United States Patent

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[45] **Oct. 24, 1972**

[54] **GROUNDING RECEPTACLE**

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[21] Appl. No.: **178,025**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 829,566, June 2, 1969, abandoned.

[52] **U.S. Cl.** .....**339/14 R**

[51] **Int. Cl.** **H01r 3/06**

[58] **Field of Search**.....339/14, 34, 35, 40, 41, 42, 339/43, 44

[56] **References Cited**

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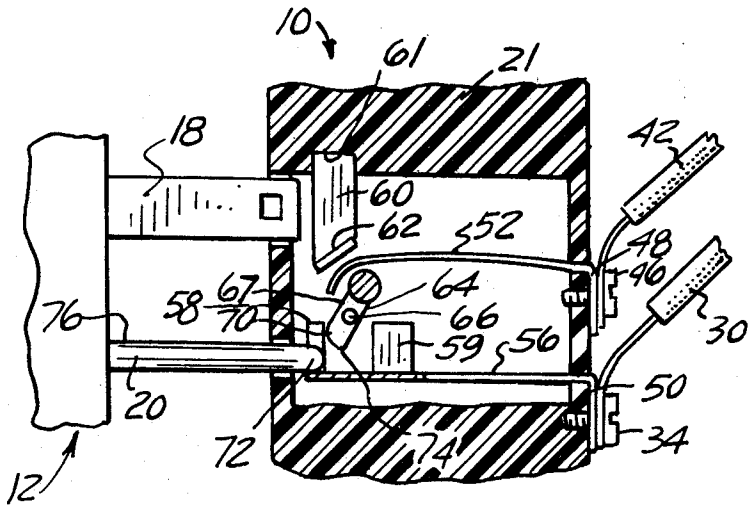
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Assistant Examiner—Robert A. Hafer
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[57] **ABSTRACT**

An electrical grounding receptacle for receiving an electrical plug having power blade terminals and a grounding prong, carries an insulative bar which cooperatively pivots upon insertion of the grounding prong into the receptacle, to cause electrical engagement between power contacts receiving the plug blade terminals and, for example, resilient conductors connected to receptacle power input terminals.

