

Feb. 6, 1951

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SAFETY ELECTRICAL RECEPTACLE

2,540,496

Filed April 13, 1948

FIG. 1

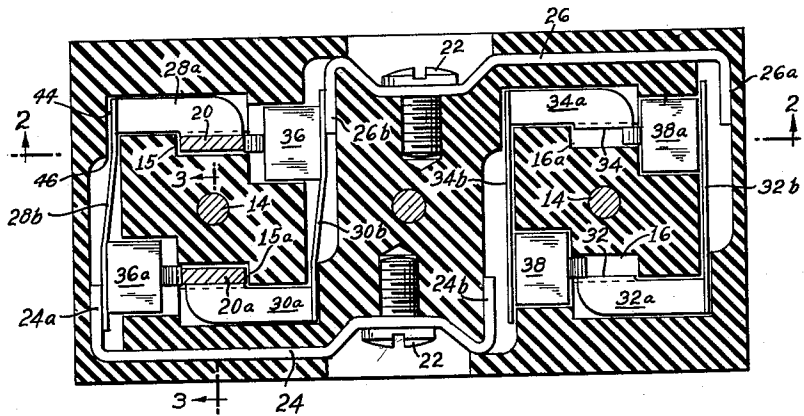


FIG. 2

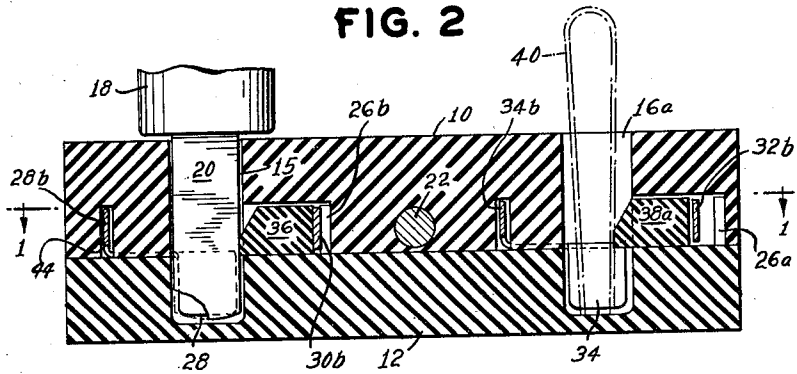


FIG. 3

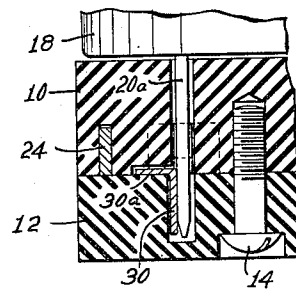
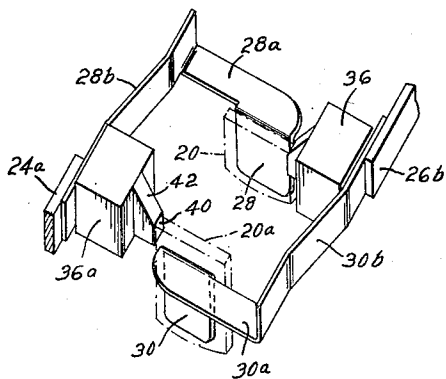


FIG. 4



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2,540,496

SAFETY ELECTRICAL RECEPTACLE

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Application April 13, 1948, Serial No. 20,632

8 Claims. (Cl. 200—51.09)

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This invention relates to improvements in shock-proof electrical connection receptacles of the plug receptacle type commonly used as wall outlets in buildings and in electrical fixtures.

Conventional types of plug receptacles are known to present a potential source of danger because a person inserting a foreign metal object into an opening in such a receptacle may be subjected to a severe electrical shock or burn. This is particularly true in the case of children who, through curiosity, may insert nails, hairpins or other objects into the openings of such receptacles.

The present invention is an improvement upon safety electrical plug receptacles of the kind having a pair of openings to receive the prongs of an electric plug, an electrical contact located in each opening for engagement by a plug prong, a movable member partly located in each of the openings in a position to be engaged and moved by the prong of the plug, and electrical connections actuated by the movement of the movable member associated with either of the openings when a prong of the plug enters that opening to close a path for electric current to the electrical contact located in the other opening of the pair. A plug receptacle having these features and construction is disclosed in my pending application Serial No. 725,455, filed January 31, 1947, for "Electrical Connection Receptacle," now Patent No. 2,500,474, March 14, 1950. In such a receptacle the electrical contacts in both of the openings are normally dead and either of them can only be made alive by the movement of the movable member associated with the other opening in such a manner as to close the electrical connections providing the path for electric current.

