An electric plug having a pair of alternative retractable prongs for insertion into an electrical receptacle connected with a source of electrical power. The electrical plug is arranged with a pair of contact blades which are inserted into appropriate slots in the electrical terminal or receptacle and also with a pair of ground prongs, one of which can be inserted in the ground opening of the receptacle assuming it is a three opening receptacle. The two round ground plugs are retractable into the housing for the plug. Both of the ground plugs are connected to the ground of the appliance. The appliance may be a refrigerator, television set, recreational vehicle or other vehicle or power tool or any other type of appliance with which the plug is designed to cooperate. One of the two blade contacts is connected to the positive side of the appliance and the other blade contact is connected to the neutral or negative side of the appliance. The neutral lead has a Y formed therein and a lead is provided from the end of the Y through a resistance, a small neon light, and a buzzer and back to the ground terminal of the cable leading to the plug. Means are provided for manually retracting either of the ground prong contacts, the means consisting of a button attached to each one of the ground prongs.

11 Claims, 8 Drawing Figures
REVERSIBLE SAFETY GROUND PLUG

BACKGROUND OF THE INVENTION

1. Field
This invention relates to an electric plug for insertion into an electrical receptacle constituting a source of electric power to connect the power through the plug and a three line cable connecting to an "appliance." An appliance as used herein is an appliance such as a recreational vehicle or other type of vehicle or a freezer, television set, a power tool or any other type of appliance. The plug is designed to correct a fault and eliminate a danger which is becoming increasingly more prevalent. The problem is one that is particularly important in connection with the use of a recreational vehicle and the discussion below refers to uses in connection with recreational vehicles as an example of the use. The danger is one which is very important and in a literal sense is shocking.

When an electrical plug is inserted into an electrical receptacle connected to a source of electrical power and the plug is inserted incorrectly into the receptacle or the positive lead and the neutral lead of the receptacle are reversed from the proper condition, the flow of electricity creates a hazard which is appreciated by many people having electrical knowledge but not by all people who use such appliances. Many articles have been written and published pointing out this problem and hazards connected therewith. For instance, an article entitled "Let's Travel" by Johnny Johnson in the May 1970 issue of "Travel Life Magazine"; an article by Bill Estes in the November 1970 issue of "Trailer Life"; an article by Carl Avrum in the January 1971 issue of Woodall's Trailer Travel Magazine; an article entitled "Camper's Circuits" in the March 1971 issue of the Woodall's Trailer Travel Magazine; an article by Carl Avrum in the May 1971 issue of Woodall's Travel Trailer Magazine and many other similar articles.

2. Description of Prior Art
Many devices have been devised to try to correct this difficulty. For example, one device consists of an adapter plug to be attached to a three prong plug to use in a two prong socket. There is a wire on the adapter which should be connected to the face plate (slipped under a face plate screw) if the plug-in box is to be grounded. If this wire is not connected (and few users take the trouble to connect it) the connection would be quite hazardous if the polarity is crossed and shocks have often been received. In fact deaths have occurred.

Another device is a ground monitor which can be inserted in a receptacle to determine whether the receptacle has the proper polarity and then if it has, the three prong plug can be correctly inserted. However, the device is complex, complicated to read, and for the most part is another piece of equipment which the camper must have accessible at the time of hooking the vehicle to the power source. Its only function is to tell the user what is right or wrong as the case may be, it has no facilities to make the necessary corrections. The fact of the matter is, only a small percentage of the recreational vehicle owners using such equipment know about this common problem and as a result, hundreds of electrical cords are often left lying on the ground unused because the owner has received an electrical shock and doesn't know what caused it or what to do about it.

Another device, of course, is a test rig by which the user can apply one wire to one portion of the receptacle and another wire to another portion of the receptacle, or hold such other wire in his hand to determine by means of a light what are the facts regarding the wiring of the receptacle. Another device is an ohmmeter by which the user may test the electrical circuit at the receptacle and determine just exactly what the situation is. This, however, is complicated and does not appeal to the casual user.