9 Claims, 8 Drawing Figures



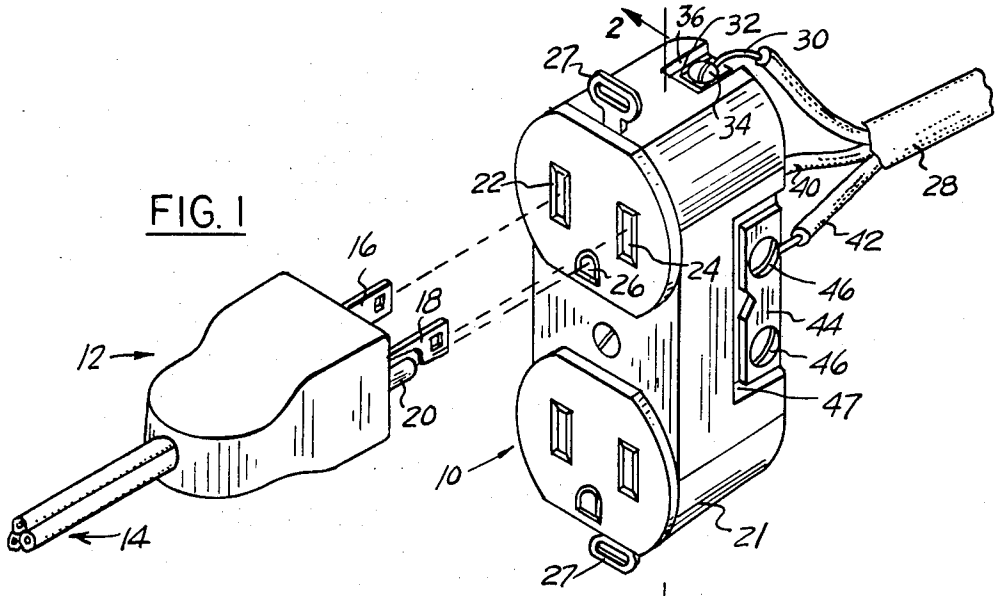


FIG. 1

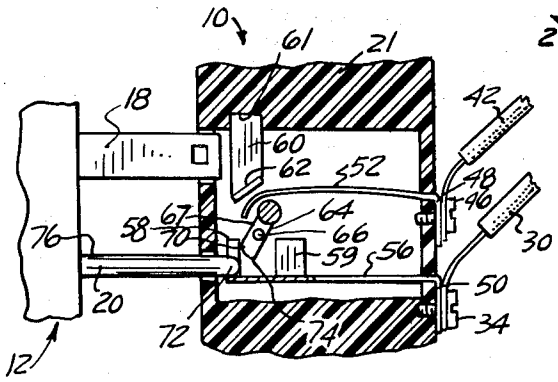


FIG. 2

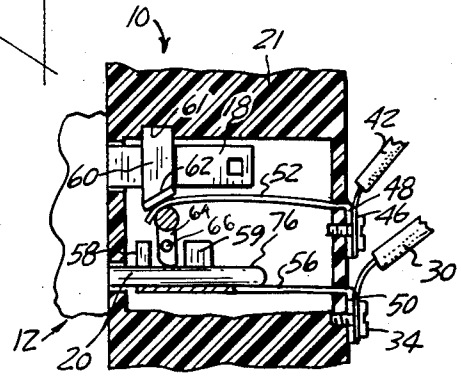


FIG. 3

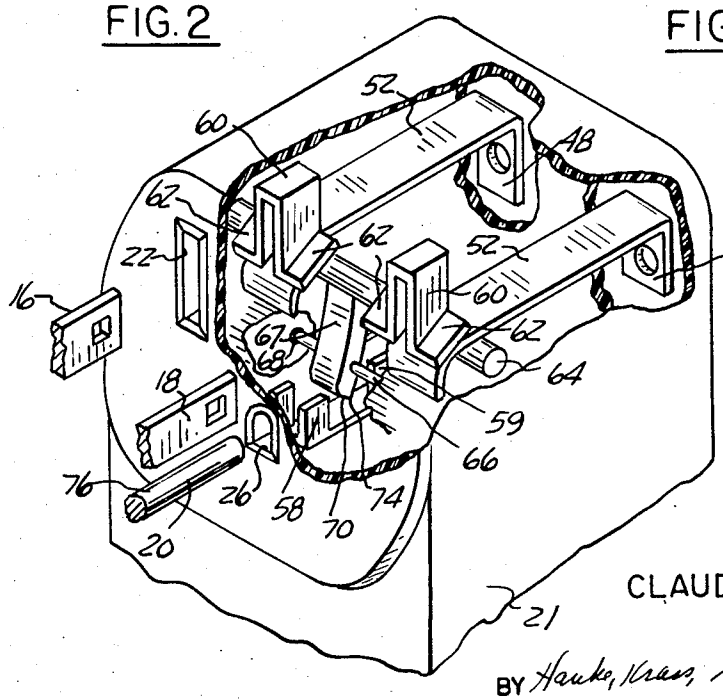


FIG. 4

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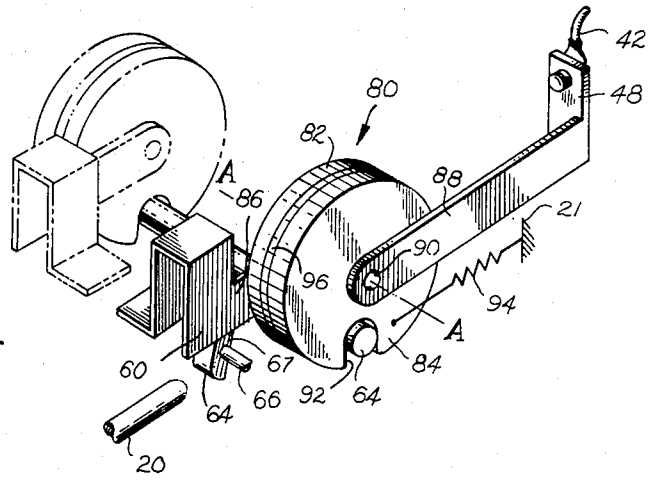


