

March 18, 1941.

D. S. ROSS

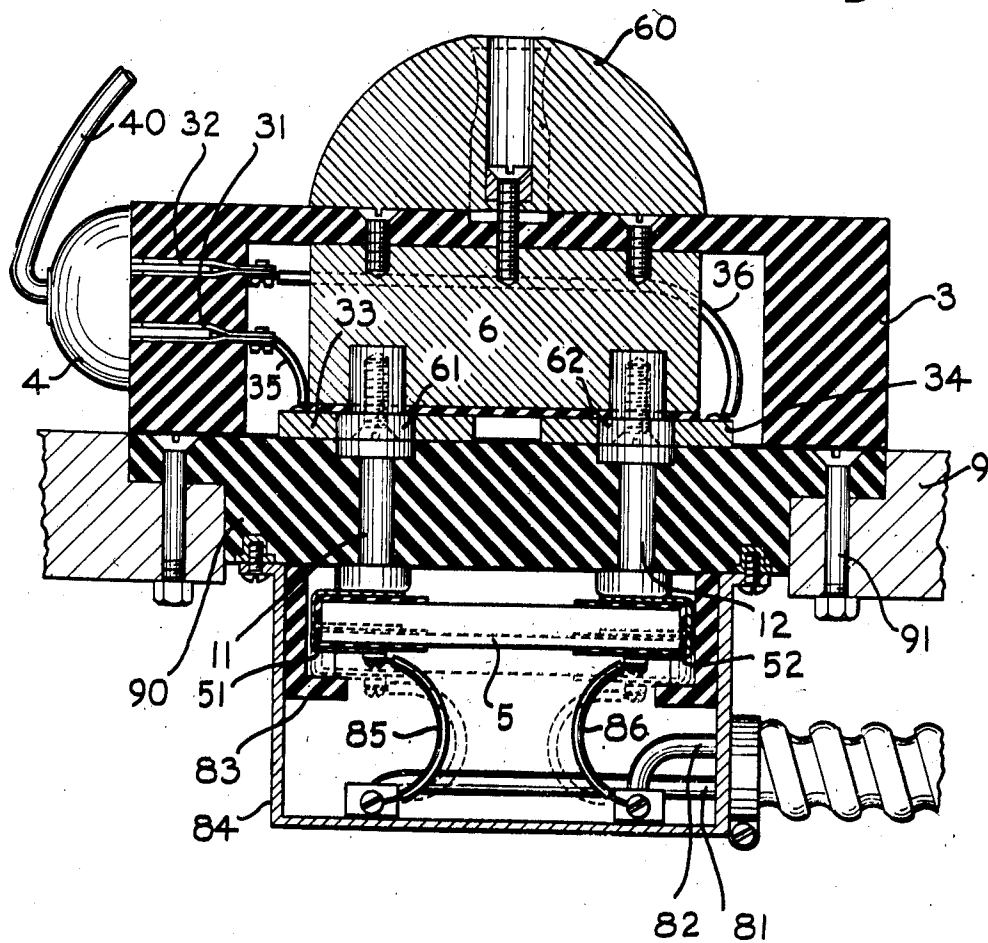
2,234,982

FLUSH FLOOR ELECTRIC OUTLET

Filed April 7, 1939

4 Sheets-Sheet 1

Fig. 1



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Fig. 3

