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Floor Boxes

This invention relates to devices which facilitate access and connection to underfloor electrical cabling, i.e. floor boxes.

A floor box essentially comprises a frame connected to an outturned flange. The flange supports the frame when it is located within an aperture in a floor. Several known arrangements exist for securing the floor box in the aperture. For instance British Patent Application No 2 264 731A ("Scott") utilises screw driven grips mounted within the frame which swing outwards before being drawn upwards to clamp the floor between the grip and the flange.

Another arrangement, disclosed in European Patent Application No 0 656 676A ("Harrison"), employs retractable blades which are biased into engagement with the floor after insertion of the floor box into the aperture. However, neither of the above arrangements, or other arrangements proposed or used hitherto, have proved entirely satisfactory. For example, with the screw driven arrangement described in Scott installation is time consuming. Also, the blades of the Harrison arrangement engage the edge of the floor aperture and they may, in time, wear grooves in the flooring reducing the effectiveness of the attachment.

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The present invention provides a convenient and effective solution to the problem mentioned above and it resides in a floor box for mounting in an aperture in a floor comprising a frame connected to supporting means projecting outwardly from the frame, clamping means rotatably mounted externally of the frame, adjustment means disposed within the frame and coupled to the clamping means for rotation of said clamping means between a retracted position enabling insertion and removal of the frame through the aperture, and an extended position in which the floor is clamped between the clamping means and the support means to secure the floor box in the aperture, and locking means for releasably securing the clamping means in the extended position.

The coupling of the adjustment means and the clamping means allows a relatively simple rotational operation to ensure positive engagement of the clamping means with the underside of the floor.

Conveniently, the locking means comprises a ratchet mechanism, and in one embodiment the floor box additionally comprises biasing means for urging the clamping means into the extended position, and detent means for retaining the clamping means in the retracted position. In use, after the floor box has been inserted into the aperture, it can be secured in position simply by releasing the detent means, whereafter the clamping means are urged into the extended position. Further downward pressure is translated into an increased clamping force by means of the ratchet mechanism.



According to a second aspect of the present invention there is provided an electrical connection box panel comprising a socket for receiving and retaining a plug, a protective cover moveable between a closed position overlying the socket and an open position enabling insertion of the plug, and biasing means to urge the cover from the open position to the closed position.

According to a further aspect of the present invention, there is provided a floor box for an electric socket, comprising means for releasably retaining the floor box in a floor aperture, an upper panel having electric socket openings, and a protective cover movable between a closed position overlying the socket openings and a open position enabling insertion of a plug. Biasing means may be provided to urge the cover from the open position to the closed position, and more than one socket, with an associated protective cover, may be provided in the upper panel. The protective cover protects the socket(s) from the ingress of dirt when not in use.

A clear understanding to the invention will be gained from the following detailed description, given with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of a floor box, partly cut away, showing the clamping mechanism of a first embodiment of the first aspect of the invention;

Figure 2 is a similar view to Figure 1 showing an alternative embodiment;

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Figure 3 is a perspective view of the floor box shown in Figures 1 and 2; and

Figure 4 is a perspective view, partly exploded, of an electrical connection box according to the second aspect of the present invention.

A floor box has a generally rectangular sleeve or frame connected to or integral with a circumjacent outturned flange or rim 2. Figures 1 and 2 show a vertical section through a corner of the floor box. A hooklike floor engagement finger or cam 1 is externally disposed below an inward step 25 in the corner region of the frame. The distal end of the finger 1 has a curved abutment surface 6 aligned generally perpendicular with the finger's local direction, and the proximal end of the finger has a hub with a horizontally projecting cylindrical journal 23 for engagement with a corresponding journal box 24 in the frame.

A shaft or axle 22, which is also journaled in the journal box 24, has a non-circular section 28 which engages a complementary bore 29 in the cylindrical journal 23 so that the shaft and the finger 1 are coupled to rotate together. The shaft and finger are held against separation by a spring washer 30 which is fitted to the outer end of the shaft. The shaft 22 projects interiorly of the frame and from an enlarged cylindrical head it carries a radial arm 3 having a pawl 26 at its distal end. The pawl abuts a segmental ratchet wheel 5 stationarily mounted on the interior of the frame and which has at its upper end a



catch or detent 4.

Referring to Figure 1, fittings 20, 21 are provided adjacent the upper end of the ratchet wheel 5 and on the radial arm 3 to retain the ends of the torsion spring 7 that is mounted on the shaft 22. Figure 2 shown an alternative embodiment in which the shaft 22 has a shaped recesses 32 to receive a handtool, e.g. the recess may be hexagonal to receive an Allen key.

The finger 1 does not project outwardly beyond the upper portion of the frame, thus allowing the floor box to be inserted into an aperture in the floor dimensioned for a close fit with the upper portion. During insertion (or removal) of the floor box the pawl 26 abuts the detent 4 to retain the finger 1 in a retracted position, i.e. directed generally downwards and not projecting outwards beyond the upper portion of the frame. With the floor box located within the floor aperture, the resilience of radial arm 3 allows the pawl to be lifted over the stop and, in the embodiment depicted in Figure 1, the shaft 22 and hence the finger 1 are rotated by the action of the torsion spring 22 to bring the abutment surface 6 into contact with the underside of the floor whereafter reverse rotation of the clamping mechanism is prevented by engagement of the pawl and the teeth of the ratchet wheel 5. Any slack created by further downloading of the floor box or wear will be taken up by the sprung pawl and the ratchet to ensure that the floor box remains securely clamped in position.