In the patented art there have been devices disclosed for the conversion of a plug from a three pronged plug to a two pronged plug or vice versa. In some of these devices a third prong is retracted into the casing; in others the third plug is pivoted so as to be inoperative in protruding from the plug in a direction parallel with the fixed blade prongs. In Hawkins U.S. Pat. No. 3,441,896 there is a double outlet socket so that a conventional three prong plug may be used and the socket may be reversed in order to reverse polarity. In Ricci Pat. No. 3,495,205 there is shown a convertible plug by which the third prong may be removed so that the plug may be used either with a three opening socket or a conventional two opening socket. In Swarthout U.S. Pat. No. 3,439,308 there is shown an adapter by which a plug may be used either as a male plug or as a female receptacle.

In McNamara U.S. Pat. No. 3,171,173 there is shown an electric plug with a ground indicating light. There are two fixed prongs and a resiliently movable ground contact slidably mounted with a spring urging it outward and a testing unit including a light for indicating the grounding of the third wire. McNamara does not have any real means in his plug for correcting the difficulty even if he should find it. He is seeking to find out if the electrical system is grounded. He does not seek to find out whether polarity is reversed. My device is directed solely to the finding of the fault of reversed polarity and correcting it. None of these patents show devices which will solve the problem.

Therefore there is a need for an electrical plug which may be used with any three opening receptacle and which will indicate a reversed polarity of the receptacle by warning light, warning noise or by any other type of signal as a warning and which can be converted easily and manually to a plug which is satisfactory to correct the polarity of the incorrect polarity receptacle.

SUMMARY OF THE INVENTION

The plug of the invention uses a casing in which the wiring of the plug is enclosed and which has a pair of blade contacts extending forwardly from the casing and a pair of retractable round prong contacts extendible forwardly from the casing, the round prong contacts, when extended, being placed on opposite sides of a plane extending substantially through the central axis of the blade contacts. The blade contacts are connected, one to the positive wire leading into the three wire cable which is connected to the plug and one to the neutral or negative wire leading into the three wire cable. The extendible round prong contacts are both connected to the ground wire extending into the three wire cable. Each of the prong contacts is provided with a pushbutton extending outside of the casing by which the prong contact may be extended or retracted manually at the discretion of the user. Connected to a Y extension of the neutral lead is a wire
which leads from the neutral wire through a resistor, a neon light bulb, a noise making device such as a buzzer and thence to the ground wire of the three wire cable. This forms an electrical circuit which is energized when polarity is reversed to give a signal to warn of the dangerous condition.

The invention therefore comprises a casing; a pair of spaced blade electrical contacts supported by and projecting out of said casing; a pair of movable electrical prong contacts each arranged to extend at times outward from said casing; means for moving one of said prong contacts to and from a projecting parallel relationship to a retracted position; and means for moving the other said prong contact to and from a projecting parallel relationship to a retracted position.

It also comprises an electric plug having a casing; a pair of spaced blade electrical contacts supported by and projecting out of said casing; each of said contacts being arranged to extend into an electrical receptacle connected to a source of electric power so that each is connected to an opposite polarity of said source; a pair of movable electrically interconnected prong contacts each arranged to extend outward from said casing and when so extending to be connected to ground terminal and an electrically responsive signal means connecting between said movable prong contacts and one of said blade contacts.

It is therefore an object of the invention to provide an improved three contact electrical plug for use with an electrical receptacle.

Another object of the invention is to provide an electric plug for use with an electrical receptacle connected to a source of electrical power which indicates a warning if the polarity of the receptacle is reversed as to the polarity of the appliance with which it is to be used.

Another object of the invention is to provide an electric plug which has a pair of electrical blade contacts and a pair of electrical prong contacts, the latter being positioned on opposite sides of a plane substantially connecting the longitudinal axes of the blade contacts, the prong contacts being retractable into the casing or extendible at the option of the user, whereby when the user finds by means of a warning signal that the polarity of the receptacle is reversed as to the polarity of the appliance with which it is to be used he can retract the one prong and extend the other, turn the plug over, insert it in the socket or receptacle and thus correct the polarity so that the warning signal stops and the hazard of shock due to incorrect polarity is eliminated.