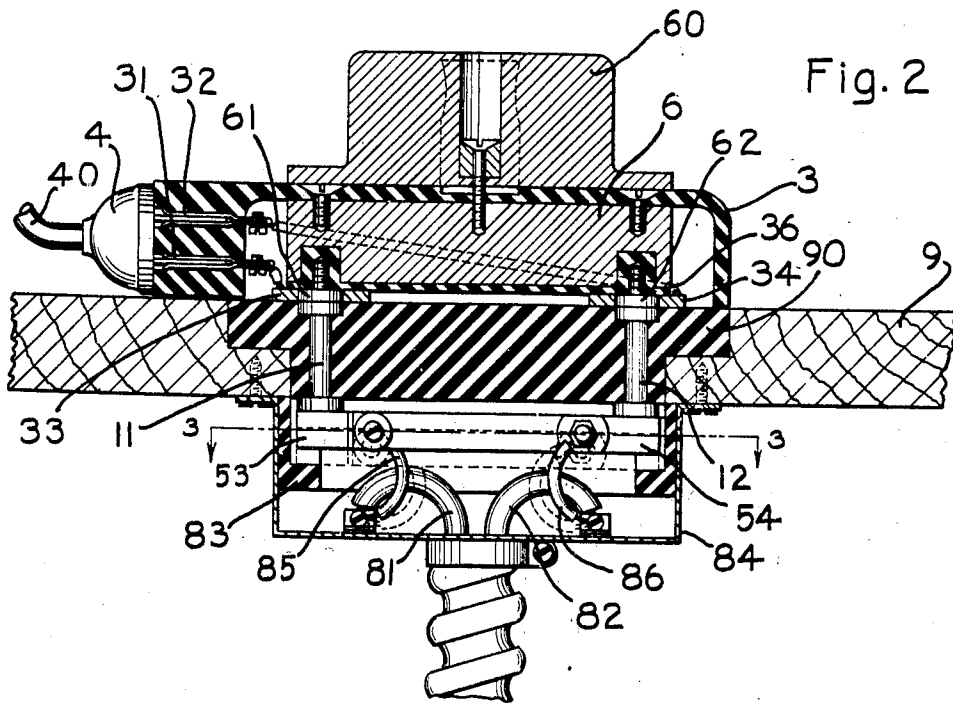
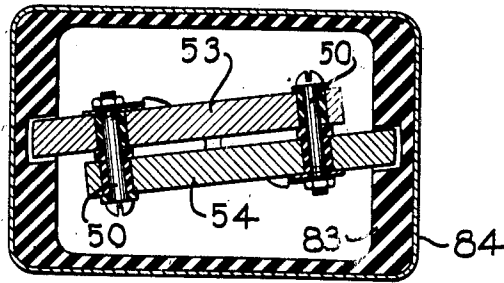


Fig. 2

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Fig. 5

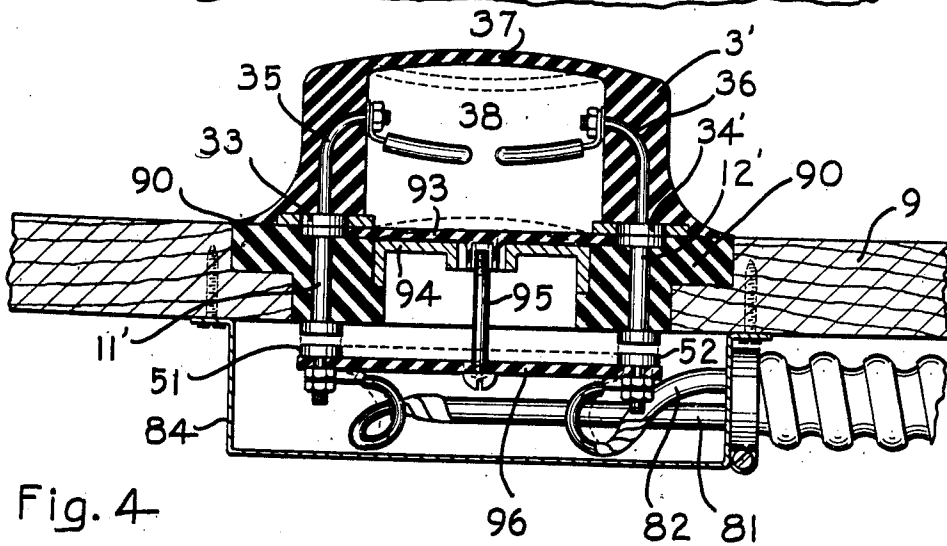
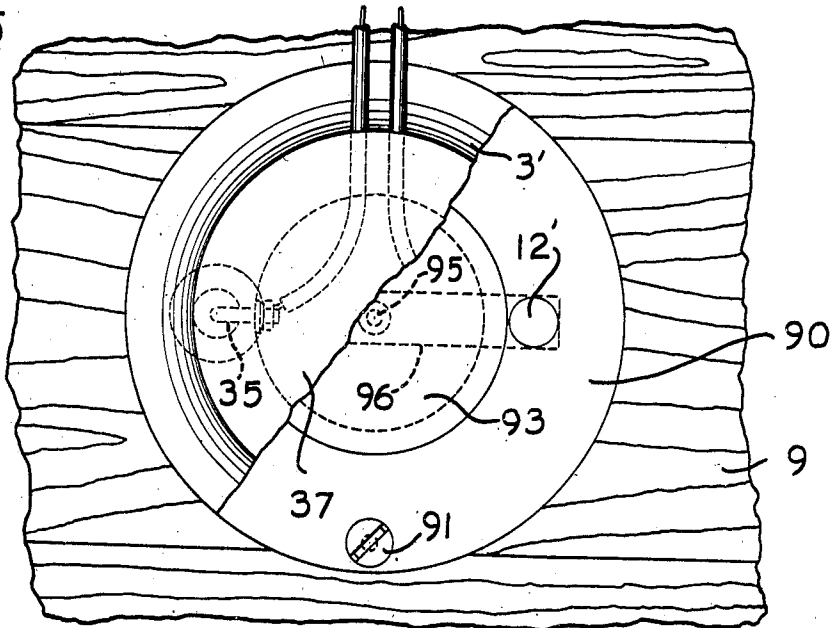