In the alternative embodiment depicted in Figure 2, the

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shaft 22 and finger 1 are rotated by a handtool, e.g. an Allen key. Only a partial rotation of the handtool brings the abutment surface 6 of the finger 1 into contact with the floor reducing the number of manual operations required to secure the floor box compared with, say, the Scott screw driven arrangement.

The pawl can be lifted off the ratchet wheel 5 and rotated back to the detent 4 to allow removal of the floor box.

The hooklike form of finger 1 and curved abutment surface 6 engage the floor in a generally perpendicular direction to ensure positive contact therebetween.

The flange 2 has a recessed underside, e.g. an archlike recess, to reduce the amount of carpet pile which is compressed, thus reducing the upward pressure exerted by the compressed carpet pile on the floor box and the stresses on the clamping mechanism.

Modifications from the above described embodiments are possible without departing from the scope of the invention. For example, other forms of engagement finger 1 could be employed, e.g. ovoid cams.

The electrical connection box illustrated in Figure 4, generally designated 50, has a back 51 and end walls with outturned flanges 52 to which is secured, e.g. by screws (not shown) a rectangular uniplanar front or top panel 53. A pair of conventional 3-pin electrical sockets (the lower portions of which are not shown) are mounted in the panel 53 with the socket fascia 54 orientated



outwardly. Each socket can be selectively electrically connected by actuation of an associated switch 55, also mounted in the panel 53.

A socket guard or cover 56 is pivotally mounted adjacent each socket fascia 54 on a rod or axle 58 which is journaled between opposed semi-cylindrical housings 57 and the panel 53. The housings 57 are integrally formed with a backing plate 59 which is screwed, rivetted or otherwise securely fixed to the panel 53. The cover 56 is generally T-shaped to overlies the socket fascia 54 and it has downturned projections 50 to transmit forces applied to the cover directly to the panel 53, thereby reducing the chance of damage to the socket fascia. The ends of a torsion spring 61, which is mounted on the rod 58, respectively engage with the panel 53 and a recess 63 in the cover 56 to urge the cover into a closed position overlying the socket fascia 54. In this position the socket is protected from the ingress of debris when it is not in use.

The cover 56 can be manually pivoted about the axle 58 to an open position to allow insertion of a plug. To facilitate manual engagement of the cover 56, a raised lip 62, e.g. a semidome configuration, may be provided at its distal end. The cover 56 is biased to overlies the socket fascia 54 when the plug is removed from the socket.

The cover 56 and/or the plates 59 can be coloured to allow identification of the power supply type, e.g. the colour red conventionally represents a clean earth supply. Additional graphical

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indications, e.g. textual marking, can be used to complement the coloured cover/plate. Although it is known to utilise coloured socket fascia to indicate power type, once a plug is inserted the fascia is obscured from view. By providing the power type indications on the cover/plate, the indications remain visible at all time.

Of course, the socket guard arrangement described could be used, with appropriate modification to the cover shape, with any type of socket. Equally, the location of the pivot is not essential to the invention so long as the guard overlies the socket fascia when the socket is not in use. The socket guard arrangement may be incorporated into a floor box according to the first described aspect of the present invention.

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CLAIMS

1. A floor box for mounting in an aperture in a floor comprising a frame connected to supporting means projecting outwardly from the frame, clamping means rotatably mounted externally of the frame, adjustment means disposed within the frame and coupled to the clamping means for rotation of said clamping means between a retracted position enabling insertion and removal of the frame through the aperture, and an extended position in which the floor is clamped between the clamping means and the support means to secure the floor box in the aperture, and locking means for releasably securing the clamping means in the extended position.
2. A floor box according to claim 1, wherein the locking means comprises a ratchet mechanism.
3. A floor box according to claim 1 or 2, wherein the locking means includes biasing means for urging the clamping means into the extended position, and detent means for retaining the clamping means in the retracted position.
4. A floor box according to any one of claim 1 to 3, wherein the frame is substantially rectangular, and respective clamping means are mounted adjacent the corners of the frame.





5. A floor box according to any one of the preceding claims, wherein the or each clamping means comprises an elongate arcuate member.
6. A floor box according to claim 5, wherein the arcuate member has a convex engagement surface at its distal end for engagement with the underside of the floor.
7. A floor box according to any one of the preceding claims, wherein the adjustment means comprises a shaped recess for the receiving a hand tool.
8. A floor box according to any one of claims 1 to 7, wherein the underside of the supporting means is recessed.
9. A floor box according to any one of the preceding claims, additionally comprising an upper panel having a socket opening, and a protective cover movable between a closed position overlying the socket opening and an open position enabling insertion of a plug.
10. A floor box according to claim 9, wherein resilient means are provided for urging the cover from the open position to the closed position.





11. An electrical connector box panel comprising a socket for receiving and retaining a plug, a protective cover moveable between a closed position overlying the socket and an open position enabling insertion of the plug, and biasing means to urge the cover from the open position to the closed position.

12. A floor box for a floor box for an electric socket, comprising means for releasably retaining the floor box in a floor aperture, an upper panel having electric socket openings, and a protective cover movable between a closed position overlying the socket openings and a open position enabling insertion of a plug.

13. A floor box according to claim 12, wherein biasing means are provided to urge the cover from the open position to the closed position.

14. A floor box substantially as herein described with reference to the accompanying drawings.

