An injection moulded flush-mounted electrical plastic box for electrical elements having a hollow lug on at least one side wall. Such hollow lug has an insert with a hole with internal threads with limited displacement inside the hollow lug such that the hole remains accessible. Also provided integrally moulded is at least one knock-out on at least one of the side walls and the back wall and at least one detachable connector pin that can be snap fitted inside a through hole provided on at least one of the side walls.
TITLE OF THE INVENTION

Flush-mounted electrical box

FIELD OF THE INVENTION

This invention relates to a flush-mounted electrical box.

BACKGROUND OF THE INVENTION

Electrical elements or components like switches, dimmers, plug pin sockets or fan regulators were being initially directly mounted on mounting surfaces like walls or were being housed in surface mounted electrical boxes and the boxes were being mounted on the mounting surfaces. In the former case, all the electrical elements and in the latter case, the surface mounting box remains protruding from the mounting surfaces. This does not give a neat and clean surface finish and aesthetically good look to the mounting surfaces. With the introduction of concealed electrical wiring, the electrical elements are housed in flush-mounted electrical boxes, also known as junction boxes, conduit boxes, connector boxes or under plaster boxes and the flush-mounted electrical boxes are located in corresponding recesses formed in the mounting surfaces.

A flush-mounted electrical box generally comprises round or slot shaped mounting holes at the back wall and is fixed in position in a recess with fixing screws tightened in the mounting holes and corresponding holes in the recess. Alternatively, the boxes may be without the mounting holes and may be secured in position in the recess with plaster or mortar. The electrical box also comprises openings provided in the sidewall and/or bottom of the box for electrical wires, cables or conduits to be taken into the electrical box. The front side of the electrical box is open and is closed with a cover fitted with the electrical elements. Alternatively, the electrical elements such as switches or electrical outlets are fitted on the cover at the time of fixing the cover to the box or subsequent to the fixing of the cover to the box.

In order to fix the cover to the flush-mounted electrical box, metallic lugs with threaded mounting holes are provided in the box. The cover is mounted to the box with fixing screws tightened in the fixing holes provided in the cover and in the mounting holes in the lugs. Alternatively, the electrical box comprises mounting lugs with threaded mounting holes integrally formed in the side wall of the box and the box is closed with a cover and the cover is fitted to the box with fixing screws tightened in fixing holes in the cover and mounting holes in the lugs. Flush-mounted electrical boxes give a neat and clean surface finish and aesthetically good look to the mounting surfaces. Flush-mounted electrical boxes are generally made of metals such as galvanized iron or injection moulded with injection mouldable
plastics, preferably electrical grade and injection mouldable plastics such as acrylonitrile butadiene styrene (ABS), Polycarbonate, High Impact Polystyrene etc.

The main disadvantage with the flush-mounted electrical box is that in the event the box is fitted in the recess in an inclined position accidentally or due to any defect in the recess profile or configuration or due to plastering defect, the cover will also take an inclined position and no adjustment or relative movement of the cover with respect to the inclined position between the fixing holes in the cover and mounting holes in the lugs of the box is thereafter possible. If any adjustment or relative movement of the cover on the box with respect to the fixing holes in the cover and mounting holes in the lugs of the box is attempted in order to cover up or rectify the defect in the position of the box, the fixing holes will misalign with respect to the mounting holes and it will not be possible to mount the cover to the box. Any inclined position of the cover does not give a neat and clean surface finish and a good aesthetic look to the mounting surfaces of the boxes. Because of the above disadvantage, customer appeal to the electrical box and saleability and marketability of the electrical box is reduced or adversely affected. As a result, the economic significance and importance and selling point of the electrical box also reduces.

To address the problem, a solution is a plate having a vertical slot that would permit angular movement of the cover over the plate. The plate is positioned between the box and the cover. This solution requires an extra part in the form of a plate with the slots.