Fig. 4

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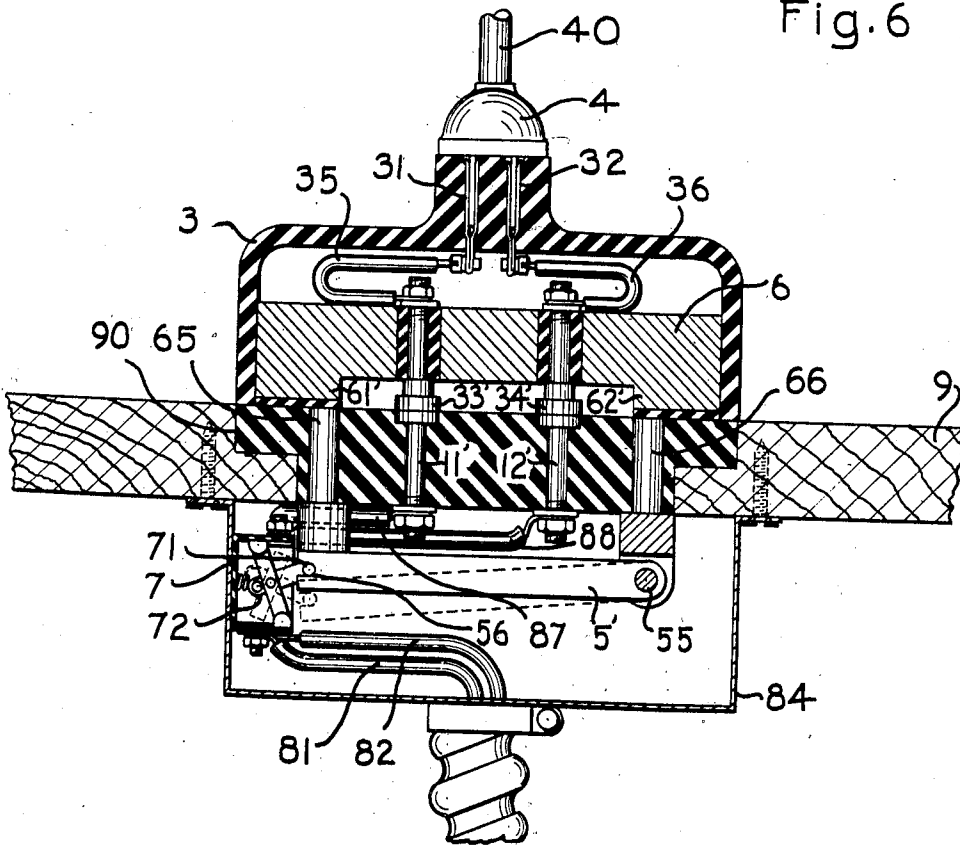
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FLUSH FLOOR ELECTRIC OUTLET

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Fig. 6



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UNITED STATES PATENT OFFICE

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FLUSH FLOOR ELECTRIC OUTLET

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Application April 7, 1939, Serial No. 266,496

16 Claims. (Cl. 200—83)

My invention relates to electrical connectors or convenience outlets, and its uses and purposes are best illustrated in connection with a floor outlet rather than a wall outlet, for with floor outlets certain peculiar problems are involved, to the solution of which my invention is peculiarly adapted. It is not to be understood, however, that the invention is susceptible of use only with, or that it is restricted to, floor outlets, for its principles are equally usable with other types of outlets, e. g., wall outlets, if the occasion so requires. The invention, then, may be said to pertain to electric connectors to close a circuit to and through a removable member, at the opposite or normally inaccessible side of a partition, a floor being one special type of partition.

