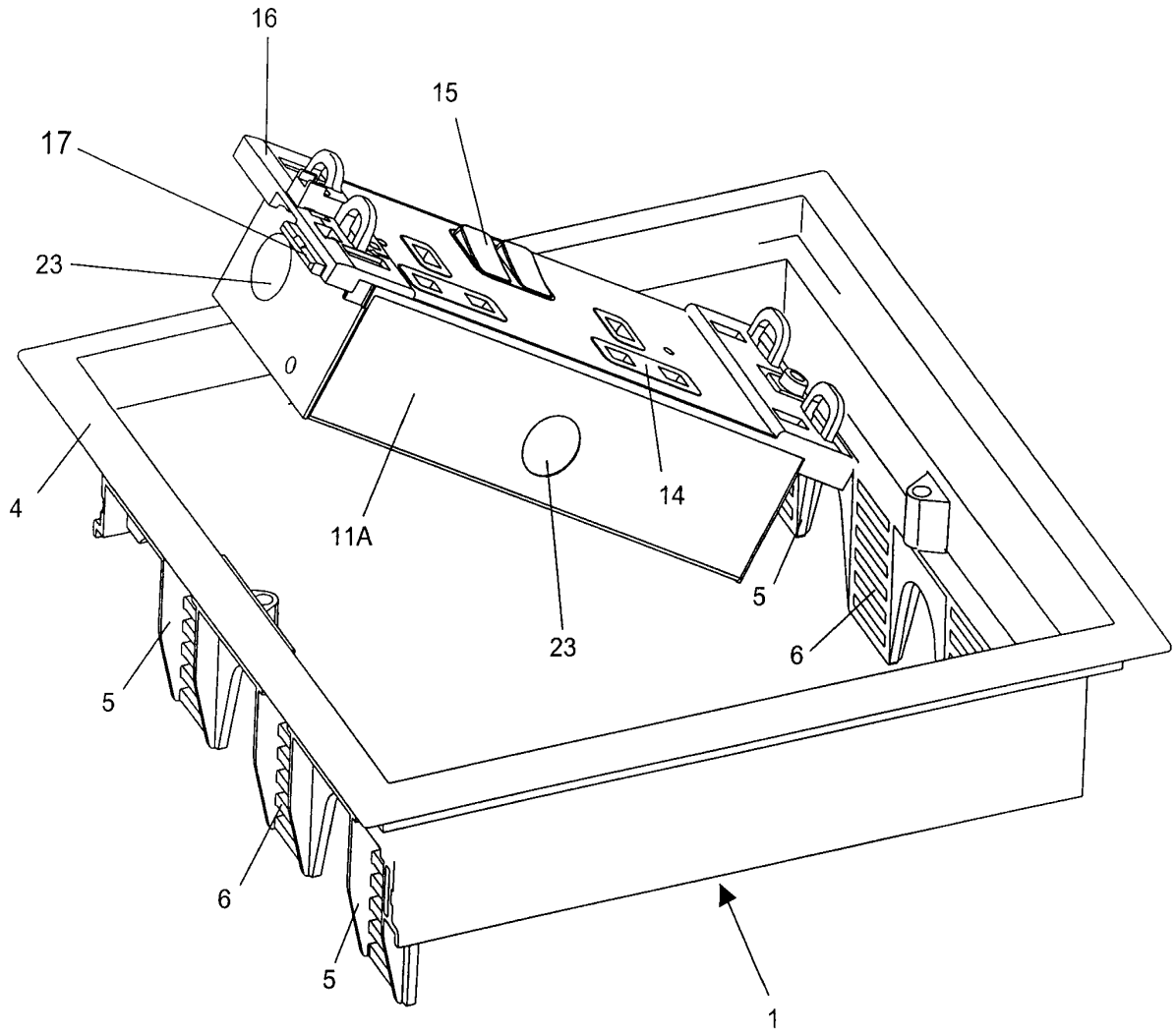

FIG. 5

