

Service Outlet Floor Box with Connector Module

The present invention relates to service outlet floor boxes, and in particular to connector modules mounted in service outlet floor boxes.

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.

When the floor box is installed, it is necessary to gain access to the rear of the connector unit in order to connect the end of a cable laid under the floor to the connection facility. Usually that access is obtained by detaching the connector unit from the casing, feeding the end of the cable through the module and out through the top of the casing of the module with a sufficient length of cable projecting beyond the top of the module to allow it to be connected by a user to the rear of the detached connector unit. After making the connection, the length of cable projecting through the top of the casing of the module must be fed back into the module,

and, preferably, back out of the floor box. Such feeding back of the cable is often difficult to achieve and therefore makes the process of connecting the end of the cable to the module more difficult.

5 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 detachably secured to the frame within the floor box, the
10 connector module including a casing of generally hollow cuboidal shape, wherein the casing comprises a first part including the top of the casing which mounts a connector unit that presents an upwardly facing connection facility to which connection can be made during use of the floor box, and a
15 second part including the bottom of the casing, the first and second parts of the casing being separable from one another.

 By arranging for the casing to be divisible into first and second parts with the first part including the top of the casing and the second part including the bottom of the casing,
20 it becomes possible to obtain easy access to the rear of the connection facility mounted on the top of the casing by separating the first and second parts of the casing. It is then a simple matter to connect a cable to the rear of the connection facility and it need not be necessary to draw a
25 substantial length of extra cable into the floor box to enable that connection to be made. Consequently, after making the connection, the two parts of the module can be secured together and the module secured in the floor box, without having to feed a substantial length of cable back into the
30 floor box or back under the floor.

 Preferably, the second part of the casing includes a pair of opposite sides of the casing. If the first part of the casing mounting the connector unit does not have the sides of

the casing when separated from the second part of the module, access to the rear of the connector unit is facilitated.

Preferably the first part of the casing includes an end of the casing, and it may include two opposite ends of the casing. It may be convenient to pass an end of the cable through an opening in the end of the casing before connecting it to the connector unit and in that case it may be advantageous for at least that end of the casing to be retained on the first part of the casing when it is separated from the second part.

Most commonly the connection facility comprises a socket in the top face of the connector module, the socket being formed in the top of the connector unit that is mounted on the top face of the connector module. The socket may be for any of a variety of purposes including, for example, telecommunications and data communications; often it will be an electric power socket.

The first part of the casing preferably mounts a plurality of connector units that present a plurality of upwardly facing connection facilities. It is usually most convenient to provide two or more connection facilities on the top of one module.

The module may be of generally elongate cuboidal shape, the sides of the module being longer than the ends of the module. A plurality of connector modules may be detachably secured within the floor box. The modules may be secured side by side.

The connector module is preferably able to be mounted in the frame at a plurality of depths within the frame. The connector module preferably has 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 of 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 floor structure comprising at least one service outlet floor box mounted therein, the service outlet floor box being as defined above. The floor structure preferably comprises at least one cable in the floor, the cable passing into the floor box and terminating at the rear of the connector unit.

According to the invention there is further provided a method of connecting an end of a cable to a floor box, comprising the steps of:

providing a service outlet floor box as defined above in a floor,

detaching the connector module from the frame,
separating the first part of the casing of the connector module from the second part,

adjusting the orientation of the first part of the casing of the connector module to allow easy access to the rear of the connector unit,

passing the end of the cable into the floor box and connecting it to the rear of the connector unit while the first and second parts of the casing are separate,

5 and joining together the first and second parts of the casing,

securing the connector module to the frame.

The end of the cable may be passed through an opening in the casing.

10 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;

15 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;

20 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);

25 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;

30 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

5 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
10 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
15 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,
20 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
25 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.

30 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

- 10 -

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 slideably 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 Fig 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.

5 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.

10 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
15 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.

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Claims:

1. A service outlet floor box including a frame and a connector module detachably secured to the frame within the floor box, the connector module including a casing of
5 generally hollow cuboidal shape, wherein the casing comprises a first part including the top of the casing which mounts a connector unit that presents an upwardly facing connection facility to which connection can be made during use of the floor box, and a second part including the bottom of the
10 casing, the first and second parts of the casing being separable from one another.
2. A service outlet floor box according to claim 1, wherein the second part of the casing includes a pair of opposite sides of the casing.
- 15 3. A service outlet floor box according to claim 1 or 2, wherein the first part of the casing includes an end of the casing.
4. A service outlet floor box according to claim 3, wherein an opening is provided in the end of the casing to allow a
20 cable to pass through into the interior of the casing and to be connected to the connector unit.
5. A service outlet floor box according to claim 3 or 4, wherein the first part of the casing includes a pair of opposite ends of the casing.
- 25 6. A service outlet floor box according to any preceding claim, wherein the connection facility comprises a socket in the top face of the connector module, the socket being formed in the top of the connector unit that is mounted on the top face of the connector module.
- 30 7. A service outlet floor box according to any preceding claim, wherein the socket is an electric power socket.
8. A service outlet floor box according to any preceding claim, wherein the first part of the casing mounts a plurality

of connector units that present a plurality of upwardly facing connection facilities.

9. A service outlet floor box according to any preceding claim, wherein a plurality of connector modules are detachably secured within the floor box.

10. A service outlet floor box according to any preceding claim, in which the connector module is able to be mounted in the frame at a plurality of depths within the frame.

11. A service outlet floor box according to claim 10, in which the connector module has 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.

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

13. A floor structure comprising at least one service outlet floor box mounted therein, the service outlet floor box being in accordance with any preceding claim.

14. A floor structure according to claim 13, comprising at least one cable in the floor, the cable passing into the floor box and terminating at the rear of the connector unit.

15. A method of connecting an end of a cable to a floor box, comprising the steps of:

providing a service outlet floor box according to any of claims 1 to 12 in a floor,

detaching the connector module from the frame,

5 separating the first part of the casing of the connector module from the second part,

adjusting the orientation of the first part of the casing of the connector module to allow easy access to the rear of the connector unit,

10 passing the end of the cable into the floor box and connecting it to the rear of the connector unit while the first and second parts of the casing are separate,

joining together the first and second parts of the casing, and

securing the connector module to the frame.

15 16. A method according to claim 15, wherein the end of the cable is passed through an opening in the casing.

17. A method of connecting an end of a cable to a floor box, the method being substantially as herein described with reference to and as illustrated by the accompanying drawings.