Dec. 7, 1943. G. E. BLINN 2,336,218

RECEPTACLE

Filed June 10, 1942 2 Sheets-Sheet 1

Fig. 1,

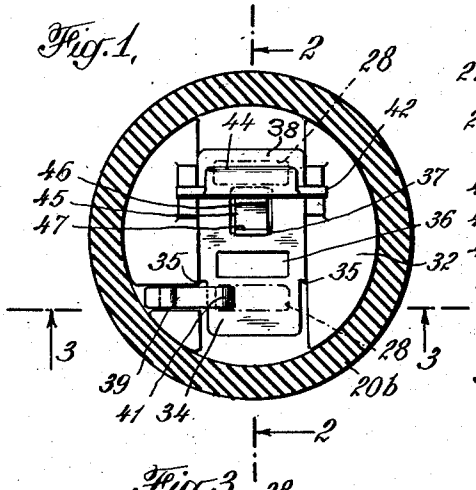


Fig. 2,

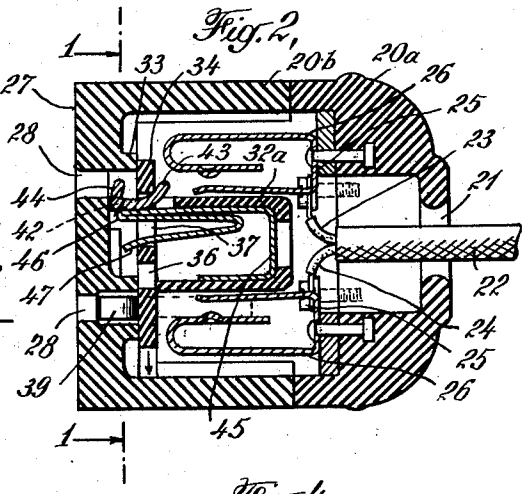


Fig. 3,

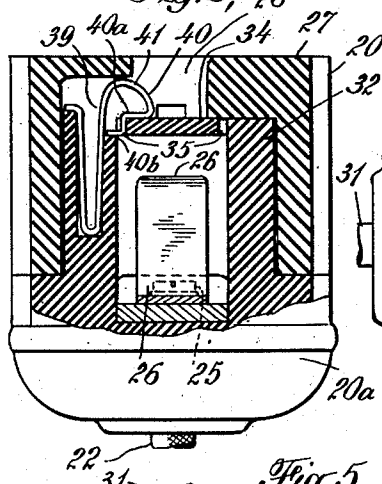


Fig. 4,

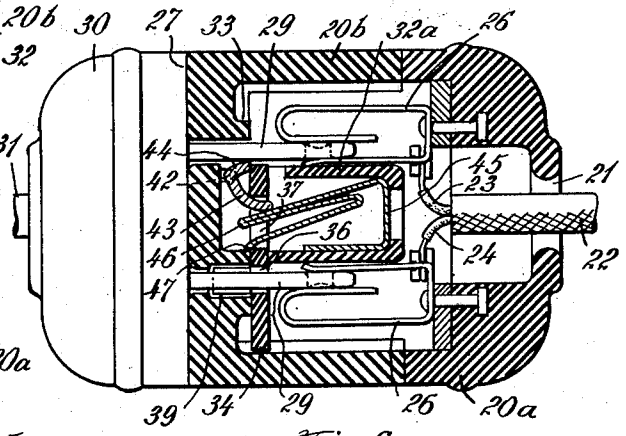


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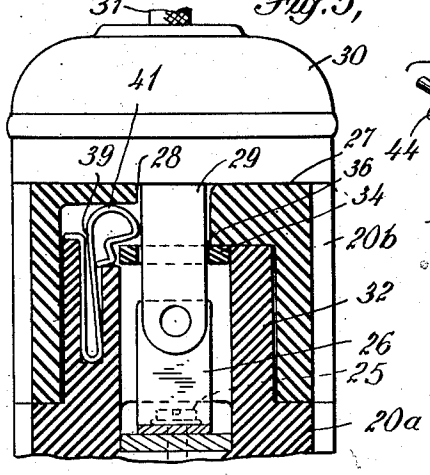
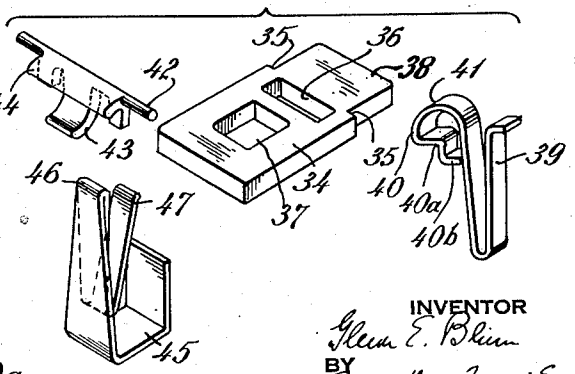