Sometimes flush-mounted electrical boxes are needed to be connected to each other either horizontally or vertically. Connector pins may be used to make such connections and are separately available. Using connector pins to connect flush-mounted electrical boxes is a known art, but the disadvantage is that customers have to separately purchase connector pins and that adds to the cost and the need to keep them readily available when needed. These connector pins are relatively small parts and are likely to be lost if kept separately from flush-mounted electrical box.

**SUMMARY OF THE INVENTION**

In view of the above, an object of the present invention is to provide a flush-mounted electrical box that overcomes the problem in the event the box is fitted in the recess in an inclined position accidentally or due to any defect in the recess profile or configuration or due to plastering defect.

Yet another object of the present invention is to provide connector pins that are integrally moulded in a single moulding process in the flush-mounted electrical box according to the present invention. That provides an economic significance and a great convenience to the customers who otherwise would be forced to buy connector pins separately.
According to the present invention, there is provided a flush-mounted electrical box, which is injection moulded with an electrical grade and injection mouldable plastic and which comprises a closed back wall and a surrounding side wall projecting from the back wall to define a hollow space therein and an open front side and which further comprises hollow lugs formed at the side wall, wherein the lugs comprise inserts with internally threaded holes adjustably held in the hollow lugs for limited displacement in the lugs which are accessible through vertically positioned front-facing slots. It also comprises integrally moulded connector pins which can be knocked out for use in side-by-side installation of two or more boxes in symmetrically aligned manner.

In case the flush-mounted electrical box has an inclined position, the front-facing slots will permit the cover to be fitted allowing angular movement to correct the incline as a result of which the cover will appear properly aligned even when the box is mounted in an inclined position.

**BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

In the accompanying drawings:

- Fig. 1 is a view showing a typical wall and a typical recess for an electrical box;
- Fig. 2 is front view of a prior art flush-mounted electrical box of Fig. 1;
- Fig. 3 is a view showing the inclined position of a prior art flush-mounted electrical box inside the recess in the wall;
- Fig. 4 shows a typical cover with switches;
- Fig. 5 shows the typical cover of Fig. 4 in an inclined position covering the flush-mounted electrical box;
- Fig. 6 shows the front perspective view of the flush-mounted electrical box according to the present invention without the insert;
- Fig. 7 shows the bottom perspective view of the flush-mounted electrical box according to the present invention;
- Fig. 8 shows the side perspective view of the flush-mounted electrical box according to the present invention;
- Fig. 9-A shows the front view of the flush-mounted electrical box according to the present invention, without the insert;
- Fig. 9-B shows the cross-sectional view through the hollow lugs of the flush-mounted electrical box according to the present invention without the insert;
- Fig. 9-C shows the partial cross-sectional view of one of the hollow lugs of the flush-mounted electrical box according to the present invention without the insert;
Fig. 10-A shows the cross-sectional bottom perspective view through the hollow lugs of the flush-mounted electrical box according to the present invention without the insert;

Fig. 10-B shows the partial cross-sectional bottom perspective view of one of the hollow lugs of the flush-mounted electrical box according to the present invention without the insert;

Fig. 11-A shows the front view of the insert according to the present invention;

Fig. 11-B shows the side view of the insert according to the present invention;

Fig. 12-A shows the front view of the flush-mounted electrical box according to the present invention with the insert;

Fig. 12-B shows the cross-sectional view through the hollow lugs of the flush-mounted electrical box according to the present invention with the insert;

Fig. 12-C shows the partial cross-sectional view of one of the hollow lugs of the flush-mounted electrical box according to the present invention with the insert;

Fig. 13-A shows the cross-sectional bottom perspective view through the hollow lugs of the flush-mounted electrical box according to the present invention with the insert;

Fig. 13-B shows the cross-sectional bottom perspective view of one of the hollow lugs of the flush-mounted electrical box according to the present invention with the insert;

Fig. 14 shows the perspective view of the connector pin according to the present invention;

Fig. 15 shows the bottom perspective view of two flush-mounted electrical boxes before getting connected using the connector pins according to the present invention;

Fig. 16 shows the top view of two flush-mounted electrical boxes after getting connected using the connector pins according to the present invention;

