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SELF-ADJUSTING THREE-PRONG ELECTRIC PLUG ADAPTABLE FOR EITHER TWO OR THREE PRONG ELECTRIC SOCKETS

Filed Nov. 17, 1964 2 Sheets-Sheet 1

FIG. 1.

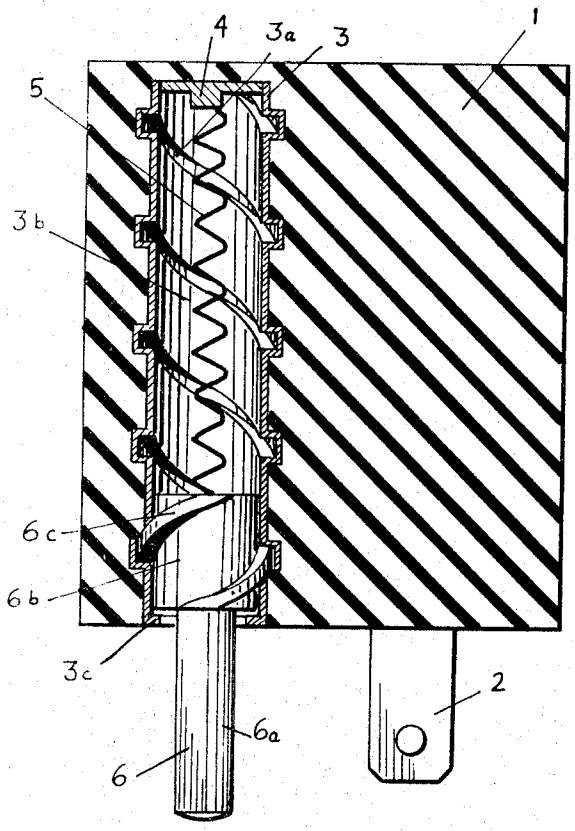
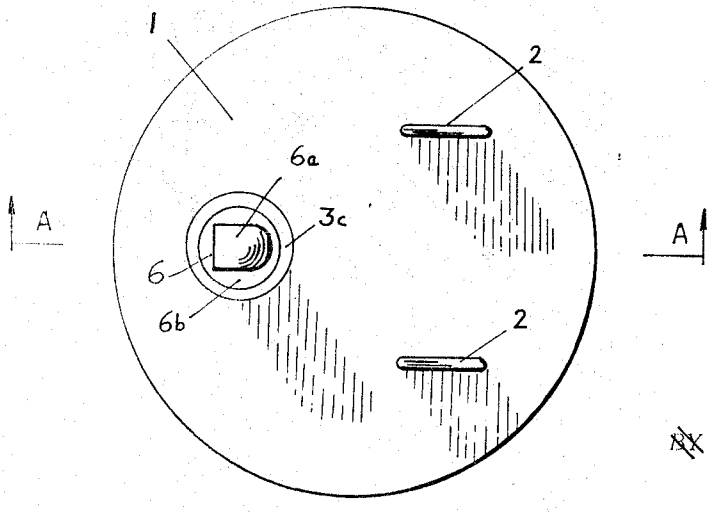


FIG. 2.



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FIG. 3.