Fig. 6,



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RECEPTACLE

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Fig. 7,

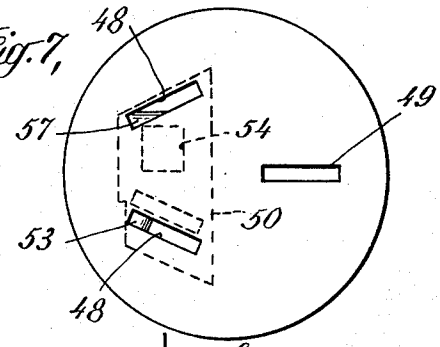


Fig. 10,

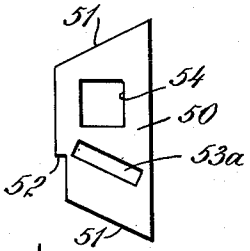


Fig. 8,

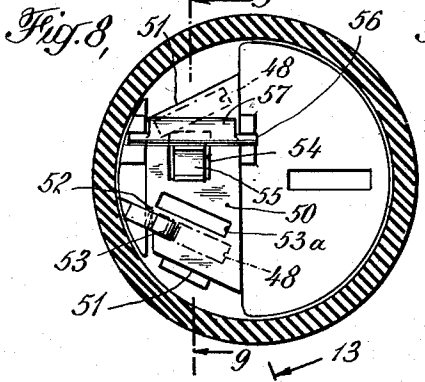


Fig. 9,

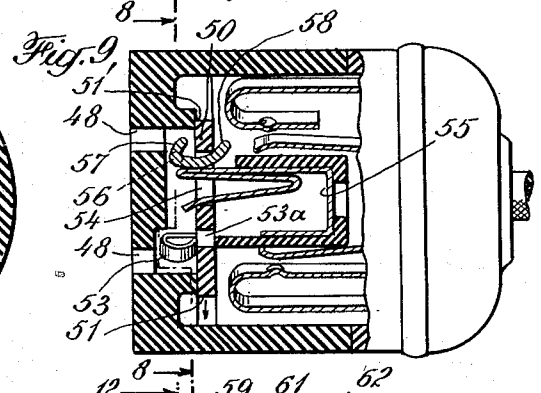


Fig. 12,

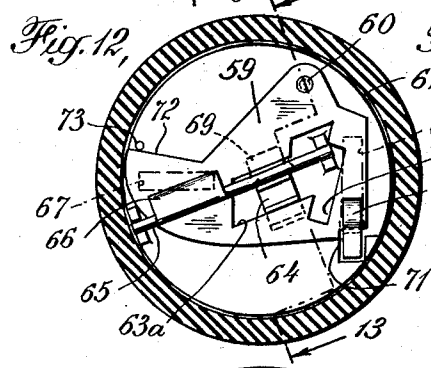


Fig. 13,

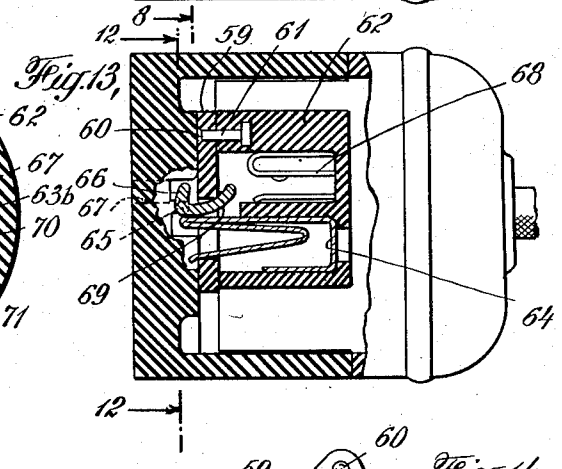


Fig. 11

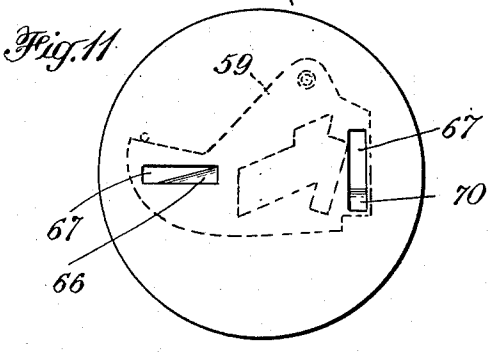
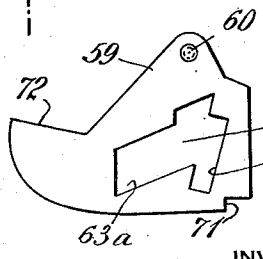


Fig. 14



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UNITED STATES PATENT OFFICE

2,336,218

RECEPTACLE

Glenn E. Blinn, Harrington Park, N. J.

Application June 10, 1942, Serial No. 446,455

16 Claims. (Cl. 173—328)

This invention relates to electric receptacles of the type which includes terminals engageable by the prongs of a plug inserted into holes in the receptacle for the purpose of connecting together conductors which are connected, respectively, to the terminals and the prongs. More particularly, the invention is concerned with a receptacle provided with novel safety means which prevent accidental contact with the live parts of the receptacle and also serve to suppress the arc which may be formed when a heavy flow of current through the conductors is broken by withdrawal of the plug from the receptacle.

The receptacle of the invention resembles in many respects that disclosed in my Patent No. 2,155,925, April 25, 1939, but is superior thereto in that it is of simpler construction and, therefore, less expensive to manufacture and, in addition, it is more nearly positive in action and provides a greater degree of safety.

The new receptacle may be constructed to receive any standard plug having two or more connection prongs, such, for example, as an ordinary plug having two prongs lying parallel, a polarized plug having two prongs lying at an angle to one another, or a three-prong plug for use in a system having a ground wire. In all constructions, the