LINE PLUG WITH RETRACTABLE GROUNDING PIN

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ABSTRACT

A plug having a pair of fixed prongs, a retractable grounding pin, and a grounding wire is provided for making an electrical connection by insertion in a female receptacle. The fixed prongs are connected to the line and load leads of a power cord and the grounding wire is connected to the ground lead of the power cord. The grounding wire is provided with a hook shaped terminal and the retractable grounding pin is formed with an annular groove adapted for locking engagement with the terminal. If the female receptacle is of the type adapted to receive a three prong male plug, the grounding wire is locked within the annular groove by means of the terminal, whereby the grounding pin is secured in the extended position. If the female receptacle is of the type adapted to receive a two prong male plug, the grounding wire is attached to a ground point on the box housing the receptacle by means of the terminal, whereby the grounding pin is retracted as the plug is inserted in the receptacle.

10 Claims, 3 Drawing Figures
LINE PLUG WITH RETRACTABLE GROUNDING PIN

BACKGROUND OF THE INVENTION

1. Field of the Invention
The present invention relates to electrical plugs and more particularly to electrical plugs adapted for use with two and three port female receptacles.

2. Description of the Prior Art
Due to the potential hazards from electric shock, power tools are provided with three prong plugs which allow the power tools to be grounded. However, all female receptacles are not adapted to receive three prong plugs. Accordingly, a separate adaptor is provided as an interface between the three prong plug and the two port receptacle. Often times, such adaptors are misplaced and the grounding pin of the plug is removed in order to use the power tool. After the grounding pin has been removed, the power tool can no longer be grounded and the potential of electric shock is presented whenever the tool is being used.

SUMMARY OF THE INVENTION
It is an object of the present invention to provide a line plug adapted for use with two and three port female receptacles. The plug is characterized by a body portion having extending therefrom a pair of fixed prongs, a retractable grounding pin, and a grounding wire. The fixed prongs are connected to the line and load leads of a power cord and the grounding wire is connected to the ground lead of the power cord. The body portion is formed with a chamber adapted for slidable reception of the grounding pin. The grounding pin is formed with a central bore adapted to slidably receive a guide pin and spring which are axially mounted to the body within the chamber. The spring is received within the central bore, whereby the grounding pin is held normally in the extended position. The grounding pin is formed also with an annular groove and the grounding wire is provided with a hook shaped terminal which is adapted for locking engagement with the groove when the grounding pin is in the extended position. If a three prong female receptacle is provided, the terminal is latched within the groove and the grounding pin is fixed against retraction. If a two port female receptacle is provided the grounding wire is attached to a ground point on the receptacle box housing by means of the terminal whereby the grounding pin is retracted as the plug is inserted in the receptacle. The combination of a pair of fixed prongs, a retractable grounding pin, and a grounding wire is such as to provide a power cord plug which is adapted for use with two and three port female receptacles.

The invention accordingly comprises the device possessing the construction, combination of elements and arrangement of parts that are exemplified in the following detailed description, the scope of which will be indicated in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS
For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective of a line plug made according to the invention;

FIG. 2 is a front elevation of the plug; and
FIG. 3 is a side elevation, partly brokenaway, showing certain details of the plug.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT
Referring now to the drawings, reference character 10 denotes a line plug embodying the invention and adapted for use with two and three port female receptacles. Plug 10 comprises a body portion 12, fixed prongs 14 and 16, a retractable grounding pin 18, and a grounding wire 20. A power cord 22 having power line leads 24 and 26 and ground lead 28 is operatively connected to body 12. Leads 24 and 26 are connected to fixed prongs 14 and 16, respectively, and lead 28 is connected to grounding wire 20. Preferably, lead 28 and grounding wire 20 are integral. Fixed prongs 14, 16 and grounding pin 18 are oriented in mating registration with the correlative ports of the female receptacle.

Body 12 is formed with a substantially tubular cavity 32 which is closed at one extremity and opened at the other extremity and is adapted to slidably receive grounding pin 18. Proximate to the closed extremity of cavity 32, there is a rib 34 which is adapted for locking engagement with a groove 35 of a hub 36.

A bias element 38, for example a helical compression spring, envelops a rod 40 which extends from hub 36 into cavity 32. Proximate to the opened extremity of cavity 32, there is a notch 42 which is adapted to lockingly engage a shoulder 44 of a bushing 46. Body 12 is formed with an annular recess 48 which is adapted to receive a shoulder 50 of bushing 46 in such a manner that exposed face of bushing 46 is substantially flush with the face of body 12. Bushing 42 is formed with an bore 52 which is adapted to slidably receive grounding pin 18.

Grounding pin 18 is formed with a bore 54, an annular groove 56, and a stop 58. Bore 54, closed at the one extremity and opened at the other extremity, is adapted to receive rod 40 and spring 38, the axis of bore 54 and rod 38 being in registration. Rod 40 is positioned within bore 54 approximate to the outermost face of stop 58 and spring 38 abuts the closed extremity of grounding pin 18. That is, rod 40 defines a guide for grounding pin 18 which is held normally in an extended position by spring 38. Stop 58 is slightly larger than bore 52 whereby grounding pin is prevented from being pushed out of bushing 46 by spring 38. The innermost side of annular groove 56 is substantially flush with the outermost face of bushing 46.

Annular groove 56 is adapted for locking engagement with a terminal 60 which is attached to the free end of grounding wire 20 by means such as crimping or soldering, for example. In the illustrated embodiment, terminal 60 defines a hook shaped configuration having a socket portion 62 which is adapted to receive grounding wire 20. It is to be understood that, in alternative embodiments, terminal 60 defines other than a hook shaped configuration, for example a snap-ring configuration. When terminal 60 engages annular groove 56, grounding pin 18 is fixed against retraction into cavity 32 of body 12.

