United States Patent

[11] 3,612,953

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[73] Assignee **said Gittin, by said McDonald**

[54] **ELECTRICAL WIRING SYSTEM AND EJECTABLE DEVICES THEREIN**
6 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **317/40 A,** 307/42, 307/147, 315/361
[51] **Int. Cl.** **H02h 5/04**
[50] **Field of Search** ..... 307/42, 147; 315/320, 361; 317/40 A

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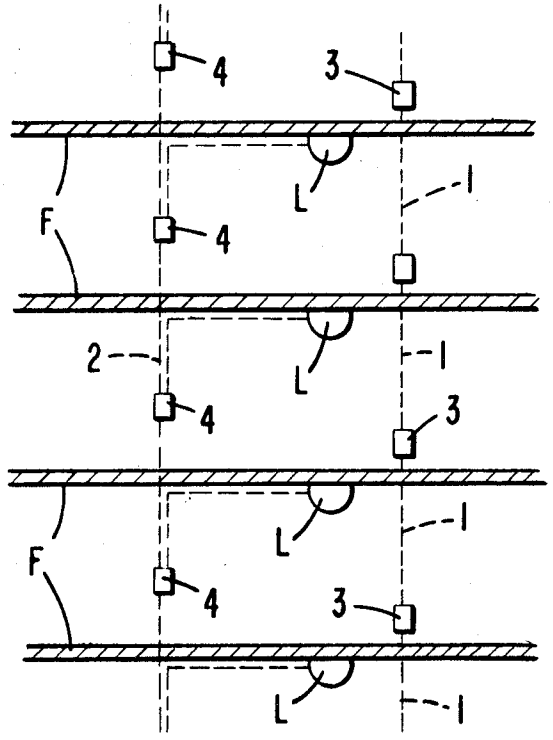
ABSTRACT: An electrical wiring system for multistory buildings, embodying feed-wires extending vertically through the several stories of the buildings with electrical devices, such as outlet receptacles, switches, etc., in housings connected in circuit with said feed wires in substantial vertical alignment, and each of said devices incorporating a protective safety-fuse element therein, which upon rupture is ejected from its housing to render it easily discernible for replacement. Thereby the need for conventional panel boards with circuit-breakers or fuses therein, at different levels of the buildings, and in individual apartments, may be eliminated.