FIG. 5

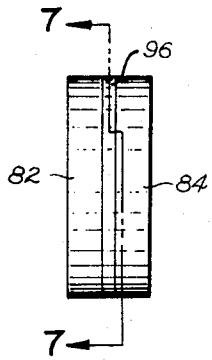


FIG. 6

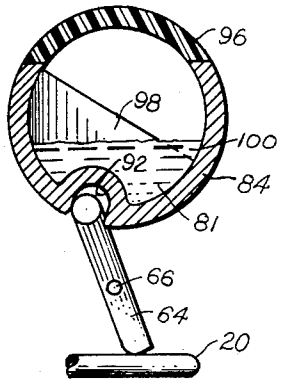


FIG. 7

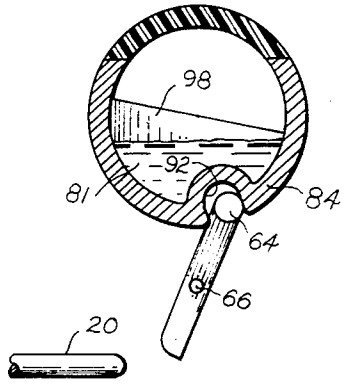


FIG. 8

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GROUNDING RECEPTACLE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my copending application, Ser. No. 829,566, filed June 2, 1969, now abandoned.

FIELD OF THE INVENTION

This invention relates to grounding receptacles and in particular to an electrical grounding receptacle wherein an electrical path is provided therethrough only after insertion of a plug grounding prong.

SUMMARY OF THE INVENTION

A startling number of injuries and deaths are caused each year by defective electrical equipment. All-too-frequently these mishaps are a result of operators continuing to use equipment which has faulty grounding plugs, particularly those having a ground prong missing. Accordingly, there is need for a device which connects electrical equipment to a source of electrical power only when that equipment has an electric cord plug which has an intact grounding prong. The present invention provides such a device. A conventional electrical receptacle or the like having the standard slot and hole arrangement for receiving a standard three prong electrical plug is ideally suited for modification and incorporation of the device. The device is carried within the receptacle body and engages an inserted grounding prong, thereby cooperatively moving and causing an electrical circuit to be made through the receptacle between simultaneously inserted plug power blades and a power source connected to the receptacle. An illustrative example of such a device comprises a bar which is engaged by the grounding prong to cooperatively slide, rotate, pivot, or similarly move to a position whereat an electrical connection is made inside the receptacle between the receptacle input terminals connected to an electrical power source and receptacle output terminals connected to an electrical appliance.

The internal connection can be made in any manner well known in the art, such as through mechanical linkages, conductive fluids or the like. The bar returns to a ready position when the grounding prong is extracted. It should be appreciated that established outside dimensions and the exterior appearances of receptacles need not necessarily be changed to embody the invention.

DESCRIPTION OF THE DRAWINGS

The description refers to the accompanying drawings in which like reference characters refer to like parts throughout the several views and in which:

FIG. 1 is a perspective view of one preferred electrical receptacle embodying the invention and disposed for receiving the illustrated plug;

FIG. 2 is a fragmentary side elevational and partially cross-sectional view of the receptacle taken substantially along line 2—2 of FIG. 1, disposed for receiving the plug of FIG. 1;

FIG. 3 is a view similar to FIG. 1 illustrating the plug engaged with the receptacle;

FIG. 4 is a fragmentary perspective view, partially broken away, of a portion of the receptacle shown in FIG. 1 disposed for receiving the illustrated plug terminals;

FIG. 5 is a fragmentary perspective view of a portion of the receptacle shown in FIG. 1, modified to include a conductive fluid carrying drum;

FIG. 6 is a side view of the conductive fluid carrying drum of FIG. 5;

FIG. 7 is a fragmentary cross-sectional view of the conductive fluid carrying drum along the line 7—7 of FIG. 6, engaging other elements of the receptacle and plug; and

FIG. 8 is a partial cross-sectional view of the conductive fluid carrying drum along the line 7—7 of FIG. 6, engaging elements of the receptacle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

There is shown in FIG. 1 a duplex receptacle **10** in accordance with the principles of the invention disposed in receiving position for a three prong electrical plug **12** attached to one end of an insulated three wire cord **14** extending from an electrical appliance (not shown). The wires of the cord **14** are individually connected inside the plug **12** in a manner well known in the art to plug power blades **16** and **18** and plug grounding prong **20**, disposed in the conventional geometric array. For well established safety reasons, the grounding wire connected to the grounding prong **20** is connected at its other end to the chassis of the electrical appliance. The face of the receptacle **10** has elongated power blade slots **22** and **24** and grounding prong aperture **26** disposed for receiving the terminals and prong of the plug **12**. The bottom plug openings in the duplex receptacle **10**, as illustrated in FIG. **1**, are typically arranged.

The utility of the receptacle **10** embodying the invention parallels that of other receptacles well known in the art and accordingly the receptacle **10** is constructed for mounting into walls, partitions or the like, and is generally contained within and fastened to a receptacle box (not shown) at mounting tabs **27**. The receptacle **10** has an insulative body **21** preferably formed of a thermo-setting plastic and is adapted to receive electrical power in a conventional manner and accordingly is preferably wired with underwriters approved electrical cable or the like, such as that illustrated at **28**.