receptacle includes a door member which normally closes the holes through which the prongs of the plug are inserted to make contact with the terminals and the door is normally locked in closing position. When the prongs of the plug are simultaneously introduced into the holes and moved inward, one prong first unlocks the door member and shortly thereafter the other operates means by which the door member is moved away from the position in which it closes the holes. The ends of the prongs may then move beyond the door to the terminals. When the plug is removed, the door member is returned automatically to closing position and again locked in that position.

The means by which the door is moved to and from closing position are of such construction that the movement imparted to the door by the action of the prong may be greater than the dimension of that prong in the direction of movement of the door. This makes it possible to employ a door which closes the holes leading to the terminals with a substantial overlap, so that when the door is in closing position, it cannot be pried open by a tool inserted through one of the holes. The door moving means do not act directly on the door but operate through a spring, so that if the means are actuated before the door is unlocked, the movement of the means will be taken up by flexure of the spring and none of the parts of the receptacle will be injured.

For a better understanding of the invention, reference may be had to the accompanying drawings in which

Fig. 1 is a sectional view of one form of the new receptacle on the line 1—1 of Fig. 2;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Figs. 4 and 5 are views similar to Figs. 2 and 3, respectively, showing the action of the parts upon insertion of the prongs of a plug;

Fig. 6 is a perspective view of the door member and its locking and operating means in disassembled relation;

Fig. 7 is a view in elevation of the face of a modified form of the receptacle for use in a three-wire system.