Fig. 17-A shows the cross-sectional view of the electrical boxes connected using the connector pins according to the present invention;

Fig. 17-B shows partial cross-sectional view of the connector pins connecting the electrical boxes according to the present invention;

Fig. 17-C shows partial cross-sectional view of one of the connector pins connecting the electrical boxes according to the present invention;

Fig. 18 shows another embodiment of an electrical box according to the present invention;

**DETAILED DESCRIPTION OF THE INVENTION WITH REFERENCE TO THE ACCOMPANYING DRAWINGS**

Fig. 1 shows a typical wall 10. The said Fig. 1 also shows a typical recess 20 in the said wall 10. A typical flush-mounted electrical box would be located in such a typical recess 20.
Fig. 2 shows a typical flush-mounted electrical box 30 of prior art having round fixing holes 40 at two places as shown in Fig. 2; the said fixing holes 40 would be used to attach a typical switch cover using fixing screws. Such a flush-mounted electrical box 30 would be placed inside recess 20 and may be secured inside the said recess 20 using fasteners. The said flush-mounted electrical box 30 may be secured inside the recess 20 using plaster or mortar instead of using fasteners. It may happen that flush-mounted electrical box 30 is fitted in recess 20 in an inclined position as indicated by angle α, as shown in Fig. 3, accidentally or due to any defect in the profile of recess 20 or configuration or due to plastering defect. Fig. 4 shows switch cover 50 and switches 60 and fixing screws 70. Switch cover 50 would be attached over the flush-mounted electrical box 30 using fixing screws 70 which would be tightened inside fixing holes 40 in order to attach switch cover 50 over flush-mounted electrical box 30.

In case flush-mounted electrical box 30 is fitted in an inclined position as shown in Fig. 3, after switch cover 50 is attached as aforementioned, switch cover 50 will also take the same angle of inclination by angle α, as shown in Fig. 5. When this happens, no adjustment of switch cover 50 would be possible as a result of which, switch cover 50 would not look aesthetically appealing over wall 10.

According to the present invention as shown in Fig. 6, there is provided a flush-mounted electrical box 80, which is injection moulded with an electrical grade and injection mouldable plastic and comprises a closed back wall 100 and surrounding four side walls 110 projecting from the back wall 100 to define a hollow space therein, an open front side and two mounting hollow lugs 130 formed at side walls 100 as shown in Fig. 6. Flush-mounted electrical box 80 also comprises integrally moulded connector pins 140 which can be knocked out for use in side-by-side installation of two or more flush-mounted electrical boxes 80 in a symmetrically aligned manner as described hereinafter in greater detail. Flush-mounted electrical box 80 in accordance with the present invention easily and effectively overcomes the disadvantage of flush-mounted electrical box 30 by providing instead of fixing holes 40 which are round, vertically positioned front-facing slots 90 on hollow lugs 130. Vertically positioned front-facing slots 90 permit angular movement of switch cover 50 to correct any inclination the positioning of flush-mounted electrical box 80 in recess 20 as explained hereinafter in greater detail. Also provided in flush-mounted electrical box 80 are mounting holes 150 and mounting slots 150 on back wall 100, which can be used to fasten using fasteners (not shown) the flush-mounted electrical box 80 inside recess 20.

Flush-mounted electrical box 80 is provided with knock-outs 120 which could be round or of similar shape. The knock-outs 120 are connected to either the back wall 100 or side walls 110 using thin ribs 235. Such knock-outs 120, could be easily knocked out of back wall 100 or side walls 110 at the thin ribs 235 to permit passage. Flange 230 is also provided towards the front of flush-mounted electrical box 80 which provides structural strength, facilitates flush mounting of the electrical box 80 according
to the present invention. Holes 160 are provided, one each per outside corner of side wall 110 as shown in Fig. 6. Thus, for each flush-mounted electrical box 80, there are two holes 160 on all four sides as shown in Fig. 6.