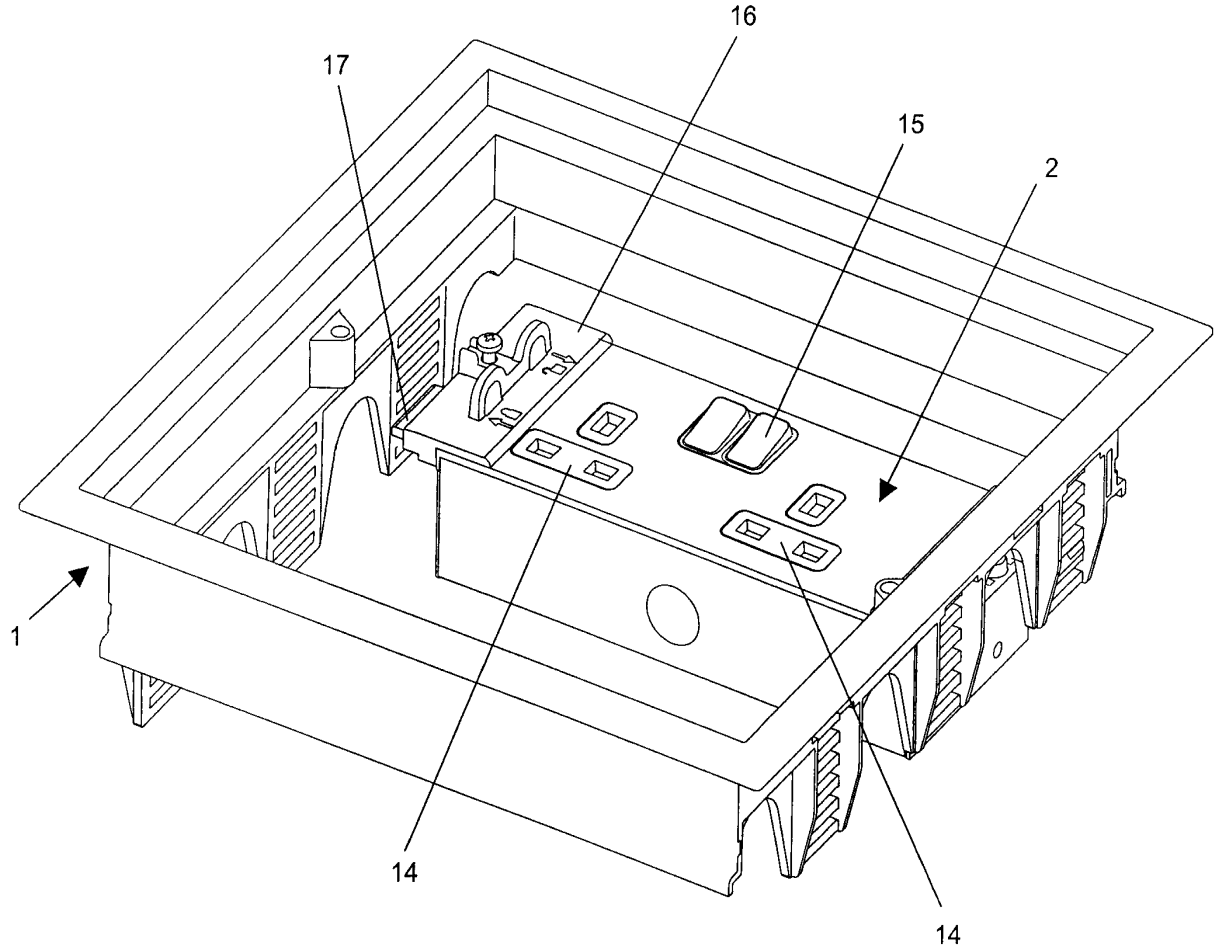

FIG. 6

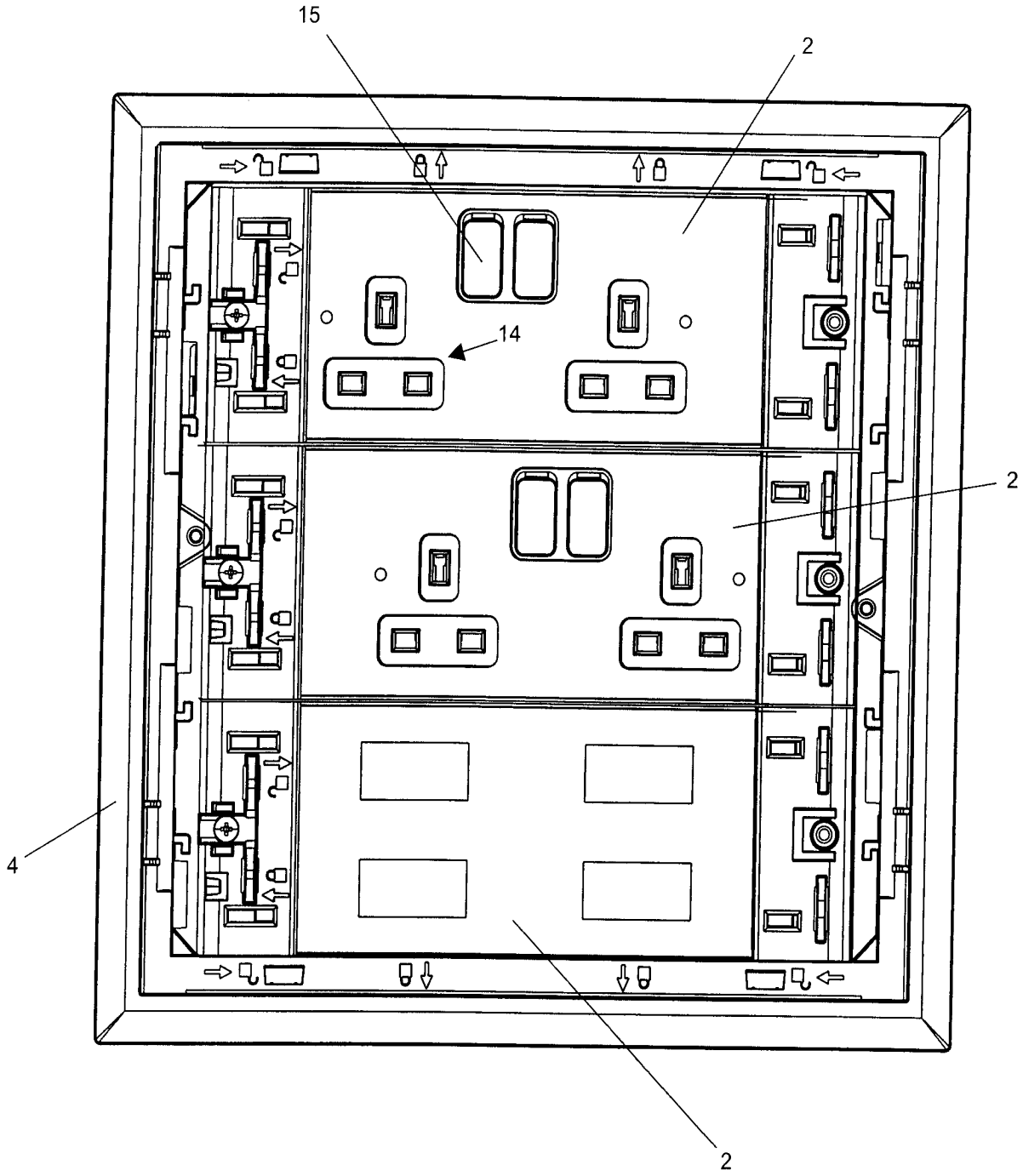

FIG. 7

FIG. 8A

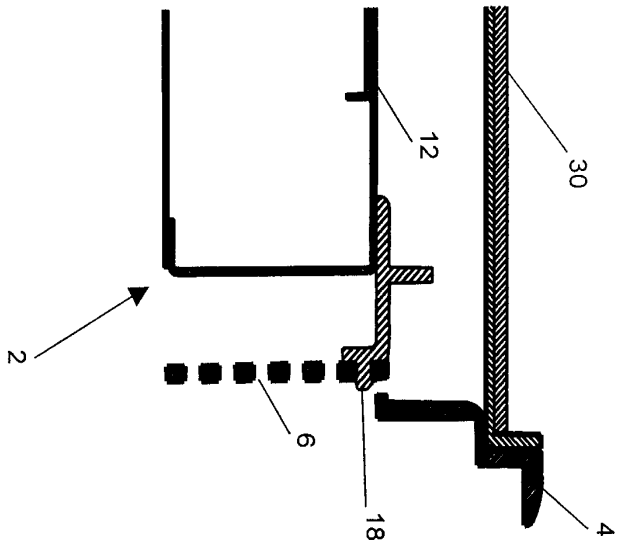

FIG. 8B