Fig. 8 is a sectional view of the modified form of the receptacle on the line 8—8 of Fig. 9;

Fig. 9 is a sectional view on the line 9—9 of Fig. 8;

Fig. 10 is a plan view of the door member used in a receptacle of Figs. 7 to 9, inclusive;

Fig. 11 is a view similar to Fig. 7 of a polarized receptacle of the new construction;

Fig. 12 is a sectional view of the polarized receptacle on the line 12—12 of Fig. 13;

Fig. 13 is a sectional view of the receptacle on the line 13—13 of Fig. 12; and

Fig. 14 is a plan view of the door member employed in the receptacle of Fig. 11.

Referring to the drawings, the receptacle shown in Figs. 1 to 6, inclusive, includes a housing formed of two parts 20*a*, 20*b* made of insulating material. Part 20*a* has an opening 21 at one end through which extends an electric cord 22 containing a pair of insulated conductors 23, 24 connected by screws 25 to contact terminal springs 26. The terminals are secured to the inner face of the housing member 20*a* and extend into the hollow interior of the housing member 20*b*. The members 20*a* and 20*b* are secured together in any suitable manner and the member 20*b* has a flat front end 27 through which are formed holes 28 in alignment with the spring terminals. The holes are shaped to receive the prongs 29 of a plug 30 of the usual construction, the prongs being connected to conductors in a cord 31, as is customary.

The member 20*a* is provided with a central hollow extension 32 of insulating material which

fits into member 20b and has a portion 32a lying between terminals 26. Between the free end of portion 32a and the inner faces of projections 33 from the inner surface of end wall 27 of the housing member 20b is a door member 34. In the construction shown, the door is a plate of insulating material of generally oblong shape having a width substantially greater than the width of the individual prongs of the plug to be used with the receptacle and a length substantially greater than the distance between the centers of the prongs. The door member is provided with notches 35 in its long sides near one end and an opening 36 is formed through the door member beyond the notches toward the other end, the opening being slightly larger than the cross-section of one of the prongs. Just beyond the opening 36 is another opening 37 for a purpose to be described. The distance between the end wall 38 of the door member and the adjacent wall of the opening 36 is slightly less than the distance between the opposed faces of the prongs of the plug.

The door member is provided with a latch taking the form of a spring 39 seated in a recess in extension 32 of housing member 20a. One end 40 of the spring overlies the door member, the extreme end portion 40b entering one of the notches 35 in the door member, when the latter is in normal closing position. Immediately above the portion 40a, the spring is provided with a curved cam surface 41 which lies in the path of movement of a prong entering one of the holes 28. As the prong moves through the hole, it engages the cam surface and flexes the spring so that its end portion 40b moves out of the notch 35 and the door is released.

The door member is movable endwise by means which include a shaft 42 seated in notches in the end wall of the extension 32 and lying parallel to the door member. The shaft is provided with an arm 43 which enters the opening 37 in the door member and it also has an arm 44 of considerable breadth which normally extends part way across the second hole 28. A spring 45 is seated in the interior of the portion 32a of extension 32 and this spring has a double end, both portions of which extend through opening 37 through the door. One part 46 of the double end of the spring bears against the arm 43 on shaft 42 and normally forces the arm against one wall of opening 37 to hold the door in closing position with solid parts thereof in front of both holes 28. The other end portion 47 of the double end of the spring bears against the opposite wall of opening 37. In the normal position of the parts, the arm 44 on shaft 42 lies inward from the face 27 of the receptacle a slightly greater distance than the cam surface 41 on latch spring 39.

