

[54] **ELECTRICAL PLUG WITH GROUND PRONG ACTIVATED SWITCH**

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[51] Int. Cl.² **H01R 33/30**

[58] Field of Search 339/14 P; 200/51.07, 51.08,
200/51.09, 51 R; 174/51

[56] **References Cited**
UNITED STATES PATENTS

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[57] **ABSTRACT**

A plug for a conventional 110 volt electrical appliance includes switches between the two current carrying prongs and the wires leading to the appliance. The switches are normally open. The ground prong is longitudinally movable in the plug and urged outwardly by a spring. When the plug is inserted into a socket, the ground prong contacts the back of the socket before the plug is completely inserted. Continued insertion of the plug causes the ground prong to be moved an additional distance into the plug. As this occurs, a cam attached to the ground prong closes the switches thereby establishing an electrical connection between the current carrying prongs and the appliance wires.

12 Claims, 4 Drawing Figures

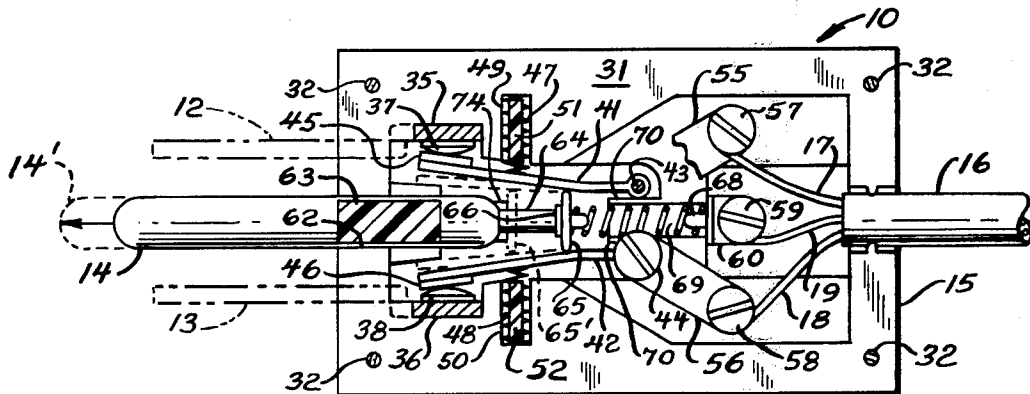


Fig. 1

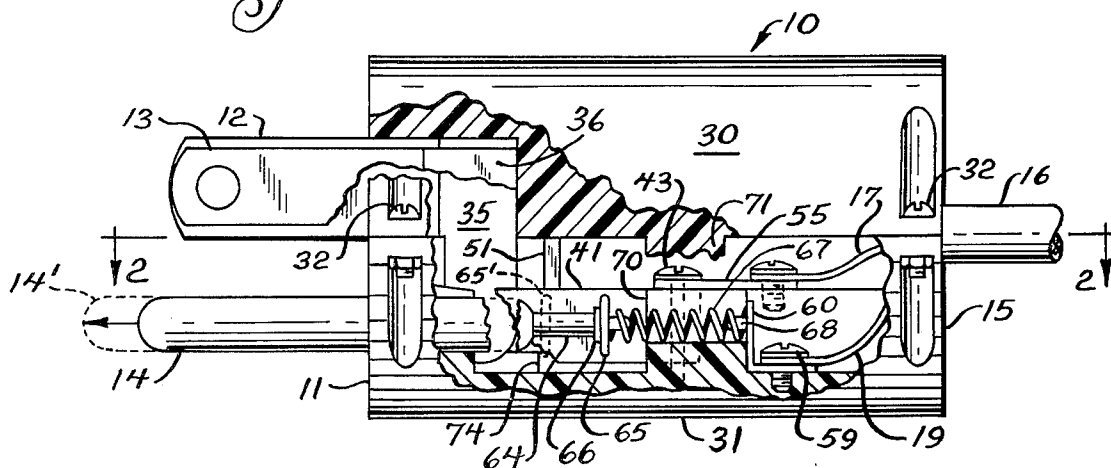


Fig. 2

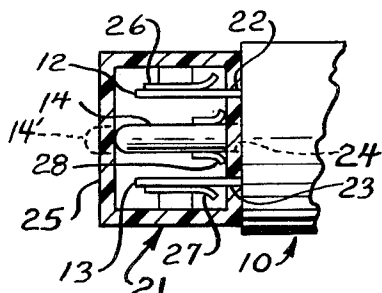
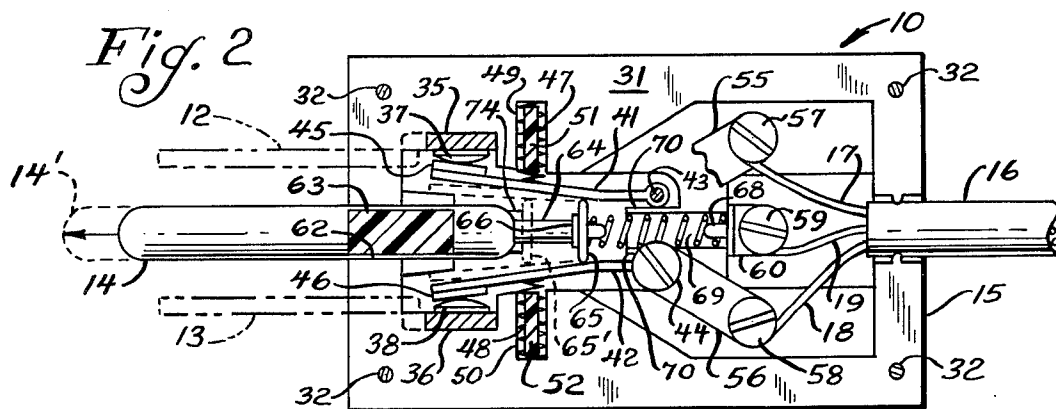


Fig. 4

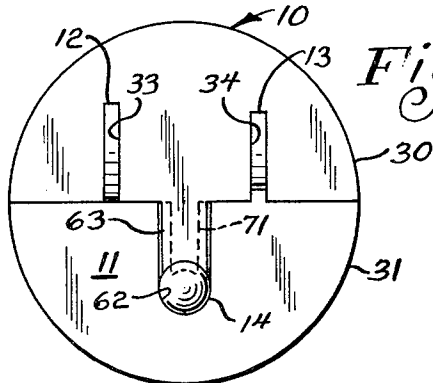


Fig. 3

ELECTRICAL PLUG WITH GROUND PRONG ACTIVATED SWITCH

BACKGROUND AND SUMMARY OF THE INVENTION

The electrical wiring of appliances, such as for example might be used about the home, and the sockets for those appliances are normally made so that the user of the appliance will be protected against electrical shock or electrocution. Some of these protective features are: (1) the plug and socket are polarized so that a particular wire to the appliance will be at ground potential and a second particular wire will be at elevated potential with respect to ground; (2) a separate ground prong is employed by which the case, frame, etc., of the appliance is connected to ground. However, it is not uncommon for these protective provisions to be circumvented either intentionally or unintentionally. One example would be a two-wire extension cord being used with the result that the ground prong of the plug is not actually connected to ground.