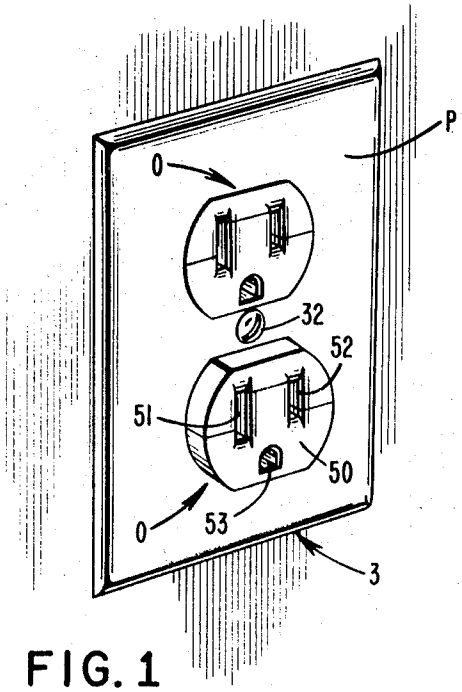


FIG. 1

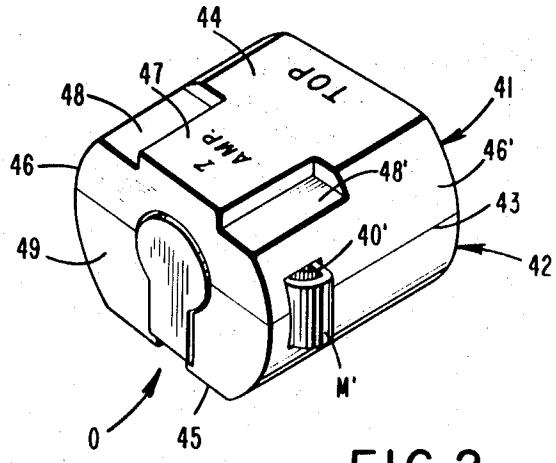


FIG. 2

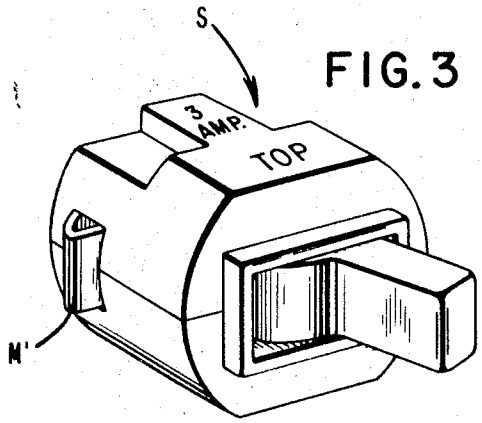


FIG. 3

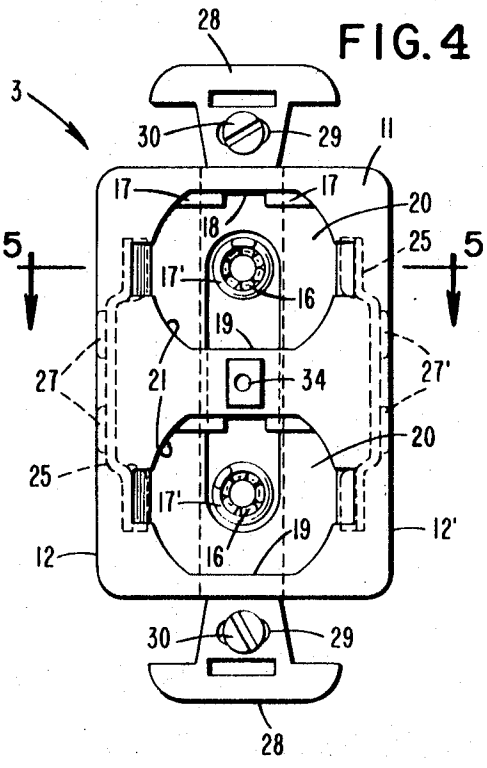


FIG. 4

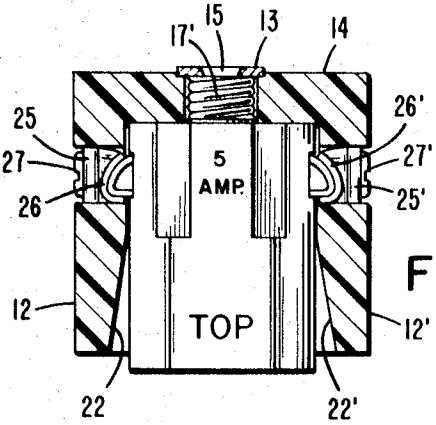


FIG. 5

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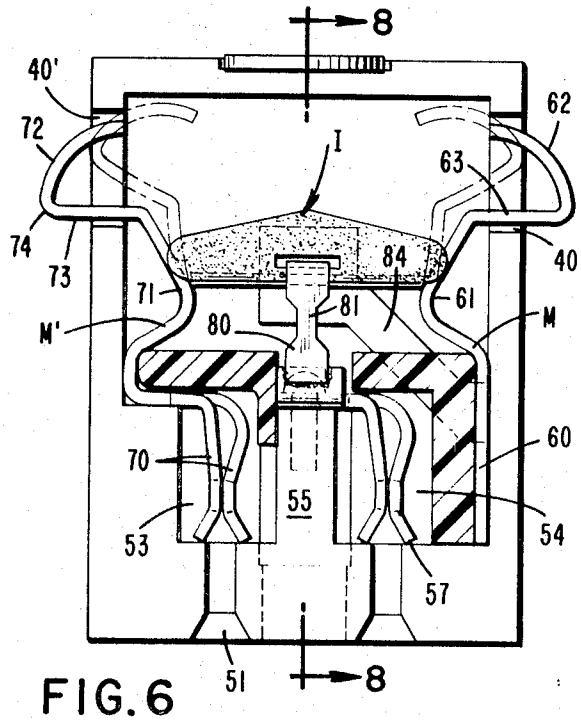