It is frequently desirable to provide a convenience outlet for electric current in floors, to avoid leading length of wire over or under carpeting or across the bare floor from a wall outlet. The normal type of outlet, however, is impracticable for use in a floor, for the reason that the open holes or sockets provided therein, for the reception of plugs or prongs, open into the interior of the socket, and communicate with the electrical conductors within the socket; these openings will at the least collect dust and dirt, and will perhaps fail to function properly, and may indeed receive metallic objects, such as hairpins, which will thus come into contact with a live conductor, and which may shock a person touching them, or perhaps through heat generated by resistance become a fire hazard. Such open sockets within a floor have come to be recognized as undesirable and potentially dangerous, and some building codes prohibit their use.

It is one of the principal objects of the present invention to provide an outlet of such type that it may be used in a floor, yet is completely closed over, has no aperture whatsoever leading to the interior, and has no conductor which can be connected to the current source at such time as the conductor is exposed.

A subsidiary object is thereby attained, namely, to provide a convenient outlet which may be installed in a floor, and which may be completely and fully flush with the floor, without a break or crack, so as to constitute in effect no break in the smooth continuity of the floor.

More specifically it is an object to provide an outlet of the general type indicated, which is provided with two conductors, or such number as is required, which extend through the floor, to be flush with the surface of the floor, and which are

capable of being connected in an electric circuit and thereby of transmitting electric current to a removable member resting upon the floor and applied to the conductors, but which connection, beneath the floor, is not accomplished until, and by reason of, the placement of the removable member in proper position with relation to the connector or outlet. This placement of the removable member, corresponding to the plug, serves automatically to effect movement of a circuit-closing means or switch beneath the floor, thereby to close the circuit through the conductors. This movement of the circuit-closing means may be effected by a force which can be projected through the floor, as, for instance, the force of magnetism, or a suction force or a pressure force, or the like.

By such means a further object is achieved, namely, that the removable member is held in its proper position relative to the outlet by a force which is sufficient to prevent normal accidental displacement of the removable member, such as the forces of magnetism or suction, previously referred to, to the end that the positioning and holding functions normally accomplished by the prongs of a plug are no longer required.

It is a further object, of course, to provide such a connector in which the electrical circuit to the conductors which extend through the floor is automatically broken or interrupted by the action of removing the removable member, which latter can be accomplished at the will of the operator in opposition to the force which prevents accidental displacement of the removable member.

With these and other objects in mind, as will appear hereafter, my invention comprises the novel parts, and the novel combination and arrangement thereof, as shown in the accompanying drawings, described in this specification, and as will be more particularly pointed out by the claims which terminate the same.

In the accompanying drawings I have shown my invention embodied in various forms illustrating the principles of my invention in different forms of execution.

Figure 1 is a sectional view through the floor, illustrating a preferred form of the invention, utilizing the force of magnetism.

Figure 2 is a view similar to Figure 1, showing a somewhat modified form of the invention, and Figure 3 is a section, taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view similar to Figures 1 and 2, illustrating a modified form of the inven-

tion employing the force of suction, and Figure 5 is a top plan view of the same, with parts broken away.

Figure 6 is a view similar to Figure 1, illustrating a further modification, employing the force of magnetism, but accomplishing the making and breaking of the electric current in a different manner.

The floor is indicated at 9, and at the desired location a hole is cut in the floor which is closed and filled flush by a filter plate 90, preferably of insulating material, such as fiber. The filler plate 90 is suitably held in place, as for instance by the bolts 91, which again are flush with the floor. Through the insulating plate 90 extend two conductors 11 and 12, by means of which electric current from a source indicated as the lead-in wires 81 and 82 is conducted to an outlet such as the jacks 31 and 32, within which are receivable the prongs of an ordinary appliance plug 4. Obviously the upper ends of the conductors 11 and 12 should be finished flush with the plate 90, so that the entire surface is smooth and flush with the surface of the floor 9.