In a preferred form of the improved receptacle constructed in accordance with the present invention, the electrical contacts located in, and the movable member associated with the respective openings of the receptacle, are so positioned with respect to each other that when the prong of a plug is inserted in either opening it first engages and moves the movable member therein to actuate the electrical connections to close a path for electric current from a current supply terminal to the electrical contact located in the other opening, and thereafter as the prong is further inserted in the opening, and for the first time, it engages the electrical contact located in that opening.

When the electrical contact and movable member associated with the respective openings of the receptacle have this relationship and the

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inserted prongs of the plug are withdrawn from the openings, the circuit through the receptacle and the plug will be broken by the initial movement of the prongs at the contacts located in the openings, thereby eliminating the possibility of arcing at, and particularly the welding together of the electrical connections actuated by either movable member. The making or breaking of the circuit to the plug as its prongs engage or disengage the contacts located in the openings rather than in the electrical connections actuated by the movable members, greatly increases the safety characteristics of the receptacle because the contacts in the openings cannot be accidentally made alive by the welding together of the electrical connections between the respective contacts in the openings and the current supply terminals located in the receptacle. The path for electricity through the electrical connections to their respective contacts is broken only after the prongs disengage the contacts and break the circuit to the plug.

In the preferred construction the movable members in the form of cam blocks of insulating material are located near the upper portion of the openings of the receptacle and the contacts associated with the openings are located only in the lower portion of such openings, that is, below the cam blocks, so that when the prongs or blades of a plug are inserted, they first move the cam blocks to connect the contacts with their respective current supply terminals, and thereafter engage the respective contacts in the receptacle openings. Arcing in the electrical connections between the contacts and their current supply terminals is therefore positively avoided, since the contacts and terminals are connected up by the cam blocks before the prongs of the plug engage the contacts to form a circuit. While there may be arcing between the prongs and their contacts in the openings, this is no more serious than in conventional receptacles, and one can safely conclude that when the plug is withdrawn, the contacts in the openings are dead and have not been made alive by welding in the connections to the current supply terminals.

In an advantageous form of the present invention, the cam blocks, cam-surfaced members of insulating material or equivalent means, are positioned in the body of the receptacle so that the portions provided with the cam or surface to be engaged are adapted to project into the respective outlet openings at a point above the position of the contact element mounted therein, so that the cam portion of the members is moved

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out of the openings by the prongs of the plug before the prongs engage the respective contact elements.

The features of the present invention are described in detail hereinafter in connection with an illustrative embodiment thereof shown in the accompanying drawings forming a part of this application.

In the drawings:

Figure 1 is a horizontal sectional view taken on an irregular line approximating the line 1—1 of Figure 2, showing the operative parts and their relationships, of a twin type plug receptacle constructed in accordance with the features of the present invention. In this view the surfaces of some of the elements below the line 1—1 are shown.

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a broken vertical sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a broken perspective view of parts of the mechanism shown in Figures 1 to 3 removed from the body of the receptacle, showing the position of the important elements with plug prongs inserted.

The receptacle shown in the figures of the drawings includes a body of insulating material comprising an upper section 10 and a lower section 12 held together by screws 14 to form a unitary structure having an external shape similar to conventional receptacles. The receptacle as shown is provided with two pairs of openings or slots 15—15a and 16—16a for the reception of the prongs or blades of electrical plugs of conventional design. The twin unit shown is illustrated in connection with a plug 18 with its prongs or blades 20 and 20a inserted respectively in the openings 15 and 15a.

The receptacle is adapted to be connected into a pair of current supply wires in the usual way by means of a pair of screws 22 threaded through similarly shaped metal current supply bars 24 and 26 fitted in recesses in section 10 and adapted to supply current to both receptacles. The bar 24 is bent at one end to provide a contact terminal 24a and at the opposite end to provide a contact terminal 24b. The bar 26 is bent in the same way to provide contact terminals 26a and 26b.