FIG. 6

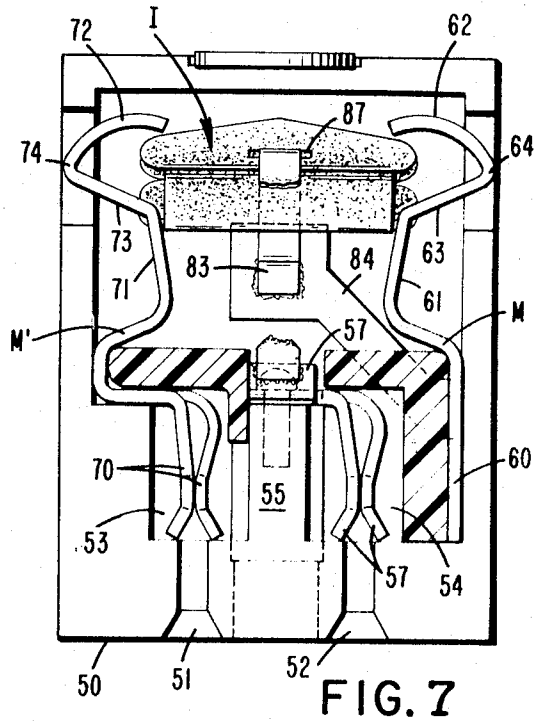

FIG. 7

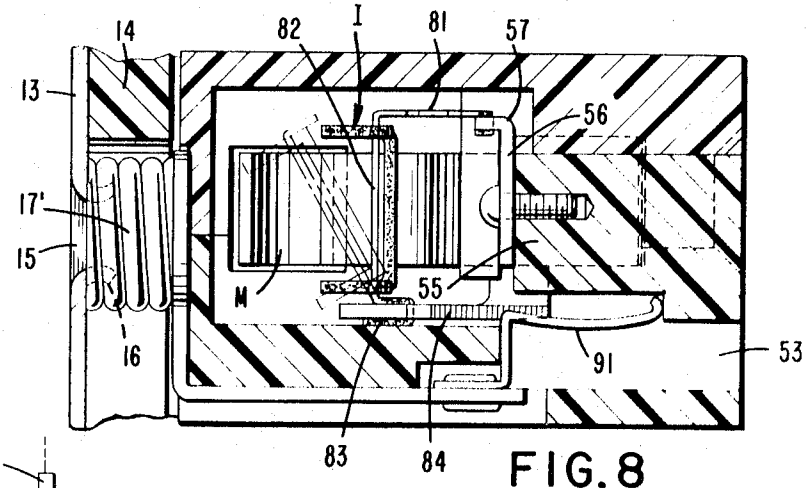

FIG. 8

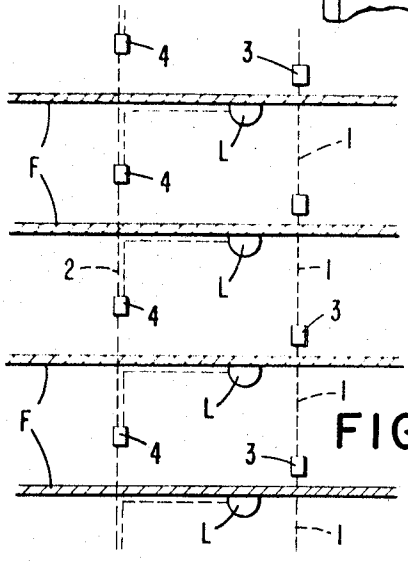

FIG. 10

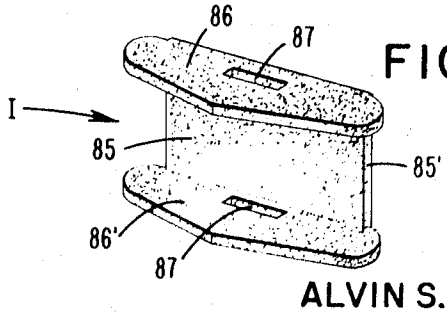

FIG. 9

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ELECTRICAL WIRING SYSTEM AND EJECTABLE DEVICES THEREIN

This invention relates to an electrical wiring system for multistory buildings and more particularly a system adaptable to the wiring of modern high-rise buildings, which eliminates the need for panel boards at the different levels of the building.