It is self-evident that the conductors 11 and 12 can not be alive, nor be capable of being left alive, except when they are protected against contact with dirt or other foreign matter, or against accidentally touching them. They may be protected, in this instance, by a housing device or casing 3, which may be of insulating material, and which carries the jacks 31 and 32 and connections between the latter and the conductors 11 and 12, but means must be provided which will only permit the conductors 11 and 12 to be connected to the current source when the housing 3 is in place, and which will automatically break the connection of the conductors to the current source upon and by removal of the casing 3.

To this end I employ a force which will act through the partition, or through the filler plate 90, the force-producing member being carried by the casing 3, so that it is only active when the casing is in place. This force may be the force of magnetism, acting through pole pieces that extend through the filler plate 90, and which may be, indeed, the same conductors 11 and 12, if these are made of magnetic material, as is preferred; or this force may be the force of suction, as in the form illustrated in Figures 4 and 5, or a pressure force.

In the form shown in Figure 1 electric terminals 51 and 52 are carried upon but insulated from the opposite ends of a bar or armature 5, which is of magnetic material, so that it will be attracted by a magnetic force. The magnetic armature 5 is supported and guided by brackets 83 within a housing or junction box 84, and the lead-in wires 81 and 82, or somewhat more flexible extensions thereof 85 and 86, respectively, are connected to the respective terminals 51 and 52. The armature 5 is held by gravity in the dash line position, where it is adjacent but spaced from the lower ends of the electric and magnetic conductors 11 and 12, which now function as the pole pieces of a magnet, whenever the pole pieces are magnetized. These pole pieces are magnetized, whenever it is desired to close the circuit, by a permanent magnet 6, which is supported by and housed within the casing 3. Magnetic contacts 61 and 62 are carried by the opposite poles of the magnet 6, but electrically insulated from the latter, in position to contact with the upper ends of the terminals or pole pieces 11 and 12. These magnetic terminals 61 and 62 are extended

or are in electrical connection with extensions 33 and 34, of non-magnetic material, from which the respective leads 35 and 36 extend to the jacks 31 and 32. A handle 60 may be of non-magnetic material, or may be of magnetic material, to serve as a keeper for the magnet 6, if desired. In the latter case it should be so pivotally connected, as shown in Figures 1 and 2, that it may be turned and held, while the magnet is attracting the armature 5, out of the magnetic path, as shown in dash lines in these views. A keeper is not strictly essential, some magnets being of material not easily demagnetized, or the magnet may be replaced from time to time if it loses its strength.

As it is believed will now be evident, when the magnet 6 is removed, the pole pieces 11 and 12 are demagnetized, and the armature 5 drops to its dash line position, and hence there is no electrical circuit connected through to the pole pieces 11 and 12. Upon placing the magnet 6 in proper position, as shown, the pole pieces 11 and 12 are magnetized, attracting the armature 5, and thereby closing the electric circuit from the lead-in wires 81, 82 through the flexible leads 85, 86, through the terminals 51 and 52, thence through the pole pieces or conductors 11 and 12, the magnetic terminals 61 and 62, the extensions 33 and 34, the leads 35 and 36, to the outlet terminals 31 and 32. Now the plug 4 may be connected and disconnected in the normal way, and to all intents and purposes the floor outlet, though flush and dead when not in use, becomes the full equivalent of a normal socketed convenience outlet.

It may be noted that the force of magnetism may be sufficiently strong, and will be normally, that an accidental pull on the cord 40 to the appliance will not pull the magnet 6 away from the conductors 11 and 12. Indeed, the housing 3 may be part of a heavy object, not easily moved, such as the base of a floor lamp. It may be pointed out, too, that while the same physical pieces 11 and 12 are used both for electrical conductors and for magnetic pole pieces, separate pieces may be employed, so that the electrical and magnetic functions are divided. Such an arrangement is shown in Figure 6. In such an arrangement the magnetic pole pieces need not show at the floor surface, for they will work sufficiently well if they are concealed beneath a thin cover.

Whenever it is desired to remove the housing 3 and the magnet 6 this may be done by exerting sufficient force to lift the magnet or to push it aside, and immediately the magnet is removed the pole pieces 11 and 12 are demagnetized, and the armature 5 drops down and breaks the electric circuit through the electric conductors 11 and 12.