The principal object of the present invention is to provide a further safety feature in the nature of a plug for the appliance which will prevent the application of electrical power to the appliance unless the plug is inserted into a suitable electric socket. That is, if the plug is inserted into a two-wire socket having no provision for a ground plug, such as can occur when using a two-wire extension cord, a switch in the plug will remain open thereby preventing any electrical power from reaching the appliance. This is accomplished by having switches for the power wires which are actuated by the insertion of the ground prong of the plug into an appropriate socket.

It is not uncommon for individuals using appliances, etc., having a grounded plug to break off (or otherwise remove) the ground prong so as to be able to insert the plug into any socket without the necessity of using an adapter. This practice is rather prevalent among workmen who are using power tools in diverse locations. A plug incorporating the present invention will not function to supply power to the appliance or tool should the ground prong have been removed. Thus such an undesirable practice, which avoids the safety of having the appliance or tool grounded, is defeated because it would render the plug completely unworkable to supply power.

Further objects and advantages will become apparent from the following description.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view, partially broken away, of an embodiment of my invention;

FIG. 2 is a view of a plug half as seen at line 2—2 of FIG. 1;

FIG. 3 is an end view of the plug of the illustrated embodiment; and

FIG. 4 is a sectional view of an electrical socket with the plug inserted therein.

DESCRIPTION OF SPECIFIC EMBODIMENT

The following disclosure is offered for public dissemination in return for the grant of a patent. Although it is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how others may later disguise it by

variations in form or additions or further improvements.

An electrical plug has a body, generally 10, of insulating material (plastic, rubber, etc.). Extending from an end 11 of the body are two metal current carrying prongs 12 and 13 and a ground prong 14. Extending from the opposite end 15 of the body is an electrical cord 16 for an appliance, etc. Within the cord 16 are two power wires 17 and 18 and a grounding wire 19.