It is the object of the present invention to provide an electrical wiring system for multistory buildings which is economical in initial construction, as well as maintenance, and which is characterized by many safety features which are more than adequate to comply with the minimum code requirements for providing adequate power for anticipated loads.

It is another object of the invention to provide an electrical wiring system for multiple story buildings which embodies a plurality of feed wires extending in vertical directions from the service entrance box, with electrical devices accommodated in housings which are inserted in the vertical feed wires in substantial vertical alignment, with such devices incorporating self-contained safety fuses for the protection of the wiring system and the electrical units attached thereto, without need for individual panel boards with circuit breakers or safety fuses therein at the different levels of the building for distribution of the electric power therefrom.

The provision of individual fusible safety links in the electrical devices wired into the vertical feeders, with provision for the automatic ejection of the devices from their housings upon the rupture of the fusible links, makes possible the easy detection of any fault in the system when such is caused either by a short circuit of any appliance which may be connected in the system, or by a high resistance fault which presents a fire hazard and which eventually leads to a conflagration. This reduces maintenance costs in the course of troubleshooting.

The wiring system in accordance with the invention, with the electrical devices such as outlet receptacles and switches arranged in substantially vertical alignment, results in tremendous economies over present systems of wiring. Thus, not only are the costs of the panel boards and the connections thereto eliminated, but the amount of material and labor which is entailed in the stringing and connecting the feed lines from the panel boxes in horizontal and vertical directions around doorways and through the vertical studs, is reduced substantially, resulting in great economies.

Furthermore, the increased safety accruing from the provision of fusible links at each electrical device, such as outlet receptacles and switches, reduces fire hazards as well as more serious injuries arising from the insertion of foreign metal objects within the openings of the outlet receptacles. The individual and immediate "blowing" of a safety fuse in one outlet receptacle excludes "black-outs" which normally are caused by the "blowing" of a fuse in a panel board, as usually occurs when a fault arises in any branch circuit or feeder line, which incapacitates these lines and all electrical units connected thereto.

The proximity and the distribution of the fusible individual links forming part of each individual electrical device connected to the vertical feeders and the immediate rupture thereof, would greatly reduce the incidence of fire resulting from a high-resistance fault in the wiring system which engenders heat and ultimate burning, without necessarily actuating the fuse or circuit breaker in the panel box, as has been the case heretofore. Furthermore, the fault is more easily located in proximity to the ejected switch or outlet.

The provision of safety outlets throughout the wiring system eliminates the possibility of overloading any part of the wiring system.

It is another object of the invention to provide rugged and economical electrical devices, such as outlet receptacles and switches, which may be fitted with safety fuses of different capacities in dependence upon the circuit needs, and the failure of which may be indicated readily so that another operative device may be substituted therefor to reestablish the necessary circuit conditions upon the removal of the faulty electrical unit therefrom, the location of which may be determined with relative definiteness by virtue of the proximity of the ejected device to the faulty electrical unit or wiring.

The electrical devices in accordance with the invention, embodying housings for ejectable outlet receptacles and switches, also may be installed in existing wiring systems to realize all of the advantages accruing from these devices even though they may not form components of vertical wiring arrangements.

While outlet receptacles for attachment plugs, as well as switches, have been provided heretofore with fuse devices therefor, as described in Pat. Nos. 2,086,861, July 13, 1937, and 2,256,716, Sept. 23, 1941, none has incorporated the advantageous features as disclosed herein, and especially the feature of the automatic ejection of the device from its housing upon the "blowing" of the fusible link.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings, wherein

FIG. **1** is a perspective view of a duplex outlet receptacle for attachment plugs, each incorporating a safety fuse, and the lower one shown in ejected position arising from rupture of the fusible link in the interior thereof;

FIG. **2** is a perspective view of the outlet receptacle adapted to be inserted interchangeably in the casing provided therefor, which is wired into the vertical feeders extending through a plurality of stories of the building;