The same general arrangement obtains in the form shown in Figures 2 and 3, save that instead of insulating the two terminals 51 and 52 from a single magnetic armature 5, the armature is divided into two electrically insulated bars 53 and 54, connected by the bolts 50 each of which is connected electrically to a different one of these constituent bars of the armature, but is insulated from the other. These bolts may serve as the binding posts for the flexible leads 85 and 86.

In Figure 6 the arrangement is similar to that previously described, the armature 5' in this instance being pivoted at 55 upon one of the magnetic pole pieces 66, and its free end being movable towards and from the opposite magnetic pole piece 65. The electric conductors 11' and

12', respectively, carry only electric current in this instance, and in consequence are physically separate from and electrically insulated from the magnetic pole pieces 65 and 66, and from the magnet 6, and from any contact with the armature 5'. As a result the electrical contact points 33' and 34' are independent of the magnetic pole tips 61' and 62'.

Since the electric circuits are entirely divorced from the magnetic armature 5' in this form, it is necessary to provide other means for making and breaking the electric circuit. Such means, however, are under the control of the armature. Thus the armature 5' is notched, as indicated at 56, to receive a pin 71 upon the end of a switch tumbler arm 72, forming part of an electric switch 7, to which the lead-in wires 81 and 82 are connected, and from which the leads 87 and 88 extend to the respective electric conductors 11' and 12'. The switch 7 is preferably of a snap type, working, however, against a comparatively weak spring, and is thrown into the open position by the downward swing of the armature 5' under the influence of gravity. As the magnet is attracted, however, the switch is thrown, by upward movement of the armature, into closed position, thereby closing the circuit through the electric conductors 11' and 12', as the magnetic circuit is closed by contact of the armature 5' with the magnetic conductors 65 and 66.

In Figures 4 and 5 similar principles are illustrated in conjunction with operation under the influence of a suction force. The filler plate 90 in this instance is provided with a central aperture closed by a flexible diaphragm 93, supported from below by a plate 94. The flexible diaphragm 93 may be of rubber, for instance, so that it will distend but will return to its normal, flat position. It is suitably clamped and held in place, and normally forms a smooth, flush continuation of the floor surface, but may be flexed upwardly, as is indicated in dash lines, if acted on by suction, upwardly directed. To it, by a pin 95, is connected a bar 96 of insulating material, which carries the electric terminals 51 and 52. No magnetic terminals are required, merely the electrical conductors 11' and 12'. The housing 3' in this instance is formed with a flexible wall, indicated at 37, and encloses a chamber 38 of appreciable volume.

When the housing 3' is removed there is no force to pull upwardly the flexible diaphragm 93, and consequently the bar 96 with its contacts 51 and 52. The flexible diaphragm 93 therefore falls to its full-line position, where it is supported by the plate 94. When the casing 3' is put in place, however, and its flexible wall 37 is pushed inwardly, air is expelled from the chamber 38, about the margin of the casing, and since the margin of the casing fits closely down to the surface of the filler plate 90, air may not reenter the chamber 38, but upon release of pressure from the wall 37 the latter, by its own inherent stiffness, tends to restore itself from the dash-line position to the full-line position. Spring means or other assisting means may be employed to insure that this takes place, if desired or necessary, and such spring means may be used with the magnetic forms of the device. Upon restoration of the shape of the casing 3' the partial vacuum within the chamber 38 draws upwardly the flexible diaphragm 93, thereby drawing upwardly the bar 96 and making contact between the electric terminals 51 and 52 and the electric conductors 11' and 12'. Again,

as in the other instances, the electrical connection is broken merely by removal of the casing 3'.

What I claim as my invention is:

1. Means to effect an electrical connection through a partition, one side whereof is normally inaccessible, comprising, in combination, electrical conductors of magnetic material extending through the partition, a magnetic removable member applicable to the accessible ends of the conductors, but electrically insulated therefrom, a magnetic armature adjacent but normally spaced from the inaccessible ends of the conductors, and movable under the influence of transmitted magnetic force into contact with such conductors, insulated live electrical terminals connected to said armature, and movable with the latter into contact with the corresponding conductors, and outlet terminals carried by and insulated from the removable member, and disposed to contact the accessible ends of the conductors, to be energized upon attraction of the armature.