When a connection is to be made at the new recepetacle, the prongs of a plug are inserted into the holes 28 and, as the prongs move inward, one prong strikes cam surface 41 on the latch and flexes the latter to move the end 40b out of notch 35 on the door member and release the latter. Shortly thereafter, the other prong strikes the arm 44 on shaft 42 and rocks the shaft. In this movement of the shaft, the arm 43 thereon acts on portion 46 of spring 45 to flex the double end of the spring and that action causes the end 47 of the spring to move the door member endwise. The extent of movement is such that the end wall 38 of the door member moves entirely across one of the holes 28 and the opening 36 through the door member moves into alignment with the other hole 28. One of the prongs may, accordingly, move past the end of the door and the other may pass through the opening in the door until both prongs engage the contact springs 26.

It will be observed that arm 43 on shaft 42 is considerably longer than arm 44 and that arrangement is advantageous for following reasons. When a prong enters the hole in which arm 44 is exposed and engages and swings the arm out of the path of the prong, the arm is moved by an amount not greater than the thickness of the prong and, therefore, not greater than the dimension of the hole at right angles to the axis on which the arm swings. If arms 43 and 44 were of the same length, the endwise movement of the door produced by the action of the prong on arm 44 would, therefore, be not greater than the thickness of the prong or than the dimension of the hole in the direction of movement of the door. Accordingly, in a construction in which the arms are equal in length, the door in its closing position cannot overlap the walls of the hole, since otherwise the insertion of a prong in the hole would not produce a sufficient movement of the door to open the hole completely. The end wall 38 of the door might lie flush with one wall of one hole 28 and the remote wall of opening 36 through the door might lie flush with the corresponding wall of the other hole 28, but that arrangement, which is the best obtainable under the conditions specified, would not be satisfactory, because it would be possible to insert a tool through one of the holes and force it past the end of the door or into opening 36 and pry the door aside. The tool might then be forced inwardly into contact with a terminal 26.

If arm 43 is longer than arm 44, as in the construction described, the movement imparted to the door member by the swinging of arm 44 by means of a prong inserted through one of the holes 28 may be substantially greater than the thickness of the prong and greater than the dimension of the hole in the direction in which the door is moved. The door may, therefore, be so constructed that, in its closing position, solid portions thereof will close the holes with a substantial overlap, as shown in Fig. 2. Such an overlap makes it impossible to pry the door open by a tool inserted through either of holes 28 and thus the use of a door arm 43, which is longer than the prong arm 44, makes the receptacle completely safe.

Arm 43 does not act directly on the door member to effect movement of the latter away from closing position, but, instead, the movement of arm 43 flexes the double end of spring 45 and end portion 47 of the spring moves the door member to open position. Accordingly, if a tool or one prong only of a plug is inserted through hole 28 and engages and swings arm 44, the door member will remain locked in position by latch 39 and the movement of arm 44, shaft 42, and arm 43 will merely cause flexure of the double end of the spring. Thus, under the conditions mentioned, no damage will be done to the door moving means and the door will not be moved to expose a live terminal.

The receptacle shown in Fig. 7 is of the three-pole type and includes two live terminals which may be reached through openings 48 lying at an angle to one another and a grounded terminal in line with a third opening 49. In this receptacle, the openings 48 leading to the live terminals are normally closed by a door 50 in the form of a plate with its ends 51 lying at an angle to one

another corresponding to the angle between openings 48. A notch 52 is formed in one side of the door in position to receive part of a latch spring 53 generally similar to latch 39 and mounted in a recess in the body of the receptacle. Adjacent the notch, an opening 53a is formed through the door, the longitudinal axis of the opening lying parallel to adjacent end 51 of the door. The door is also provided with an opening 54 through which may extend the double end of spring 55 similar in form and mounting to spring 45. A shaft 56 is journalled in the end of an extension from one of the housing members of the receptacle and lies parallel with the door. The shaft is provided with an arm 57, which extends partly across one of the holes 48, and carries another arm 58 which extends through opening 54 in the door member and lies between a wall of the opening and one of the end portions of the spring 55.