FIG. **3** is a perspective view of a toggle switch adapted to be inserted into a housing therefor and which is wired into the vertical feeders extending vertically through the several stories of the building for the control of overhead ceiling lights or other electrical units;

FIG. **4** is a front elevation of the casing of a duplex outlet receptacle adapted to be mounted within an outlet box mounted within the building wall and which is covered by the ornamental plate shown in FIG. **1**, with the sockets therein for receiving the ejectable outlet receptacle bodies;

FIG. **5** is a horizontal sectional view along line **5—5** of FIG. **4**;

FIG. **6** is a horizontal sectional view of the outlet receptacle body shown in FIG. **2**, showing the arrangement of the contact terminals therein;

FIG. **7** is a view similar to FIG. **6** showing the arrangement of the parts upon the "blowing" of the fuse within the outlet receptacle body arising from a short circuit or other fault in the electrical unit which is adapted to be connected to the outlet body by means of an attachment plug;

FIG. **8** is a vertical sectional view along line **8—8** of FIG. **6** with the fuse mounting shown in solid lines when the outlet body is operative, and with the fuse mounting in dotted lines upon the rupture of the fuse as indicated in FIG. **7**;

FIG. **9** is a perspective view of a structural detail for supporting the fusible link shown in fIGS. **6**, **7** and **8**; and

FIG. **10** is a schematic view of a multistory building showing the feed wires extending upwardly through the several stories, with electrical devices wired therein in substantially vertical alignment at laterally displaced points of the building, for example, casings for mounting outlet receptacles for attachment plugs in some of the feed wires, while others are wired with housings for receiving ejectable control switches in accordance with the invention.

In FIG. **10** of the drawings a multiple story building B is shown schematically, having vertical feed wires **1** and **2** extending upwardly through the several floors F and into which are wired electrical devices **3** and **4**, respectively. These feed wires are run from a service inlet from a main panel board at a lower level of the building and are distributed around the building to provide housings **3** for outlet receptacles **0** in substantially vertical alignment at the several levels of the building for connection of floor lamps, table lamps, or other electrical units thereto. Another feeder **2** is designed to have connected thereto at the different levels of the building, housings **4** for control switches S which are connected to overhead ceiling lights **11**, and which control the operation of the latter. It is

understood that these vertical feeders 1 and 2 are illustrative of many which are spaced laterally around the perimeter of the building and which extend vertically, to satisfy the need for switches and outlets for the electrical units and appliances to satisfy the demands for electric power in the building, in dependence upon the functional needs of the building, whether it be for apartments, offices or the like.

The arrangement of the distribution of the wiring feeders is indicated schematically in FIG. 10, which makes possible connection of the electrical units thereto without need for any panel boards at the different levels of the building which normally are provided with adequate circuit breakers in conformity with the requirements of the electrical building codes. The latter are replaced by devices in accordance with the invention which are connected to the vertical feeders and which are fitted with the necessary safety devices which function is normally performed by circuit breakers within the panel box. The devices in accordance with the invention meet these needs to a degree superior to that afforded by the conventional panel boxes, so that the latter may be eliminated and realization may be had of the advantages accruing from a system of wiring which need be run mainly in vertical directions without minimum of wiring extending in horizontal directions, with the consequent reduction in costs of labor and materials entailed in cutting through vertical studs and across doorways and other building components.

The electrical devices in accordance with the invention are illustrated in the remaining figures of the drawings, and FIG. 1 shows one of the duplex outlets which may be used interchangeably with single outlets, which are adapted to be wired into the vertical feeders 1 extending through the building walls at laterally displaced points therealong.

As shown in FIGS. 1 and 4, the duplex outlet 3 may be formed of a casing of insulating material defined by a front wall 11, lateral walls 12, 12' and a rear wall 14. The casing is preferably formed of molded plastic material, such as Bakelite and may be reenforced by a metallic band 13 extending across the vertical median of the rear face thereof, and which extends transversely therefrom adjacent to the top and bottom edges of the casing and wherefrom it is bent in vertical directions to form mounting flanges 28 at the front of the casing. The mounting flanges 28 are provided with slightly elongated slots 29 therein for receiving fastening screws 30 which engage threaded lugs formed in the outlet box mounted within the building wall, which expedients are conventional and well known in the art. In the case of the duplex outlet shown in FIG. 4, a threaded opening 34 is provided at the midportion of the front wall for receiving a threaded bolt 32 for mounting an ornamental plate P in overlying relation to the casing 3, as shown in FIG. 1.