The metal contact elements for all of the receptacle openings have the same shape and construction, for example that for the opening 15 comprises a sheet metal member having a contact leaf 28 (Figs. 2 and 4) bent from a flat horizontal portion 28a and extending downwardly in the portion of the opening 15 in the lower body section 12. The portion 28a extends laterally along the top of the section 12 and has attached thereto a long spring section 28b bent up edgewise from the section 28a extending through an opening in the body section 10 crosswise of the receptacle in front of the terminal 24a which projects into the same opening in the upper body section 10. The arrangement is such that current supplied by the terminal 24a is conducted through the spring section 28b, section 28a to the contact leaf 28 which is engaged by the plug prong 20. The contact element for the opening 15a includes a contact leaf 30 therein attached to a horizontal section 30a and a contact spring section 30b which is adapted to engage the contact terminal 26b.

The contact element for the opening 16 includes a contact leaf 32 bent from a horizontal section 32a to which is attached a spring con-

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tact member 32b adapted to be moved into engagement with terminal contact 26a. The contact element for the opening 16a includes a leaf contact 34 extending along the lower part of the opening 16a and bent down from a lateral section 34a to which is attached a spring contact member 34b adapted to be moved into engagement with the terminal contact 24b. The contact elements for all openings are mounted in appropriate passages or cut-outs in the upper body section 10 except for the leaf contacts which extend downwardly in the lower portions of the respective receptacle openings.

Each receptacle opening has associated with it a block of insulating material having a cam element normally extending into the opening. These blocks are of the same construction for all openings and comprise a block 36 for the opening 15, a block 36a for the opening 15a, a block 38 for the opening 16 and a block 38a for the opening 16a.

The structure of these blocks of insulating material is shown more completely in Figure 4 in which the block 36a, for example, is shown as comprising a substantially rectangular shaped block having a lateral projection 40 provided with a sloping cam surface 42. The projection 40 is of such a width and positioned to be movable laterally into one edge of the receptacle opening 15a so that it normally blocks off a portion of the opening. Each block, such as 36a, is mounted so as to slide on the lower body section 12 in an appropriate cavity in the body section 10 as shown, which communicates with the cavity or passageway housing the oppositely mounted contact spring and terminal contact.

Figure 1 of the drawings shows the position of the elements described above with the prongs of the plug 18 inserted in the openings 15 and 15a, while the other receptacle including the openings 16 and 16a illustrate the normal position of the elements described with the plug removed. In this receptacle the spring contact sections 32b and 34b are shown as being substantially straight, flat springs which are normally biased away from the respective terminal contacts 24b and 26a, this bias being sufficiently strong to move the cam blocks 38 and 38a to a stop in the body section 10 with the sloping cam projections extending into the openings 16 and 16a above the contact leaves 32 and 34.

When the prongs 20 and 20a of the plug 18 are inserted in the openings 15 and 15a as shown, the edges of the prongs engage the cam surfaces 42 of the blocks 36 and 36a, and as the prongs are pushed down, move the blocks laterally respectively against the contact springs 30b and 28b, so as to move them respectively into engagement with terminal contacts 26b and 24a. These steps are effected by the time the ends of the prongs 20 and 20a reach the level approximating the lower ends of the cam surfaces 42. Thereafter, further movement of the prongs into the openings brings them respectively into engagement with the now live metal contact leaves 28 and 30 to supply current through the plug to the desired source.

The portion of the contact spring 28b where it is joined to the portion 28a and somewhat beyond, is confined in a relatively narrow passageway 44 (Figs. 1 and 2) in the body section 10 terminating at a vertical corner 46 where it opens into the wider passageway for accommodating the movement of the remainder of the spring 28b. With the body sections 10 and 12

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clamped together the portions 28 and 28a of the contact element are in fixed position so that when the spring contact 28b is moved out to engage terminal 24a it is bent around the corner 46, as will be seen by comparison with the normal position of the corresponding elements 32b and 34b. The corner 46 and the corresponding corners for all contact elements aid in biasing the respective spring contacts as described.

The plug receptacle of the present invention with its novel safety features can be substituted for conventional types of receptacles for installation in homes or other points of use, since the contact elements mounted in the receptacle openings are normally dead and free from the possibility of being made alive by the internal welding of any of the internal connections in the receptacle, since arcing or welding is prevented by the improved construction. The receptacle is also safe from external hazards. For example, if a child inserts a bobby pin 48 in the opening 16a as indicated in Figure 2, the pin cannot energize the contact 34 in opening 16a, but at most only energize the contact leaf 32 in the opening 16. However, in the illustration the bobby pin is fully inserted without affecting the cam block 38a so that no danger whatever is involved. Even if a metal object of the width of a plug prong were inserted in the opening 16a, it would only energize the contact leaf 32 and not the contact leaf 34, so that there still would be no danger of a shock.