For safety reasons, a grounding wire **30** preferably insulated passes from the cable **28** to an electrical contact plate **32**, disposed within a recess **36** of the body **21** and is connected thereto by a threaded screw **34** or the like. Likewise, power wires **40** and **42** having electrical insulation coatings pass from cable **28** and are each connected to individual electrical contact plates **44**, which are disposed at the bases of body recesses **47** on opposite lateral sides of the receptacle **10**. The wires **40** and **42** are electrically connected to their respective plate **44** by threaded screws **46** or the like.

In FIGS. **2**, **3** and **4**, for illustrative purposes only, the power wire **42** is shown as being attached to a contact plate **48** disposed at the back side of the receptacle body **21** and is preferably held in electrical engagement therewith by a screw **46** threaded to an aperture in the plate **48**. Likewise, for illustrative purposes, the grounding wire **30** is electrically connected at the back side of the electrical body **21** to a contact plate **50** by a screw **34** threaded to an aperture in the plate **50**. Although not shown, the connection of the power wire **40** is typical of the connection of the wire **42**.

Integral with each contact plate 48 is a transversely extending resilient cantilever contact-conductor 52 passing from the backside inwardly toward the front face of the receptacle 10. The cantilever contact-conductor 52 is formed of resilient electrically conductive material, such as beryllium copper, and is preferably arcuately shaped to be spring biased and normally apart from other included conductors.

Similarly, a grounding contact arm 56 extends transversely from the grounding contact plate 50 inwardly toward the face of the receptacle 10 to form two substantially U-shaped portions 58 and 59 for electrically engaging the grounding prong 20 when the plug 12 is inserted into the receptacle 10.

In a conventional receptacle, inserted power blades 16 and 18 engage a female contact which is at all times electrically energized by being connected directly to an exteriorly disposed terminal board which has attached thereto a wire conducting current from a power source. In the instant case, as best illustrated in FIG. 4, female contacts 60 constructed to engage the power blades 16 and 18 of the plug 12 are not directly connected to an external power source. To provide an electrical path from engaged power blades 16 and 18 through the female contacts 60 to an external power source, an insulative pivot bar 64 is provided to cooperatively move when the grounding prong 20 is inserted to urge the resilient cantilever contact-conductors 52 into electrical engagement with the female contacts 60 to thereby complete the power path.

The female contacts 60 are substantially U-shaped and are invertedly disposed and positionally locked within body recesses, such as recess 61, disposed about the contacts 60, as best illustrated in FIGS. 2 and 3. Extending transversely outwardly from the open end of the contacts 60 at an inclined lateral angle, as best illustrated in FIGS. 2 and 3, are contact flanges 62 for electrically engaging the arcuate cantilever contact-conductors 52 when forced into contact by the pivot bar 64. To this end, the bar 64 is substantially T-shaped and has a pivot pin 66 affixed to and extending through the leg 67 of the pivot bar 64 to pivotally journal within the receptacle body 21 at apertures 68 disposed at each end of the pin 66 to thereby dispose the end portion 70 of the leg 67 in position for engagement with the grounding prong 20.

The grounding prong 20 generally extends farther out from the plug bottom than do the generally coextensive power blades 16 and 18. This construction provides for maximum safety by completing an electrically grounding circuit to the electrical appliance before it is electrically energized. The shape of the grounding prong 20 can vary within certain set standards, but is generally cylindrical with a bullet shaped end or is channel shaped in the form of a U. Accordingly, when the plug 12 is inserted into the face of the receptacle 10, the grounding prong 20 initially engages the U-shaped grounding contact portion 58 closest to the face and after slight additional insertion, engages the end portion 70 of the pivot bar leg 67, as best seen in FIG. 2. The end portion 70 of the bar 64 is generally beveled and preferably at an angle disposed 50° to 65° to an imaginary longitudinal axis extending through the bar leg 67. The end of the leg 67 has sufficient breadth to engage all approved configurations of the grounding prong 20. Engagement of the end 72 of the grounding prong 20 at the beveled end portion 70 causes the pivot bar 64 to cooperatively pivot as the ground prong 20 is inserted farther. The U-shaped grounding contact portions 58 and 59 are spaced apart to provide for unrestricted pivotal movement of the pivotal bar 64. The bar 64 pivots about the transverse axis of the pivot pin 66 to come to bear against each arcuate cantilever contact-conductor 52 to thereby urge them into electrical engagement with the flanges 62 of the female contacts 60. When fully inserted, the grounding prong 20 is electrically engaged with both grounding contact portions 58 and 59.