Such plugs are intended to be used with an electrical socket, generally 21. Such a socket comprises a body of insulating material. In the outer wall of the body are two openings 22 and 23 whereby the socket defines ways to receive current prongs 12 and 13, respectively. The body defines a third way of which opening 24 is a part to receive the ground prong 14. The back side of the socket is formed by a wall 25. A spring contact 26 extends along the way for prong 12 so that it will engage prong 12 when the plug is inserted into the socket. Similarly, there is a spring contact 27 for prong 13. Immediately adjacent the entrance end of the way for prong 14 are spring contacts 28. Contacts 26 and 27 are connected to power supply wires (not shown). It is the conventional practice for contact 26 to be grounded and contact 27 to be at an elevated potential with respect to ground (i.e., the "hot" contact). Prong 14 always extends out farther from the body 10 of the plug so that it engages prong 28 before prongs 12 and 13 are engaged by contacts 26 and 27. This (plus the positioning of the contacts) ensures that the appliance will be grounded before the electrical current is permitted to enter prongs 12 and 13. To the extent that an electrical plug and socket are described above, the description is illustrative of the conventional items.

In the illustrated embodiment the body 10 is formed by two halves 30 and 31, respectively. These halves are held together with bolts 32. The power prongs 12 and 13 are received in slots 33 and 34 in body half 30. They are integral with arms 35 and 36, respectively, which extend into body half 31. On the ends of arms 35 and 36 are switch contacts 37 and 38.

A pair of metal switch arms 41 and 42 have their proximal ends journaled on screws 43 and 44. The distal ends of the arms carry electrical contacts 45 and 46. The proximal (or pivot) ends of the arms are closer together than are the distal (or contact) ends of the arms. The arms are urged toward each other by springs 47 and 48 which are received in openings 49 and 50 in body half 31. The body half 30 has projections 51 and 52 which extend down to a position immediately above the springs so as to hold the springs in the openings.

Metal straps 55 and 56 connect screws 43 and 57 and 44 and 58, respectively. Screws 57 and 58, along with the straps, form the connectors for power wires 17 and 18. A screw 59 and a metal L-shaped member 60 form the connector for ground wire 19. These screws are all threaded into the body as well as into the members 55, 56, 60.

The ground prong 14 extends through a U-shaped opening 62 in body member 31. A projection 63 extends from body member 30 into this U-shaped opening in body member 31 so as to close the top of this opening. Thereby the ground prong 14 is journaled in the body 10 for longitudinal movement of the prong in the body. The inner end of the prong 14 has a stem 64 which, like the prong, is of metal. A washer 65 of insulating material is slipped over stem 64 and abuts a col-

lar 66 which is an integral part of the stem 64. A metal spring 67 is slipped over and frictionally engages a stem 64. The spring abuts washer 65 and holds it against collar 66. Opposed parts of the periphery of washer 65 contact switch arms 41 and 42 and the washer acts as a cam for actuating the switch arms to the switch-closed position. The other end of the spring 67 slips over a projection 68 which is a part of the L-shaped member 60. The spring also abuts member 60. The spring is silver soldered to stem 64 and prong 14 and acts as an electrical connection between the prong and L-shaped member 60. The spring is positioned in an opening 69 in the body 31. Part of this opening is defined by walls 70 of body 31. Thereby the spring is insulated from screws 43 and 44. A projection 71 extends from body part 30 to a position immediately above spring 67, thereby holding the spring in opening 69. This projection does not show in FIG. 2, having been deleted to facilitate the illustration of other features.

The ground prong 14 is urged to the left by spring 67 so that it normally extends out to the dashed line 14' illustrated in FIGS. 1 and 2. When in this position it extends farther from the plug than is the case with conventional plugs. The extent of this outward movement of the ground prong is established by washer 65 contacting a shoulder 74 formed by body half 31. The position of the washer against the shoulder is illustrated by the dashed lines 65' in FIGS. 1 and 2. When in this position, the washer permits the spring arms 41 and 42 to move to the switch-open position (illustrated in dashed lines in FIG. 2) under the urging of springs 47 and 48. This is the normal arrangement of the switches.

When the plug is inserted into a socket, as illustrated in FIG. 4, the prong 14, due to its being longer than is conventional, comes into contact with the rear wall 25 of the socket, the rear wall being an abutment and acting as a restraining means to restrain the movement of the ground prong. As the contact with the rear wall is made and the plug continues to be inserted into the socket, that continued insertion causes the ground prong to be moved along its longitudinal axis from the dashed line position to the full line position in FIGS. 1, 2 and 4. As this movement occurs, the cam action of washer 65 bearing against the switch arms 41 and 42 urges the switch arms outwardly against the resistance of springs 47 and 48. When the plug is fully inserted into the socket the switches are closed as illustrated in FIGS. 1 and 2; thus, an electrical circuit is completed from the power prongs 12, 13 to the power wires 17, 18.