With this construction, on insertion of the prongs of a plug into holes 48, one prong first engages the latch 53 and releases it from the notch 52 in the door member. Immediately thereafter, the other prong strikes arm 57 on shaft 56 and rocks the shaft, so that its end 58 causes flexure of the double end of spring 55 and this, in turn, causes endwise movement of the door member. In such movement, one end 51 of the door member moves to clear one hole 48 in the receptacle, while the opening 53a moves into registry with the other opening. The prongs may then pass beyond the door member and make contact with the live spring terminals. In this receptacle, it is not necessary to provide any safety means normally closing the hole 49, since that hole leads to a grounded terminal.

The receptacle shown in Figs. 11 to 14, inclusive, is of the polarized type and includes a pair of terminals lying with their axes at right angles. Access to these terminals is normally cut off by a door 59 pivoted at 60 on a pin 61 seated in extension 62 from one of the housing members of the receptacle. The door has an opening 63 therethrough and through part 63a of the opening extends the double end of spring 64 seated in extension 62. A shaft 65 is mounted for rocking movement in the end of the extension and the shaft has an arm 66 lying across one hole 67 leading to one of the spring terminals 68. The shaft is also provided with an arm 69 lying between one wall of opening 63a and one end portion of spring 64. A latch spring 70 seated in the extension 62 normally lies within a notch 71 in the side of the door member.

With this construction, the spring 64 normally holds the door member closed, that is, with solid portions thereof aligned with holes 67. Arm 66 on shaft 65 is accessible through one of the holes and latch 70 is accessible through the other. On insertion of the prongs of the plug, latch 70 is first released by one prong and, thereafter, the other prong engages arm 66 on shaft 65 and causes the shaft to swing. In this movement, arm 69 on the shaft engages one portion of the double end of spring 64 and flexes that end of the spring to cause the spring to swing the door member on its pivot until the wall 72 thereon has passed beyond one opening 67 and the part 63b of opening 63 through the door member has been brought into alignment with the other hole 67. The prongs of the plug may then continue their movement inward to the spring terminals without interference by the door member. Normally the door member is held in closing position by spring 64 against a stop pin 73.

In all forms of the new receptacle, the holes through which the prongs of the plug are inserted to make engagement with the live terminals are normally closed by the door member and insertion of one plug prong or a tool through either hole will not move the door member. If the prong is inserted through the hole through which the latch is accessible, the engagement of the latch by the prong will release the door member but will not produce any movement thereof. Similarly, if the prong is inserted through the other hole, it may engage an arm on the shaft of the moving means and cause the shaft to swing and the other arm thereon to flex the double ended spring. The flexure of the spring, however, will not cause any movement of the door member because the latch has not been released. Accordingly, there is little likelihood that accidental contact will be made with the live terminals of the receptacle and it would be difficult for a child, for example, to reach the live terminals because both the latch and the door moving means must be actuated before the door is moved to open position. At the same time, insertion of a plug into the new receptacle or removal of a plug therefrom requires only a straight line movement of the plug, so that in manner of use, the new receptacle is the same as one of conventional construction.

The construction described permits the use of a relatively stiff spring for maintaining the door in closed position and, consequently, when the plug is removed, the door is moved toward closed position quickly and with considerable force. Receptacles of this general type are frequently used in circuits in which the currents flowing are such that, with the ordinary receptacle and plug, the breaking of a circuit by removal of a plug results in an arc which may extend from the live terminal out through the end of the receptacle. Under some conditions, the formation of such an arc may present a considerable fire hazard, as, for example, when the receptacle is located in a baseboard near inflammable curtains. With the new receptacle, the removal of the plug causes the door to be moved rapidly to closed position, with the result that any arc that may form is instantly suppressed and the hazard is avoided.

The new receptacle has less parts than the receptacles disclosed in my patent and, in addition, the parts are of simpler construction and easier and less expensive to make. Also, assembly of the new receptacle is easier. The operating parts of the new receptacle are more rugged than those of the receptacles of the patent, and this insures that the new receptacle will have a longer life and be less likely to break down in service. Also, the use of the spring as the means through which force is applied to the door to open the latter protects the receptacle against injury, since the moving means can be actuated, even though the door is latched against movement, without any injury being done to the parts.