The ornamental plate P above and below the fastening screw 32, is provided with openings of the same contours as the socket 20 in the casing and in overlying relation thereto for the insertion into the sockets of outlet bodies 0, the fronts of which are shown in FIG. 1 and a rear perspective view of which is shown in FIG. 2. These bodies 0 are formed of any desired hard plastic material such as Bakelite and may be constituted by upper and lower members 41 and 42 joined together along a horizontal median plane 43. The outlet body is provided with openings 40, 40' in the lateral walls thereof from which protrude parts of spring detent members M and M', described in greater detail below, which serve to latch the body O within its socket 20 in the operative state of the fusible link therein, and which retract upon its rupture to permit the body to be ejected automatically from its socket.

The components 41 and 42 of molded plastic may be formed with the required passages and chambers for accommodating the circuit-making elements of the outlet body when the same is inserted into one of the sockets in the casing shown in FIG. 4.

The top surface 44 of the body O is provided with a central lug or keyway 47 of predetermined width which is limited by lateral recesses 48, 48' extending to the rear wall 49 of the body. The bottom surface of the body O is plane while the lateral walls 46, 46' have a curvature conforming to the lateral walls 21 of the sockets 20. The latter are provided with projections 17 at the junctions of the upper walls of the sockets with the lateral walls 21, leaving a gap or groove 18 between the projections, which compels the insertion of the body O with the upper wall of the body always on top, which arises from the accommodation of the keyway 47 within the groove 18. This structural arrangement renders impossible the insertion of the body O in an upside-down position. The width of the keyway provides a reliable indication for the thermal rating of the fuse link in the body O. Thus, if the housing 3 is wired to accommodate a load of 5 amps, groove 18 therein is of a predetermined width which will receive a body O with a lug 47 of corresponding width, or smaller, but which will block an outlet body of greater capacity, such as 10 amps, in which case the keyway 47 is wider.

The front of the body O is provided with vertical slots 51 and 52 of unequal length and a rounded slot 53. Conductive terminals are provided on the interior of the body O in communication with each of the slots so that those in communication with the slot 51 are connected to the neutral terminal of the distribution system, those connected to the slot 52 are connected to the "hot" side of the line, while the terminal communicating with the opening 53 leads to a grounding terminal.

The safety fuse is connected in series with the "hot" side of the line so that when any fault arises in the electrical unit which is plugged into the outlet body O by way of the prongs of an attachment plug leading from the electrical unit (not shown), through the vertical slots 51 and 52, the fuse "blows" and the outlet body O is automatically ejected from its socket for a limited extent, as indicated for the lower body O shown in FIG. 1, to indicate which unit is faulty and requires disconnection. This does not affect the continuity of the power supply to the upper outlet which is mounted in the casing 3.

The automatic ejection of the outlet body in response to a fault in the electrical unit connected thereto, may be realized in many different ways, and the arrangement shown in FIGS. 5 to 9 is illustrative of many possible arrangements for attaining for attaining this result.

The outlet casing 3 which is affixed within the outlet box in the building wall (not shown), may be provided with its own ground, while supporting means for automatically ejecting the outlet body O upon the "blowing" of the thermal fuse therein. Thus, the grounding strap 13 extending vertically across the rear of the casing may be stamped with a circular opening 15 along a plurality of radial lines and the inner ends of the several radii 16 may be turned along curved lines to engage the outer end of a spiral spring 17', as clearly shown in FIG. 8.

Each outlet body is adapted to be inserted into its socket and latched therein following the compression of the spring as shown in FIGS. 5 and 8, so that the spring exerts a resilient force to eject the body, which force is resisted by the spring detent members mentioned above, as long as the fusible link in the outlet body O is maintained in operative position. When the fuse "blows," these spring detent members are released so that the ejecting spring 17' is free to exert its influence to eject the outlet body from its socket at least to a limited degree, as shown in the case of the lower body in FIG. 1, thereby to indicate the "blowing" of the fuse therein.