Good electrical contact is maintained between flanges 62 and contact-conductors 52, since after the bar 64 pivots sufficiently to ride around the end portion 72 of the prong 20, the apex 74 of the beveled end portion 70 remains in sliding engagement with the uppermost peripheral surface 76 of the prong 20. This engagement tends to arcuately stress the pivot bar 64, thereby maintaining slight continuing force against the grounding prong and the cantilever contacts 52. It is preferred that the insulative material of the pivot bar 64 also be slightly resilient and generally less wear resistant than the material used to form the grounding prong 20.

When the plug 12 is withdrawn from the receptacle 10 the cantilever contact-conductors 52 are electrically disengaged from the flanges 62 of the female contacts 60. To this end, the cantilever contact-conductors 52 are resiliently biased to be normally disposed away from the female contact flanges 62 and to return to their normal position after extraction of the plug 12, as illustrated in FIG. 2. Accordingly, after the plug 12 is withdrawn from the receptacle 10, the resiliently biased cantilever contact-conductors 52 bear against the pivot bar 64 to urge it away from the electrical engagement position and the contact-conductors 52 return to their normal positions. For additional force to break electrical contact at the female contacts 60, a modification comprising a spring (not shown) disposed about the pivot pin 66, between the bar 64 and the receptacle body 21 or similarly, tending to pivot the bar 64 in a clockwise direction, as viewed in FIGS. 2 and 3, is advantageous.

An additional modification, for added resiliency, includes coining an upwardly extending longitudinally elongated dimple into each of the contact-conductors 52, preferably at the area of electrical contact with the female contacts 60.

Alternate embodiments may include conductive fluids for making electrical contact, as hereinbefore mentioned. In a FIG. 5, there is illustrated a drum 80 carrying an electrically conductive fluid 81, for example, liquid mercury. The drum 80 is formed of electrically conductive end caps 82 and 84 pivotally engaging, respectively, an electrically conductive support arm 86 extending from one female contact 60 and an electrically conductive support arm 88 extending from the plate 48 disposed at the back side of the receptacle insulative body 21 for receiving electrical power. On a central axis A—A of the drum 80 there is provided dimples in each of the end caps 82 and 84 for respectively receiving complementary fitting raised conical formations 90 defined by the support arms 86 and 88 at

the axis A—A. The support arms **86** and **88** are slightly resilient and biased toward each other to securely pivotally carry the drum **80** captured between them.

The drum **80** has an oversized U-shaped cutout **92** engaging the top crossed portion of the T-shaped pivot bar **64** to rotate the drum **80** about the axis A—A. The drum **80** is normally disposed for receiving the plug **12** with the U-shaped cutout **92** rearward most in the receptacle **10**, as illustrated in FIG. **8**. A biasing coil spring **94** is provided and is affixed at one end to the drum **80** generally vertically below the rotational axis A—A with the opposite end of the spring **94** affixed to the receptacle insulative body **21**, to normally orientate the drum **80** as hereinbefore explained and as shown in FIG. **8**.

The described structural arrangement of the drum **80** and the support arms **86** and **88** for electrically energizing the plug power blade **18** is typical and it will be appreciated that the opposite elements including the opposite female contact **60**, shown in broken line in FIG. **5**, aligned to receive the plug power blade **16** is similarly structured.

From FIGS. **6**, **7** and **8**, it will be appreciated that the drum **80** generally comprises a shell of unitary construction comprising the electrically conductive end caps **82** and **84** electrically insulated from each other and sealed fluid tight to an insulative middle section **96** formed of any suitable material, for example, ceramic. Referring to FIGS. **7** and **8**, it will be appreciated that the insulative middle section **96** is planar with a generally circular shape having a web section **98** extending across the circularly formed insulative section **96**, to provide an opening between the electrically conductive end caps **82** and **84** of the drum **80**.

In operation, the pivot bar **64** is caused to pivot about the pivot pin **66**, as hereinbefore described, and cooperatively rotates the conductive fluid carrying drum **80** about the axis A—A. The cooperative movement is provided for by the arcuate motion of the pivot bar **64** within the U-shaped cutout **92** in the drum **80**. In FIGS. **5** and **8**, the grounding prong **20** is shown disengaged from the pivot bar **64** and particularly in FIG. **8**, it is evident that the electrically conductive fluid **81** is at a level below the top of the web section **98** of the insulative middle section **98**.