The receptacle structure is also such that a fuse cannot readily be blown. For example, even if the two prongs of a bobby pin were inserted respectively into the two openings of the receptacle, they would not move the cam blocks or activate the contacts therein. The improved receptacle of the present invention may be single, twin or otherwise and constructed to provide for any number of openings such for example as polarity plug receptacles, provided that the contact element for any one opening can only be made alive by the movement of a cam member or equivalent means, in a different opening.

What I claim as new is:

1. An electrical plug receptacle comprising a body having a pair of openings, a first electrical contact means on said body for each opening adapted to be connected to a source of electrical energy, a second electrical contact means on said body for and associated with each of the respective openings and normally out of contact with the first means, and an actuating means comprising a pair of movable cams mounted in said body above the second contact means and associated respectively with said openings, said cams being insulated from the first and second contact means and adapted to effect contact between the first and second contact means of one opening only upon the insertion of an object in the other opening of the pair, the second contact means and the cam for each opening being arranged with respect to each other so that the insertion of an object into one opening first moves the cam associated therewith to effect contact between the first and second contact means for the other opening and thereafter the object engages the second contact means associated said one opening.

2. An electrical plug receptacle having a plurality of openings for receiving the contact prongs of a plug, an electrical contact in the lower portion of each opening adapted to be engaged by a contact-prong of a plug, a terminal connector

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for each contact adapted to be connected to a source of electricity but normally disconnected from its contact, and means associated with each opening insulated from the contact therein and operable upon the insertion of a plug contact-prong therein prior to its engagement with the contact therein for electrically connecting only the contact in a different one of said plurality of openings with its terminal connector.

3. An electrical plug receptacle as defined by claim 2 in which said means is a cam member mounted in a position to be actuated by a plug prong prior to the contact of such prong with the electrical contact in the opening into which the prong is inserted.

4. An electrical plug receptacle as defined by claim 2 in which said means is a cam member movable into and out of the opening with which it is associated, and in which the contact in each opening includes a spring portion arranged to be moved into engagement with but which is biased away from its terminal connector.

5. An electrical plug receptacle comprising a body having a pair of openings for the reception of the prongs of a plug, a contact element for each opening including a portion thereof arranged in the lower part of the opening and a portion forming a spring contact finger extending along one side of the other opening, a movable cam member of insulating material operatively arranged in said body between each contact finger and the adjacent one of said openings, each spring contact finger being adapted to urge the adjacent cam member toward and into a portion of the adjacent opening above the contact element therein, a terminal connector arranged adjacent each of said contact fingers normally out of contact therewith and adapted to be connected to a source of electrical energy, each of said cam members being arranged to be actuated by a plug prong inserted in the adjacent opening whereby the adjacent spring contact finger is moved into engagement with the adjacent contact terminal to thereby close a circuit to the contact element in the remote opening.

6. An electrical plug receptacle comprising a body having a plurality of openings therein for the insertion of the prongs of a plug, a contact element mounted in the lower portion of each opening, a movable contact member connected to the contact part in each opening and extending alongside and spaced from a different outlet opening, a current supply terminal arranged in said body on the side of each movable contact member opposite the outlet opening alongside which it extends, and an actuating member of insulating material movably arranged in a passageway in said body between each movable contact member and the opening alongside which it extends at a position above the contact element therein, said actuating member being adapted to normally project into the opening adjacent to which it is mounted, and when moved therefrom by the insertion of a plug prong into the opening being adapted to move the movable contact member into engagement with the oppositely mounted current supply terminal.

7. In an electrical plug receptacle having a pair of outlet openings adapted to receive the prongs of a plug, a contact element in each opening, a terminal connector for each element arranged to be connected therewith but normally disconnected therefrom, and a member of insulating material associated with each opening and movable by the insertion of a plug prong

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therein for connecting the contact element of the other opening with its terminal connector, the improved structure in which the movable member for each opening is arranged to be moved by an inserted plug prong prior to the engagement of the prong with the contact element for such opening, whereby arcing between the contact elements and their respective terminal connectors is avoided.

8. In an electrical connection receptacle having a pair of openings to receive the prongs of a plug, an electrical contact and a movable part located in each of the openings in position to be engaged by a prong, and electrical connections actuated by the movable part associated with either opening when a prong enters that opening to close a path for electric current to the contact located in the other opening, the movable part being located above the contact in each opening,

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whereby upon withdrawal of the prongs from the openings the circuit through the receptacle will be broken at the said contacts.

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