Fig. 7 shows hole 170 projecting outward from side wall 110, the said hole 170 being in communication with the space inside hollow lug 130.

Fig. 8 shows the side perspective view of the flush-mounted electrical box 80 according to the present invention. Also shown in the said Fig 8 are knock-outs 120, hollow lugs 130 and vertically positioned front-facing slots 90.

Fig. 9 A shows the front view of the flush-mounted electrical box 80 according to the present invention. Also shown in the said Fig 8 are knock-outs 120, connector pins 140 hollow lugs 130, vertically positioned front-facing slots 90, mounting holes 150, back wall 100 and flange 230.

Fig. 9-B shows the cross-sectional view P-P through the hollow lugs 130 of the flush-mounted electrical box 80. The cross sectional view of Fig. 9-B discloses the configuration of hollow lugs 130 and the space within.

Fig. 9-C shows the partial cross-sectional view of one of the hollow lugs 130 of the flush-mounted electrical box 80. The space within hollow lug 130 is shown in detail in the said Fig. 9-C. Passage 210 is in communication with groove 220 which in turn is in communication with vertically positioned front-facing slot 90 such that insert 180 (shown in Figs. 11-A and 11-B) can be pushed inside groove 220 from passage 210 flexing the flexible stopper 190 just enough to permit entry of insert 180 and positioning of insert 180 inside groove 220 aligning hole 170 with vertically positioned front-facing slot 90. This alignment of hole 170 with vertically positioned front-facing slot 90 will become clear while referring to Figs. 12-A, 12-B and 12-C. Flexible stopper 190, as shown clearly in Fig. 9-C, projects into groove 220 and forms a short ramp 196 decreasing the cross sectional area of groove 220 which would offer resistance to the movement of insert 180 when insert 180 is being pushed into groove 220 from passage 210. Once insert 180 is pushed inside groove 220 past the ramp 196 and beyond the flexible stopper 190, the insert 180 is trapped inside groove 220.

Fig. 10-A shows the cross-sectional bottom perspective view through the hollow lugs 130 of the flush-mounted electrical box 80. Fig 10-B shows the partial cross-sectional bottom perspective view of one of the hollow lugs 130 of the flush-mounted electrical box 80. Figs. 10-A and 10B show in perspective views the configuration of the space inside hollow lug 130 and the positioning flexible stoppers 190 relating to vertically positioned front-facing slots 90.

Fig. 11-A shows the front view of the insert 180 according to the present invention. Fig 11-B shows the side view of the insert 180 according to the present invention. Fig. 11-A shows hole 170 which is a
through hole as can be seen from Fig. 11-B. Hole 170 has internal threads (not shown). The diameter of the hole 170 is substantially of the same size as the width of vertically positioned front-facing slot 90, but is not greater than the width of vertically positioned front-facing slot 90.

Fig. 12-A shows the front view of the flush-mounted electrical box 80 according to the present invention with the insert 180. The size of hole 170 and the size of insert 180 are such that the hole 170, at all times, remains fully exposed within the width of vertically positioned front-facing slot 90 regardless of the positioning of inset 180 inside the hollow lug 130. This can be seen clearly in Fig. 12-A.

Fig. 12-B shows the cross-sectional view N-N through the hollow lugs 130 of the flush-mounted electrical box 80 according to the present invention with the insert 180.

Fig. 12-C shows the partial cross-sectional view of one of the hollow lugs 130 of the flush-mounted electrical box 80 according to the present invention with the insert 180. Fig. 12-C clearly shows alignment of hole 170 with vertically positioned front-facing slot 90 inside groove 220 and the fact that insert 180 is trapped inside groove 220 and its outward movement is restricted by flexible stopper 190.

Fig. 13-A shows the cross-sectional bottom perspective view through the hollow lugs 130 of the flush-mounted electrical box 80 according to the present invention with the insert 180. Fig. 13-A is same as Fig. 10-A except that it shows insert 180 positioned in its place.

Fig. 13-B shows the cross-sectional bottom perspective view of one of the hollow lugs 130 of the flush-mounted electrical box 80 according to the present invention with the insert 180.