I claim:

1. In an electrical plug including a body having an end, two current carrying prongs extending from said end, a ground prong extending from said end and having a longitudinal axis and wire connector means for connecting electrical wires to the respective prongs, said ground prong normally extending a given distance from said body, which plug is to be inserted into an electrical socket having first and second ways for receiving the current carrying prongs respectively, a third way for receiving the ground prong and means associated with the third way for restricting movement of the ground prong with respect to the third way, the improvement wherein said plug includes:

switch means in said body and connected between one of said current carrying prongs and the respective wire connector means, said switch means being

movable between switch-open and switch-closed positions;

said body journaling said ground prong for longitudinal movement between a first position at which the ground prong extends more than said given distance from said body and a second position at which the ground prong extends approximately said given distance from said body;

means engaging said body and said ground prong for resiliently urging said ground prong toward said first position and away from said second position; and

switch operating means engaging said ground prong and said switch means for placing said switch means in switch-open position when said ground prong is in the first position and placing said switch means in switch-closed position when the ground prong is in the second position;

whereby when the plug is not in the socket the ground prong is in the first position and the switch means is in the switch-open position, and when the plug is inserted into the socket the means associated with the third way restricts the movement of the ground prong thereby moving the ground prong from the first to the second position and thus placing the switch means in the switch-closed position.

2. In an electrical plug as set forth in claim 1, wherein said switch operating means includes a spring urging the switch means toward the switch-open position.

3. In an electrical plug as set forth in claim 2, wherein said switch means includes a metal switch arm having a distal end and a proximal end, a first switch contact on the distal end, a second switch contact, means connecting the second switch contact to said one prong, and means connecting the switch arm to said respective wire connector means; and said switch operating means including cam means attached to said ground prong and engaging said switch arm for moving said switch arm to the switch-closed position against the urging of the spring of the switch operating means when the ground prong moves to the second position, thereby bringing the contacts together.

4. In an electrical plug as set forth in claim 3, wherein said proximal end of the arm is closer to said axis and farther from said body end than is the distal end of the arm, said cam means extending outwardly from said axis and contacting said arm between said ends.

5. In an electrical plug as set forth in claim 4, wherein there is a second switch means corresponding to the first recited switch means and connected between the other of the current carrying prongs and the respective wire connector means, the switch arms of the two switch means being on opposite sides of the axis, said cam means engaging both switch arms.

6. In an electrical plug as set forth in claim 1, wherein there is a second switch means corresponding to the first recited switch means and connected between the other of the current carrying prongs and the respective wire connector means, said switch operating means engaging both of said switch means.

7. In an electrical plug as set forth in claim 6, wherein each of said switch means includes a metal switch arm having a distal end and a proximal end, a first switch contact on the distal end, a second switch contact, means connecting the second switch contact to said one prong, and means connecting

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the switch arm to said respective wire connector means; and

said switch operating means including cam means attached to said ground prong and engaging said switch arms for moving said switch arms to the switch closed position against the urging of the springs of the switch operating means when the ground prong moves to the second position, thereby bringing the contacts together.

8. In an electrical plug as set forth in claim 7, wherein the proximal ends of the arms are closer to said axis and farther from said body end than are the distal ends of the respective arms, said cam means extending outwardly from said axis and contacting said arms between said ends.

9. In an electrical plug as set forth in claim 1, wherein said switch means includes a metal switch arm having a distal end and a proximal end, a first switch contact on the distal end, a second switch contact, means connecting the second switch contact to said one prong, and means connecting the switch arm to said respective wire connector means; and

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said switch operating means including cam means attached to said ground prong and engaging said switch arm for moving said switch arm to the switch closed position against the urging of the spring of the switch operating means when the ground prong moves to the second position, thereby bringing the contacts together.

10. In an electrical plug as set forth in claim 9, wherein said proximal end of the arm is closer to said axis and farther from said body end than is the distal end of the arm, said cam means extending outwardly from said axis and contacting said arm between said ends.

11. The combination of an electrical plug and socket as set forth in claim 1.

12. The combination as set forth in claim 11, wherein the way for the ground prong has an inner end and an outer end, said means for restricting movement of the ground prong comprising an abutment at the inner end of the way for the ground prong.

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