2. A flush floor electrical outlet, comprising a pair of electrically insulated conductors of magnetic material extending through and terminating flush with the floor, a magnetic armature beneath the floor and supported to be attracted and moved by magnetization of the conductors, a pair of live insulated terminals carried by the armature in position to contact the conductors, but normally out of contact therewith, a magnet supported upon the floor and applicable to the conductors to magnetize them and thus to move the armature, and a pair of outlet terminals electrically insulated from the magnet, but disposed for electrical contact with the conductors by such disposition of the magnet.

3. A flush floor electrical outlet, comprising a pair of electrically insulated conductors of magnetic material extending through and terminating flush with the floor, a magnetic armature beneath the floor and supported in position to be attracted and moved by magnetization of the conductors, a pair of live terminals beneath the floor, means electrically connecting said live terminals with the conductors, including circuit-breaking means normally open, but connected for movement into closed position by magnetic attraction of the armature, a magnet supported upon the floor and applicable to the conductors to magnetize them and thus to attract the armature, and a pair of outlet terminals electrically insulated from the magnet, but disposed for electrical contact with the conductors by such disposition of the magnet.

4. A flush floor electrical outlet, comprising a pair of magnetic pole pieces extending through and terminating flush with the floor, a magnetic armature supported beneath the floor in position to be moved towards the pole pieces by magnetization of the latter, a magnet supported upon the floor and applicable to the pole pieces to magnetize them, outlet electric terminals carried by the magnet, and terminating in contact points in the bottom surface of the magnet, conductors flush with the floor, in position to contact said contact points, normally open switch means beneath the floor, in the circuit which includes said conductors, and operatively connected with said armature to be closed by magnetic attraction of the latter, thereby to close the switch-controlled circuit through the outlet terminals.

5. A flush floor electrical outlet, comprising electric conductors extending through and ter-

minating flush with the floor, complementary live contact points beneath the floor movable into and from contact with the respective conductors, and normally out of contact therewith, a magnetic armature operatively connected to said live contact points to move them, a housing, electric terminals carried by the housing and disposed to contact the upper ends of the respective conductors, and a magnet likewise carried by the housing and associated with the terminals, and positioned, by the positioning of the terminals in contact with the conductors, to attract the armature, thereby to close the electric circuit.

6. A flush floor electrical outlet, comprising electric conductors extending through and terminating flush with the floor, normally open circuit closing means in circuit with the conductors, and disposed beneath the floor, a magnetic armature operatively connected to said switch closing means to close the circuit when the armature is attracted, electric terminals disposed to contact the upper ends of the respective conductors, and a magnet associated with the terminals, and positioned, when the terminals are in contact with the conductors, to attract the armature, thereby to actuate the circuit closing means and to close the circuit through the conductors and the contacting terminals.

7. Means to effect an electrical connection through a partition, one side whereof is normally inaccessible, comprising, in combination, two electrical conductors extending through the partition, two electric inlet terminals at the inaccessible side of the partition, one corresponding to each of the conductors, and normally out of contact therewith, a common support for the two inlet terminals, means guiding such support for movement of the inlet terminals into and from contact with the respective conductors, a removable member applicable to the accessible ends of the conductors, carrying two outlet terminals disposed to contact each one of the conductors, and means carried by the removable member, and operable when the removable member is thus positioned to project an attractive force to the common support for the inlet terminals, thereby to attract and move such support, and thus to close the circuit through the outlet terminals.

8. Means to effect an electrical connection through a partition, one side whereof is normally inaccessible, comprising, in combination, an electrical conductor extending through the partition, a separate magnetic conductor extending through the partition, an electric inlet terminal at the inaccessible side of the partition, normally out of electrical contact with, but movable into such contact with, the electrical conductor, a magnetic armature at the inaccessible side of the partition, disposed to be attracted and moved by the magnetic conductor when the latter is magnetized, and operatively connected to the inlet terminal to move the latter into electrical contact with its conductor, when the armature is so moved, a removable member applicable to the accessible side of the partition, an outlet electric terminal carried by said removable member in position to contact the electrical conductor, and a magnet carried by the removable member, and applicable to the magnetic conductor, to magnetize the same, and thus to close the electric circuit.