The casing shown in FIGS. 4 and 5 is designed to have the neutral conductor of the feed wire 1 connected thereto at screw 27 and the "hot" wire at screw 27'. These screws are mounted in conductive members 25 and 25', respectively, which terminate in contact terminals 26, 26' of generally C-shaped allochiral relationship. The electric current is designed to pass from these terminals to the conductive terminals within the outlet body O disposed in the chambers in the latter and from there through the projecting prongs of an attachment plug connected to an electric unit, which prongs are inserted into the electrical body through slots 51 and 52.

As stated above, the outlet body is provided with spring detent members on each side thereof which perform the dual function of completing the electrical circuit between the wire terminals of the casing to the prongs of the attachment plug and at the same time function as balanced latching members which effectively resist the force of the expulsion spring 17' as long as the thermal fuse is effective, but which is incapacitated both as an electric conductor and a latch by the "blowing" of the fuse.

Thus, as may be seen in FIGS. 6 and 7, the metallic contact member M from the "hot" side of the line is retained within the body of the outlet receptacle along the length 60 thereof, wherefrom it is bent inwardly at the reentrant portion 61 in an inclined direction, and thereafter it is bent outwardly along a short straight length 63 to tip 64 wherefrom it is bent inwardly along a curved terminal portion 62. A metallic conducting piece 84 extends from length 60 of contact member M, to which is soldered the base element of the fuse 80 at point 83. The fuse 80 is threaded from point 83 through aligned openings 87 in the top and bottom flanges 86, 86' of a spacer I of insulating material (FIG. 9), beyond which the fusible element has a narrowed portion 81 which determines its rating. The end of the fuse is affixed to the terminal connector 57 seated within chamber 54 and with which cooperates a jaw of metallic material in juxtaposed relation thereto for accommodating one of the prongs of the attachment plug which is inserted into the slot 52.

The companion metallic detent member M', of generally similar contour at its outer end as is member M, is contained within the body O. The confined end 70 of member M' is retained within passages formed in the body O wherefrom the reentrant portion 71 is bent inwardly and passes therefrom to the short straight portion 73 to the curved tip 74, wherefrom the member is curved at its terminal portion 72 with a curvature generally of C-shaped contour adapted to be accommodated within the terminal 26 on the interior of the casing 3, and which is allochirally related to the terminal portion 62 of leaf spring member M.

When the outlet body O is in operative condition, the retainer member I is disposed vertically, as shown in FIGS. 6 and 8, and the opposite edges 85' of the intermediate wall 85 between flanges 86, are effective as fulcrum points for the metallic leaf springs M, m' adjacent to the bases of the reentrant portions which are adapted to be flexed from the positions shown in solid lines in FIG. 6, to those shown in dotted lines as the body is inserted into the socket 20. The inner faces of the lateral walls of casing 22, 22' may be tapered in the direction of insertion of the body, as indicated on an enlarged scale in FIG. 5 to facilitate the flexing of the free curved ends 62, 72 of the metallic springs M, m' towards the interior of the body as the latter is moved inwardly. However, when the body O reaches its end position, the free ends of the springs M, M', which have been cammed towards the interior of the body, arrive opposite the contact terminals 26, 26' and are now free to spring outwardly into the solid line positions shown in FIG. 6, at which time they assume a nested position within the terminals 26' and 26, respectively, of the casing (FIG. 5). In this position the body is seated securely to receive the projecting prongs of an attachment plug, but is biased in a condition to be ejected if the fuse in the body should "blow." When this happens, the inclined straight lengths 61 and 71 of the metallic springs M, M' serve to cam the upper portion of the insulating retainer I into the dotted line position shown in FIG. 8, so that the normal resilience of the metallic springs M, M' drives the portions of the conductors adjacent the curved tips 64 and 74 thereof free of the outer walls of the body into the interior of the latter through openings 40, 40', as indicated in FIG. 7, so that spring 17' is free to exert its force against the end of the body to eject it from the casing to the limited extent indicated in FIG. 1. The ejection of the body O at the lower end of the plate P does not affect the circuit of the electrical unit which may be connected to the upper body O, so that there is no complete blackout in the room, as generally occurs when a fuse "blows" in a panel box. The partial ejection of the outlet receptacle body renders easy its removal from the socket for inserting a replacement. Even in the absence of a replacement, the concealed contacts 26, 26' at the rear of the socket 20 minimizes any danger of injuries by accidental contact therewith. The extent of the ejecting movement of the body may be controlled by the force of the spring and the difference in length thereof between its compressed condition, as shown in FIGS. 5 and 8, and its freely extended position (not shown).