As previously indicated, plug 10 is adapted for use with two and three port female receptacles. If the female receptacle is adapted to receive a three prong plug, terminal 60 is locked within annular groove 56, in
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consequence grounding pin is fixed against retraction. If the female receptacle is of the two port type, terminal 60 is attached to a ground point on the box housing the receptacle, for example the screw holding the box plate, in consequence grounding pin is retracted in cavity 32 of body 12 as prongs 14, 16 are inserted into their respective ports of the female receptacle. Accordingly, whether plug 10 is used with a two or three port female receptacle, the power tool attached to the end of power cord 22 is grounded.

For ease of manufacture, it is preferred that plug 10 is formed by a molding technique such as injection molding, for example. In this case, the outer covering of power cord 22 is cut back to expose leads 24, 26, and 28. Leads 24 and 26 are cut and stripped so that they are substantially equal in length and shorter than leads 28. Leads 24 and 26 are connected to prongs 14 and 16, respectively. Prongs 14 and 16, lead 28, cord 22, and hub 36 are position in their respective locations in the molding fixture. Thereafter, body 12 is formed by injection molding. It is preferred that body 12 is composed of an elastomer such as natural or synthetic rubber, for example. Upon completion of the molding process, ground lead 28 is stripped and terminal 60 is attached thereto. Spring 38 is positioned about rod 40 and grounding pin 18 is inserted into cavity 32, rod 40 and spring 38 being received within bore 54. Thereafter, bushing 46 is urged into the opened extremity of cavity 32, bore 52 slidably receiving grounding pin 18, whereby shoulder 44 is locked into notch 42 and the fabrication of the plug is completed.

Since certain changes may be made in the foregoing disclosure without departing from the scope of the invention herein involved, it is intended that all matter contained herein be construed in an illustrative and not in a limiting sense.

What is claimed is:

1. A plug for use with two and three port female receptacles, power being applied to at least two of the ports, said plug comprising:
   a. body means formed with a cavity;
   b. at least two prong means operatively connected to said body and projecting therefrom, said prong means in mating registration with the ports having power applied thereto;
   c. grounding pin means operatively connected to said body means and adapted for extension from said body and retraction within said cavity, said grounding pin means normally extending from said body means in mating registration with the third port of the three port female receptacle and in parallel space relationship with said prong means, said grounding pin means slidably retractable within said cavity along a plane parallel to the longitudinal axis of each said prong means, said grounding pin means having locking means; and
   d. grounding means operatively connected to said body means and extending therefrom, said grounding means adapted for engagement with said locking means, said grounding pin means being fixed against retraction when said grounding means and locking means are engaged.

2. The plug as claimed in claim 1 including power cord means operatively connected to said body means, said power cord means including at least first, second, and third lead means, said first lead means connected to one of said prong means, said second lead means connected to another of said prong means, and said third lead means being an integral part of said grounding means.

3. The plug as claimed in claim 1 wherein said cavity is tubular, one extremity of said cavity being closed and the other extremity of said cavity being opened.

4. The plug as claimed in claim 3 including:
   a. hub means operatively connected to said body at the closed extremity of said cavity;
   b. guide means operatively connected to said hub means;
   c. bushing means operatively connected to said body means at the opened extremity of said cavity, said bushing means formed with a bore adapted to slidably receive said grounding pin means, said guide means projecting from said hub means into said grounding pin means; and
   d. bias means enveloping said guide means, said grounding pin means being held in the extended position by said bias means.

5. The plug as claimed in claim 4 wherein said grounding pin means is formed with a bore, said bore being closed at one extremity of said grounding means and opened at the other extremity of said grounding pin means, said bore adapted to slidably receive said guide means, said bias means enveloping said guide means, said grounding pin means being held in the extended position by said bias means.

6. The plug as claimed in claim 5 including stop means operatively connected to said grounding pin means proximate to said opened extremity of said grounding pin means, said stop means being larger than said bushing bore.

7. The plug as claimed in claim 6 wherein said grounding means includes terminal means, said terminal means adapted for engagement with said locking means.

8. A plug for use with two and three port female receptacles, power being applied to at least two of the ports, said plug comprising:
   a. body means formed with a cavity said cavity opened to one face of said body means and closed to an opposite face of said body means;
   b. at least two prong means operatively connected to said body and projecting therefrom, said prong means in mating registration with the ports having power applied thereto;
   c. grounding pin means operatively connected to said body means and adapted for extension from said body and retraction within said cavity, said grounding pin means normally extending from said body means in mating registration with the third port of the three port female receptacle and in parallel space relationship with each said prong means, said grounding pin means slidably retractable within said cavity along a plane parallel to the longitudinal axis of each said prong means, said grounding pin means having locking means; and
   d. grounding means operatively connected to said body means and extending therefrom, said grounding means adapted for engagement with said locking means, said grounding pin means being fixed against retraction when said grounding means and locking means are engaged.
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5. The plug as claimed in claim 8 including:
   a. hub means operatively connected to said body at the closed extremity of said cavity;
   b. guide means operatively connected to said hub means;
   c. bushing means operatively connected to said body means at the opened extremity of said cavity, said bushing means formed with a bore adapted to slidably receive said grounding pin means, said guide means projecting from said hub means into said grounding pin means;
   d. bias means enveloping said guide means, said grounding pin means being held normally in the extended position by said bias means; and
   e. grounding pin means formed with a longitudinally extending bore and a stop, said grounding pin means bore closed at one extremity of said grounding pin means and opened at the other extremity of said grounding pin means, said grounding pin means bore adapted to slidably receive said guide and bias means, said stop being larger than said bushing means bore, said stop engaging said bushing means when said grounding pin means is extended and operating to retain a portion of said grounding pin means within said cavity.

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