Fig. 14 shows the perspective view of the connector pin 140 according to the present invention. Connector pin 140 has identical pairs of prongs 200, at each end. Each pair of prongs 200 form a V-notch 260 as shown in Fig. 14. Each prong 200 has a step 240 projecting downward at an angle from tapered tip 250. A pair of connector pins 140 is used to connect and align two flush-mounted electrical boxes 80 as will be shown hereinafter.

Fig. 15 shows the bottom perspective view of two flush-mounted electrical boxes 80 before getting connected using the connector pins 140 according to the present invention. The connector pins, as can be seen in Fig. 15, would connect through two flush-mounted electrical boxes 80 at holes 160.

Fig 16 shows the top view of two flush-mounted electrical boxes 80 after getting connected using the connector pins 140 according to the present invention. As can be seen in Fig. 16, after the two flush-mounted electrical boxes are connected as shown, they are in alignment with each other and there can be more than two flush-mounted electrical boxes 80 connected in similar manner.
Fig 17-A shows the cross-sectional view of the electrical boxes 80 connected using the connector pins 140 according to the present invention. Holes 160 projected outward from side wall 120 allow some distance between the connected flush-mounted electrical boxes 80.

Fig 17-B shows partial cross-sectional view A-A of the connector pins 140 connecting the electrical boxes 80 according to the present invention.

Fig 17-C shows partial cross-sectional view of one of the connector pins 140 connecting the electrical boxes 80 according to the present invention. It can be seen from Fig. 17-C that once a connector pin 140 connects at through hole 160 on one flush-mounted electrical box 80 and corresponding through hole 160 on the other flush-mounted electrical box 80. The prongs 200 project their tapered tips 250 inside holes 160 such that the steps 240 prevent longitudinal relative movement in either direction. This securely connects the two flush-mounted electrical box 80 and keeps them aligned.

Fig 18 shows another embodiment of flush-mounted electrical box 270 according to the present invention which is rectangular. As can be seen, the same hollow lugs 130 and the same vertically positioned front-facing slots 90 as used with flush-mounted electrical box 80 can be provided in flush-mounted electrical box 270. Also provided are knock-outs 120, in a greater number.

BEST MODE OF PERFORMING THE PRESENT INVENTION

It may happen that flush-mounted electrical box 30 is fitted in recess 20 in an inclined position as indicated by angle α, as shown in Fig. 3, accidentally or due to any defect in the profile of recess 20 or configuration or due to plastering defect. In case flush-mounted electrical box 30 is fitted in an inclined position as shown in Fig. 3, after switch cover 50 is attached as aforementioned, switch cover 50 will also take the same angle of inclination indicated by angle α, as shown in Fig. 5 and no adjustment of switch cover 50 would be possible as a result of which, switch cover 50 would not look aesthetically appealing over wall 10.

Flush-mounted electrical box 80 in accordance with the present invention easily and effectively overcomes the disadvantage of flush-mounted electrical box 30 by providing instead of fixing holes 40 which are round, vertically positioned front-facing slots 90 on hollow lugs 130. Vertically positioned front-facing slots 90 permit angular movement of switch cover 50 to correct any inclination in the positioning of flush-mounted electrical box 80 in recess 20. As shown in Fig. 11-A and Fig. 11-B, insert 180 has a through hole 170, which has a diameter substantially similar as the width of vertically positioned front-facing slot 90, but is not greater than the width of vertically positioned front-facing slot 90. The insert 180 is pushed into the space inside hollow lug 130 through passage 210 and groove 220 up the ramp 196 provided by flexible stopper 190. Once the insert 180 is pushed past flexible stopper
190, it is trapped inside groove 220. The size of insert 180 is such that insert 180 will have movement permissible inside the space within hollow lug 130; however, the said movement will be such that hole 170 will always remain accessible through vertically positioned front-facing slot 90, which will permit fixing screw 70 to be tightened inside hole 170. The permissible movement of insert 180 within hole 170 and accessibility of hole 170 through vertically positioned front-facing slot 90 will permit angular movement of cover 50 so that the angle of inclination, if any, can be corrected.