FIG. 8 also shows a grounding conductor 91 within the ground opening 53 of outlet receptacle body O, which may be connected to the rear face of the body and which terminates in a circular portion against which the inner end of spring 17' presses to eject the body when the fuse "blows." The grounded terminal 91 thus communicates with the metallic strap 13 and the attachment flanges 28 to constitute an effective ground for the outlet when a grounded terminal is necessary.

As stated above, while FIGS. 1 and 4 illustrate a duplex outlet receptacle, the casing 3 may be formed with a single socket 20 adapted to house a single outlet receptacle body. Such a casing may be used to house and eject a control toggle switch S, as shown in FIG. 3, which is provided with spring detent members M, M'of a construction similar to that described in connection with the outlet receptacle O. The casings for the switches may be of the duplex type to accommodate a pair of such switches if such are desirable. Of course, the switch housings 4 for the ejectable switches S, while the similar construction as the housings for the outlet receptacles O, are positioned at higher levels above the floor as shown in FIG. 10.

It is understood that the casings 3 and 4 for outlet receptacles or switches may be substituted for conventional units in outlet boxes in existing wiring systems, to attain the advantages of the instant invention.

We claim:

1. An electrical wiring system for a multistory building, comprising:
   a. an internal electrical service inlet at a low level in the interior of said building,
   b. a plurality of vertical feed-wires branched from and extending upwardly from said service inlet through the several stories of said building.
   c. electrical devices and casings therefor connected to said feed-wires at a plurality of said stories in substantially vertical alignment and
   d. means including a thermal overload safety fuse of predetermined rating at each of said electrical devices responsive to the faulty operation of any electrical unit connected to the individual device, for ejecting the latter at least partially from its casing, thereby to disconnect said electrical unit from the system without causing failure of the remainder of the system or affecting the other electrical units connected thereto, while visibly indicating the location of the faulty unit.

2. A system as set forth in claim 1, wherein said electrical devices are outlet plug receptacles.

3. A system as set forth in claim 1, wherein said electrical devices are control switches.

4. An electrical wiring system for a multistory building, comprising:
   a. an electrical service inlet at a low level of said building,
   b. a plurality of feed-wires branched from and extending upwardly from said service inlet through the several stories of said building,
   c. outlet plug receptacles connected to said feed-wires at a plurality of said stories in substantially vertical alignment, and
   d. a thermal overload safety fuse of predetermined rating at each of said outlet plug receptacles responsive to the faulty operation of any electrical unit connected to the individual receptacle, for disconnecting said electrical unit from the system without causing failure of the remainder of the system or affecting the other electrical units connected thereto.

5. A system as set forth in claim 4, wherein said outlet plug receptacles at the plurality of said stories are of the duplex type with casings therefor, each provided with ejecting means for each receptacle from the casing containing it, in response to the rupture of the safety fuse, to locate readily the faulty electrical unit.

6. An electrical wiring system for a multistory building, comprising

a. an electrical service inlet at a low level of said building,

b. a plurality of feed-wires branched from and extending upwardly from said service inlet through the several stories of said building,

c. electrical switches and casings therefor connected to said feed wires at a plurality of said stories in substantially vertical alignment,

d. a thermal overload safety fuse of predetermined rating at each of said electrical switches responsive to the faulty operation of any electrical unit connected to the individual switch in close proximity to the latter for control thereby, and

e. ejecting means for each switch from the casing containing it, in response to the rupture of the safety fuse to locate readily the fault in the electrical system in close proximity to the ejected switch.