Further objects and features of the invention will be apparent from the following specification and claims when considered in connection with the accompanying drawings illustrating an embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 there is shown what is apparently a three prong electric plug 11 having a casing 12 and a pair of blade contacts 13 and 15 extending from the casing 12 and adapted to be inserted in the three holes or slots in an associated electrical receptacle connected to a source of electric power. The plug 11 also has a round prong contact 17 which (as shown) has been partially moved out of the casing 12 by the pushbutton 19. The button 19 has a stem 20 extending downward from the button 19 through the slot 21 in the upper face of the casing 12, and within the casing 12 is connected to the prong 17. At the bottom of the front face 16 of the casing 12, there is an opening 23 for the projection of another prong contact which will be described later. Thus the plug is actually a four prong plug. At the rear of the casing 12 there is provided a housing 25 which is adapted to enclose a three wire electrical cable as will also be later described. At the side of the casing 12 nearest the viewer in FIG. 1 there is indicated a neon tube light 27. Also beneath the casing 12 may be seen a portion of a pushbutton 31 which is similar in all respects to the pushbutton 19 shown above the casing 12, except that the pushbutton 31 is at the bottom of the casing 12 and its stem extends upward.

As may be seen in FIG. 2, the housing 25 has extending through it into the casing 12 a three wire electrical cable 33 which has a hot or high or positive lead or wire 35, a neutral or negative lead or wire 37 and a ground lead or wire 39. The hot wire 35 is connected by a screw 40 to the hot side blade contact 15 and the neutral wire 37 is connected by a screw 38 with the neutral terminal 13. As may be seen (FIG. 3), the pushbutton 19 has a stem 20 which extends through the slot 21 and is connected to the prong contact 17. The ground wire 39 is connected by a screw 48 to a conductive housing 42 for prong 17 and through the housing 42 is electrically connected to the prong 17. Thus the ground of the...
electrical receptacle is connected through the prong 17 to the housing 42 and the housing 42 and lead 39 are
connected to the ground of the appliance. The neutral lead 37 is split at 43 to form a Y, to the shorter leg of
which there is connected a wire 44 leading to the neon light bulb 27. Interposed in the wire 44 is a resistance
45 and a buzzer 46. Another wire 47 connects the light 27 to the screw 48 by which it is electrically connected
to the housing 42 and to the ground lead 39.

A longitudinally movable prong contact 51 (similar in all respects to prong contact 17) is connected by a
stem 52 with pushbutton 31. The contact 51 bears on a conducting housing 53 (similar to housing 42) which
is in turn connected through a screw 54 to the branch 55 of the ground lead 39.

Again as seen in FIG. 4, the cable 33 has three leads consisting of positive lead 35, neutral lead 37 and
ground lead 39. The positive lead 35 is connected to screw 40 and blade contact 15. The neutral lead 37 is
connected to screw 38 and to blade contact 13. The ground lead 39 is connected through its main branch to
a screw 48, attached to housing 42 and to prong contact 17 and through branch 55 to screw 54, to housing
53 and prong contact 51.

OPERATION

The operation is illustrated in FIGS. 5-7, inclusive. Let us assume that the electrical receptacle 57 (57a,
57b, 57c) in which the plug is inserted is properly connected to the generator 56 and the polarity of the re-
ceptacle is correct. As shown in FIG. 5, the blade contact 15 will be connected through slot 57a to the posi-
tive side of the generator and will be connected by the wire 35 to the positive side of the appliance. The blade
contact 13 will be properly connected through the slot 57b with the neutral side of the generator 56 and with
the generator ground 58. The contact 13 will also be connected through wire or lead 37 with the neutral side
of the appliance. The ground plug contact 17 will be connected through the receptacle hole 57c to ground
59. If the polarity is correct, the plug will function cor-
rectly and there will be no danger of a shock due to in-
correct polarity. At the same time, the wire 44 being
connected to the wire 37 which is the neutral side of
the generator circuit and ground 58 at the one end and
at the other end being connected through the prong 17
to the ground 59 there will be no current flowing
through the wire 44. Neither the light 27 nor the buzzer
46 will be activated so no warning will be given.

In the condition shown in FIG. 6, the polarity at the
receptacle is reversed. Thus the high or hot side from
the generator will be connected to the neutral side of
the appliance. The appliance will be hot and a danger-
ous condition is present. The appliance cabinet will be
at the full line voltage relative to ground. Anyone
touching the appliance and ground simultaneously will
have this voltage applied to him and get a shock. Cur-
rent will flow through the lead 37, the wire 44, the re-
sistor 45, the buzzer 46 and light 27 to the wire 39 and
the plug 17 to ground 59. This is a dangerous condition.
However, the light 27 and the buzzer 29 will give a
warning signal. The operator will know that the con-
nnection is wrong. Thereupon he will remove the plug
11, retract the prong 17, and extend the prong 51 and
reverse the plug 11 thus establishing the condition of
FIG. 7. This will correct the reversed polarity so that
the current from the generator 56 will pass through the
blade contact 15 to the positive side of the appliance.
The blade 13 will then be connected to neutral as will
the wire 37 and both sides of the wire 44 being con-
ected to ground, no current will pass through the wire
44, the resistance 45, the light 27 or the buzzer 29.