FIG. **7** illustrates the grounding prong **20** in an inserted position whereat the pivot bar **64** has pivoted to cooperatively move the drum **80** to reorientate the web section **98** to provide for an overflow of electrically conductive fluid **81** from, for example, each of the end caps **82** and **84** across the top of the web section **98** to thereby provide for continuous conductive fluid **81** between the electrically conductive end caps **82** and **84** at, for example, the area **100**. When the grounding prong **20** is inserted, as shown in FIG. **7**, a complete electrical circuit is made between the electrically powered plate **48** through the support arm **88** and, as hereinbefore described, through the electrically conductive fluid carrying drum **80** through and to the extending support arm **86** thereby providing electrical power in the female contact **60**.

When the grounding prong **20** is removed the coil spring **94** returns the drum **80** to its normal disposition, as generally illustrated in FIG. **8**, and the electrically conductive fluid **81** can no longer bridge the gap across the top of the web section **98** to complete the electrical circuit and the female contact **60** is thereby electrically deenergized.

Having described my invention, I now claim:

1. An electrical receptacle for electrically engaging a plug having a grounding prong and at least one power blade, comprising:

an insulative body defining openings for respectively receiving the grounding prong and the power blade of the plug;

a power contactor for engaging the power blade of the plug, the power contactor fixedly carried by the body and aligned to the opening for receiving the power blade;

a grounding contactor for electrically grounding the grounding prong of the plug, the grounding contactor carried by the body and aligned to the opening for receiving the grounding prong;

conductive means carried by the body for receiving electrical power to electrically energize the power contactor when the plug engages the receptacle; and

means carried by the body for engaging the grounding prong to pivot to cooperatively move the conductive means to electrically energize the power contactor and thereby the power blade when the plug engages the receptacle.

2. The electrical receptacle as defined in claim **1**, wherein the conductive means comprises an electrically conductive resilient member, biased to be spaced apart from the power contactor before insertion and after extraction of the grounding prong.

3. The electrical receptacle as defined in claim **2**, wherein said resilient member substantially comprises an arcuate leaf spring.

4. The electrical receptacle as defined in claim **1**, wherein the means carried by the body for engaging the grounding prong comprises an insulative bar pivotally carried by the body for engaging the grounding prong to pivot and cooperatively electrically connect the conductive means and the power blade, when the grounding prong is inserted into the receptacle.

5. The electrical receptacle as defined in claim **1**, wherein said conductive means comprises an electrically conductive fluid.

6. The electrical receptacle, as defined in claim **5**, wherein the electrically conductive fluid is carried by,

container means rotatably engaging the means carried by the body for engaging the grounding prong to cooperatively rotate when the grounding prong of the plug engages the receptacle to thereby provide an electrical path through the conductive fluid to electrically energize the power contactor.

7. The electrical receptacle, as defined in claim **6**, wherein the container means carrying the electrically conductive fluid comprises:

a closed container having two generally similarly shaped electrically conductive end sections generally hollow to carry the electrically conductive fluid, the end sections affixed to a middle section electrically insulative to electrically separate the end sections, the middle section defining a passageway for the electrically conductive fluid to flow to make an electrical circuit between the electrically conductive end sections when the con-

tainer cooperatively pivots at such time as the grounding prong of the plug engages the receptacle, to thereby complete an electrical path through the container.

8. The electrical receptacle, as defined in claim 7, wherein the closed container is resiliently biased to normally dispose the container to preclude electrically conductive fluid in the passageway to electrically separate the end sections of the container when the ground prong of the plug is disengaged from the receptacle.

9. An electrical receptacle for receiving an electrical plug having a grounding prong and a pair of power blades, comprising:

an insulative body having a pair of power blade slots and a grounding prong slot for receiving the plug;

power contacts carried by said body for individually engaging each power blade;

a grounding contact carried by said body adaptable to electrically ground the prong;

conductive members carried by said body for respective engagement with said power contacts, each conductive member is biased to be normally spaced apart from its respective power contact; and

an insulative bar pivotally carried by said body for engaging the grounding prong to cooperatively pivot and cause electrical engagement between respective conductive members and power contacts upon insertion of the plug into said receptacle, to thereby establish an electrical circuit through said receptacle.

* * * * *