9. Means to effect an electrical connection through a partition, one side whereof is normally inaccessible, comprising, in combination, an electrical conductor extending through the partition, a pair of normally open switch points at the in-

accessible side of the partition, one whereof is alive and the other whereof is electrically connected to the conductor, a magnetic armature at the inaccessible side of the partition, operatively connected to but electrically insulated from one of the switch points, to open or close the switch, a removable member applicable to the accessible side of the partition, an outlet electrical terminal carried thereby in position to contact the conductor, and means carried by the removable member to impress a magnetic force, through the partition, upon the armature, to close the switch.

10. Means to effect an electrical connection through a partition, one side whereof is normally inaccessible, comprising, in combination, an electrical conductor extending through the partition, a pair of normally open switch points at the inaccessible side of the partition, one whereof is alive and the other whereof is electrically connected to the conductor, a movable member at the inaccessible side of the partition, operatively connected to but electrically insulated from one of the switch points, to open or close the switch, a removable member applicable to the accessible side of the partition, an outlet electrical terminal carried thereby in position to contact the conductor, and means carried by the removable member to impress a force, through the partition, upon the armature, to close the switch.

11. An attachment member for connecting an electric cord or the like to a current source, and for use with an electrical outlet which incorporates a pair of conductors, and magnetizable means to close a switch to connect the conductors to such current source, said attachment member comprising a pair of terminals connected to the two wires of the cord, and disposed to contact the respective conductors of the outlet, and a magnet associated with said terminals, the latter being electrically insulated from the magnet.

12. An attachment member for use with an electrical outlet wherein an electric circuit is closed to include two exposed conductors by movement of a submerged element, to enable the connection of an electric cord or the like to the exposed conductors and thence to connect the cord in the electric circuit, said attachment member comprising a pair of terminals connected respectively to the two wires of the cord, and means electrically insulated from the terminals, and active, upon application to such an outlet, to project an attractive force to effect movement of the submerged element, and thereby to effect closure of the electric circuit through the exposed conductors, the terminals, and the cord.

13. An electric outlet for use with an attachment member which incorporates a pair of insulated terminals connected to the wires of a current consumer, and a means to project a force, said electric outlet comprising a face plate, two insulated electric conductors supported therein and extending therethrough from its submerged face to its exposed face, in position to contact the respective terminals of the attachment member, means constituting a normally open electric switch, disposed at the submerged face of the face plate, and when closed connecting said conductors in an electric circuit, and means disposed at the submerged face of the face plate, and movable under the influence of a force projected from the appropriate means of the attachment member, to close said switch, thereby

to close the electric circuit through the switch, the conductors, the terminals, the cord, and the current consumer.

5 14. An electric outlet for use with an attachment member which incorporates a pair of insulated terminals connected to wires of a current consumer, and a magnet, said electric outlet comprising a face plate, two insulated electric conductors extending therethrough from its
10 face which is submerged in use to its exposed face, in position to be contacted by the respective terminals of the attachment member, means constituting a normally open electric switch,
15 disposed at the submerged face of the face plate, organized and arranged, when closed, to connect the respective conductors in an electric circuit and a magnetic armature operatively connected to the electric switch, and disposed at the submerged face of the face plate, and movable under
20 the influence of the attachment's magnet to close the switch, thereby to close the electric circuit to include the current consumer.

25 15. In combination, an electric outlet comprising a face plate, two insulated conductors extending therethrough from that face which is submerged in use to its then-exposed face, means

constituting a normally open electric switch, disposed at the submerged face of the face plate, organized and arranged, when closed, to connect the respective conductors in an electric circuit,
5 a movable switch-operating element disposed at the submerged face of the face plate, and normally self-moving to switch-open position, and an attachment member for use with such an outlet, said attachment member comprising a pair
10 of insulated terminals connected to the two wires of an electric cord or the like, and disposed to contact the exposed ends of the respective conductors, and means electrically insulated from the terminals, and active, upon application of
15 the attachment member to the exposed face of the face plate, to project an attractive force to effect movement of the submerged switch-operating element, and thereby to effect closure of the electric circuit through the switch, the
20 conductors, the terminals, and the cord.

16. The combination of claim 15, wherein the switch-operating element is a magnetic armature, and the attachment-carried means is a permanent magnet.

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