In an alternative arrangement, the casing 12 of the
plug 11 is completely sealed (i.e., the slot 21 and the
similar slot for prong 51 are eliminated) so that it is wa-
terproof; and interconnected hydraulic cylinders within
the casing are simultaneously operated from outside of
the casing in order to retract the prong 17 and at the
same time extend the prong 51. At the option of the
user thereafter, the prong 51 may be retracted and the
prong 17 extended by means of the cylinders.

As shown in FIG. 8 in an alternative form of my in-
vention, the pushbuttons 19 and 31 are interconnected
by a yoke lever 61 pivoted on opposite sides of the cas-
ing 12 on two pivots such as the pivot 62 on the near
side and an identical pivot on the opposite side so that
when the button 19 is moved in one direction to move
the prong contact 17 in or out, the button 31 will be
moved in the opposite direction to move the prong con-
tact 51 in the opposite direction.

Alternatively, I may seal the plug by enclosing it (ex-
cept when operating the pushbuttons to move the
prong contacts in and out) in a waterproof boot. Alten-
atively again, I may seal the exposed terminals and
wires within the plug in a waterproof plastic.

It is to be understood that while the detailed drawings
and specific examples given describe preferred em-
bossments of the invention they are for the purpose of
illustration only, that the apparatus of the invention is
not limited to the precise details and conditions dis-
closed and that various changes may be made therein
without departing from the spirit of the invention which
is defined by the following claims.

I claim:

1. An electric plug comprising in combination:
a. a casing;
b. means in said casing for connecting a source of
electric power to an electrical apparatus compris-
ing:
   i. a pair of spaced blade electrical contacts sup-
ported by and projecting out from said casing,
said blade electrical contacts being provided for
insertion into the positive and neutral slots of a
receptacle connected to opposite poles of a
source of electric power;
   ii. a pair of movable electrical prong contacts both
electrically connected to the ground wire of said
cable and each arranged to extend at times out-
ward from said casing and at times to be re-
tracted within said casing; and
   iii. a three wire electrical cable having one end of
each wire electrically connected to an electrical
appliance and having the opposite end of one
said wire connected to both of said prong con-
tacts, having the opposite end of another of said
wires connected to one of said blade contacts,
and having the opposite end of said third wire
cabled to the other of said blade contacts; and
   c. signal means included within said casing for indi-
cating that the polarity of a receptacle into which
the blade contacts are inserted is reversed as to the
polarity of the appliance; and
3,733,576

7. The structure of claim 1, in which the means for
moving said prong contacts are independent.

3. The structure of claim 1, in which the means for
moving said prong contacts are interconnected so that
as one is extended, the other is retracted.

4. The structure of claim 1, in which when an electric
prong contact is extended outward from said casing
it is in substantial parallel relationship with said blade
contacts.

5. The structure of claim 4, in which the extended po-
sitions of said electrical prong contacts are on opposite
sides of a plane intersecting the longitudinal axes of
said blade contacts and are at a substantial equal dis-
tance from said plane.

6. The structure of claim 1, in which the prong con-
tacts are retracted by sliding along their longitudinal
axis into said casing and are projected by sliding in a re-
verse direction along said axis out of said casing.

7. The structure of claim 1, in which:
one wire of said three-wire electrical cable connects
one of said blade electrical contacts to the positive
side of an electrical appliance;
a second wire of said three-wire electrical cable con-
nects the other of said blade electrical contacts to
the neutral side of an electrical appliance; and
said electrical signal means interposed in a wire con-
ected between said second wire and one of said
electrical prong contacts.

8. The structure of claim 7, in which the signal means
is an electric light.

9. The structure of claim 7, in which the signal means
is an electric buzzer.

10. The structure of claim 7, in which the electric ap-
pliance is a recreational vehicle.

11. The structure of claim 7, in which the third elec-
trical lead has a resistor interposed between said signal
means and said neutral lead.

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