I claim:

1. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, spring means tending to resist movement of the door member

away from closing position, and means accessible through another hole and operable upon the spring means to cause the latter, upon release of the latch, to move the door member away from closing position.

2. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, spring means tending to resist movement of the door member away from closing position, and means accessible through a second hole and operable upon the spring means to cause the latter, upon release of the latch, to move the door member away from closing position a distance greater than the dimension of the second hole in the direction of such movement of the door member.

3. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, spring means tending to resist movement of the door member away from closing position, and a swinging element accessible through another hole and operable upon the spring means to cause the latter, upon release of the latch, to move the door member from closing position.

4. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, spring means tending to resist movement of the door member away from closing position, and means accessible through another hole and operable upon the spring means to cause the latter to move the door member away from closing position.

5. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, spring means tending to resist movement of the door member away from closing position, and means accessible through a second hole and operable upon the spring means to cause the latter to move the door member away from closing position a distance greater than the dimension of the second hole in the direction of such movement of the door member.

6. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, spring means tending to resist movement of the door member away from closing position, and a swinging element accessible through another hole and operable upon the spring means to cause the latter to move the door member away from closing position.

7. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals and movable in a plane away from closing position to afford such access, spring means resisting movement of the door member away from closing position, and an element mounted for swinging movement about an axis parallel to the plane of movement of the door member and operable through one of the holes to act upon the spring means to cause the latter to move the door member away from closing position.

8. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals and movable in a plane away from closing position to afford such access, spring means resisting movement of the door member away from closing position, a shaft mounted for oscillation on an axis parallel to the plane of movement of the door member, an arm on the shaft engageable through one of the holes to rock the shaft, and a second arm carried by the shaft and operable upon the rocking of the latter to move the door member away from closing position.

9. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals and movable in a plane away from closing position to afford such access, spring means resisting movement of the door member away from closing position, an element mounted for swinging movement about an axis parallel to the plane of movement of the door member and operable through one of the holes to move the door member away from closing position, and a latch normally locking the door member in closing position and releasable through a second hole.

10. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals and movable in a plane away from closing position to afford such access, spring means resisting movement of the door member away from closing position, and means accessible through another hole and operable upon the spring means to cause the latter to move the door member away from closing position.

11. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, a spring having a portion engaging the door member, and means accessible through one of the holes and engaging another portion of said spring, said means being operable to flex said spring to cause the first portion thereof to move the door member away from closing position, said second portion of the spring normally acting through said means to maintain said door member in closed position.

12. In an electric receptacle having at least a pair of terminals and holes into which the con-

nection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member pivoted for swinging movement and normally closing the holes to cut off access to the terminals, a spring tending to resist movement of the door member away from closing position, and means accessible through one of the holes to act upon the spring to cause the latter to move the door member away from closing position.

13. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member pivoted for swinging movement and normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, and means accessible through another hole and operable upon release of the latch to swing the door member away from closing position.

14. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member pivoted for swinging movement and normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, means accessible through another hole and operable upon release of the latch to swing the door member away from closing position, and spring means tending to resist movement of the door member away from closing position.

15. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member pivoted for swinging movement and normally closing the holes to cut off access to the terminals, a latch normally locking the door member in closing position and releasable through one of the holes, means tending to resist movement of the door member away from closing position, and means accessible through a second hole and operable through the spring means, upon release of the latch, to move the door member away from closing position.

16. In an electric receptacle having at least a pair of terminals and holes into which the connection prongs of a plug may be inserted to make contact with the terminals, the combination of a door member normally closing the holes to cut off access to the terminals, a spring having a portion seated in a recess in the door member and serving as a latch to hold the door member in closing position, said portion of the spring being accessible through one of the holes for flexure to release the door member, a swinging element accessible through another hole, and a spring having a portion engaging the door member and another portion acting through the swinging element to resist movement of the door member away from closing position, the swinging element being operable through the second spring, upon release of the latch, to move the door member away from closing position.

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