Flush-mounted electrical box 80 includes at least one connector pin 140 which can be easily detached from knock-out 120 in case more than one flush-mounted electrical boxes 80 need to be connected. Connector pin 140 has two ends. Through hole 160 has such a configuration that it permits one end of connector pin 140 to be snap fitted inside through hole 160. In this manner, several flush-mounted electrical boxes 80 can be connected with each other either horizontally or vertically and still maintain their alignment with each other.

The most preferred embodiment of the present invention is disclosed herein; however, the same inventive concept can be applied to somewhat different configuration of the vertically positioned front-facing slot 90 and insert 180 and hole 170. For example, insert 180 could have round shape instead of a rectangle or a square as long as it can be trapped inside the space of hollow lug 130 and hole 170 remains accessible as described hereinafore. In place of vertically positioned front-facing slot 90, an opening having a curvature could be provided that would permit correction of the angle of inclination as described hereinafore with corresponding geometrical changes on the insert 180 and the space inside hollow lugs 130. The connector pin 140 also could have different configuration; however, as long as it is provided and integrally moulded within the flush-mounted electrical box 80 as a knock-out and can be used to connect more than one flush-mounted electrical boxes 80, it will still align the connected flush-mounted electrical boxes 80 as described hereinafore.

Although the invention has been disclosed, illustrated and described with respect to the preferred embodiment thereof, it should not be understood by those skilled in the art that changes, omissions and additions may be made therein and thereto, without departing from the spirit and scope of the present invention. Therefore, the present invention should not be understood as limited to the specific preferred embodiment set out above, but to include all possible embodiments which can be embodied within a scope encompassed and equivalents thereof with respect to the features set out in the appended claims.
CLAIMS

1. An injection moulded flush-mounted electrical plastic box for electrical elements comprising
an open front;
   a hollow space confined within the back and side walls;
at least one side wall having a hollow lug;
a vertically positioned front-facing slot in the hollow lug;
an insert inside the said hollow lug having a hole with internal threads;
the said insert having limited displacement within the said hollow lug;
the said hole of the said insert remaining accessible.

2. An injection moulded flush-mounted electrical plastic box for electrical elements comprising
an open front;
a hollow space confined within the back and side walls;
at least one side wall having a hollow lug;
a vertically positioned front-facing slot in the hollow lug;
an insert inside the said hollow lug having a hole with internal threads;
the said insert having limited displacement within the said hollow lug;
the said hole of the said insert remaining accessible;
at least one of the side walls or the back wall having at least one knock-out;
at least one detachable connector pin on at least one of the side walls or the back wall;
the said connector pin having two ends;
at least two opposite side walls having at least one through hole of a size permitting the said connector pin end being snap fitted.

3. The injection moulded flush-mounted electrical plastic box for electrical elements of claim 2 wherein the connector pin is moulded in the injection moulded flush-mounted electrical plastic box.

4. The injection moulded flush-mounted electrical plastic box for electrical elements of claim 2 wherein at least one of the ends of the said connector pin has two prongs spaced apart from each other with an intervening V-notch, with each of the prongs being tapered at the tips outwardly and formed with a step at the outer surface thereof.
5. The injection moulded flush-mounted electrical plastic box for electrical elements of claim 2
wherein the said knock-out is detachably attached to the wall using at least one thin rib.

6. The injection moulded flush-mounted electrical plastic box for electrical elements of claim 1
wherein the material of the said insert is a metal or plastic.

7. The injection moulded flush-mounted electrical plastic box for electrical elements of claim 1
wherein the shape of the box is square, rectangular, polygonal, or round.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. H02G3/12  H02G3/14

**ADD.**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols) H02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
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**Date of the actual completion of the international search**

3 December 2012

**Date of mailing of the international search report**

14/12/2012

Name and mailing address of the ISA:

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