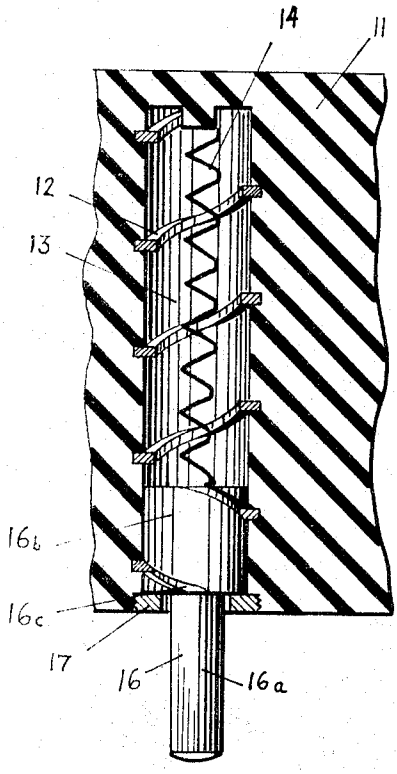
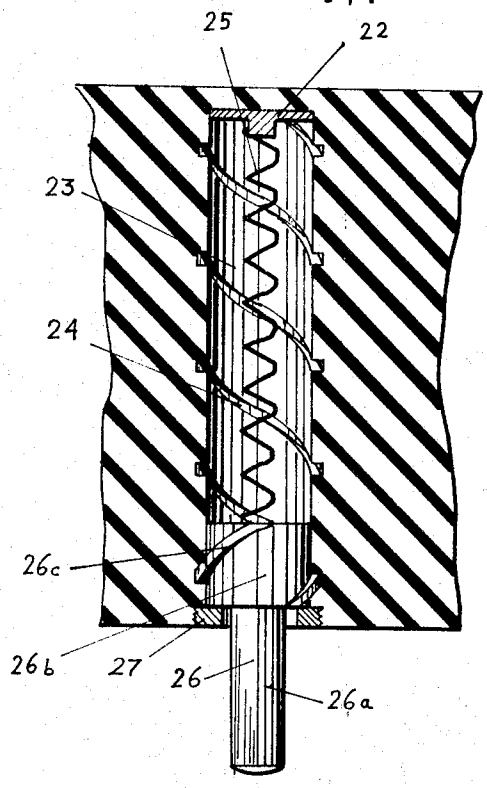


FIG. 4.



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SELF-ADJUSTING THREE-PRONG ELECTRIC PLUG ADAPTABLE FOR EITHER TWO OR THREE PRONG ELECTRIC SOCKETS

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4 Claims. (Cl. 339—14)

The present invention relates to an electrical plug with a convertible feature to allow its insertion into either a two-prong or three-prong electric receptacle.

At present, in order to utilize the standard, non-adjustable three-prong electric plug featuring two rigid blades and a "ground" pin, an intermediate adapting device must be used. This adaptor receives the three-prong plug and engages the receiving two-blade socket with two blades of its own and offers an auxiliary "ground" wire which may or may not be utilized.

Another recent design features a three-prong plug, the "ground" pin being pivoted manually to one side or the other when it cannot be engaged in the receiving two-blade socket.

The above described design and similar ones in present use represent serious deficiencies from the standpoint of convenience and ease of use. Too much manual adjustment is required for the simple and routine operation of using an electrical plug.

The safety in use of all present convertible three-prong plugs is also violated by the necessity of manual readjustment in the interchanging of use. By merely forgetting or neglecting to readjust or reposition the ground pin of the plug after the plug has been used in a two-prong socket, the main purpose of the such third prong, i.e., the certainty of grounding, is completely defeated.

The object of the present invention is to avoid the foregoing disadvantages. The present invention represents a self-adjusting plug, the inherent features of which allow it to accomplish its own complete adaptation to the particular situation of use. Both the convenience and safety factors are retained in the use and operation as the following text describes.

The plug body is made of any reasonably solid insulating material. Two flat blades are either imbedded into or attached rigidly to the plug body, with provision made for the attachment of electrical leads to them.

The distinguishing feature of the present device is its third prong or "ground" pin which features the capability of linear motion perpendicular to the receiving receptacle's face. This pin retracts when the plug is engaged into a two-blade receptacle, and yet still will protrude and engage its specific receptacle provided in a three-prong socket.

The "ground" pin is made of an electrically conductive metal. The pin is designed to engage its receiving portal in a three-prong socket and has a U-shaped cross-section. It is cast, stamped or machined, and the exposed tip of the pin is rounded. Another part of the pin is a cylindrical section, on the periphery of which helical threads or grooves, as the case may be, are fashioned. The cross-section of the pin is confined within the diameter of the cylinder.

The plug body is provided with a threaded passageway which matches the threads or grooves on the cylindrical part of the pin. The linear motion of the pin is achieved by a relative rotational movement of the pin with regard to the passageway. The end of the passageway from which the pin projects is provided with a collar or similar locking device to prevent ejection of the total pin. The opposite end of the passageway is sealed or closed.

A compressible spring is placed within the passageway between its closed end and the rear face of the cylindrical part of the pin. This spring acts to keep the pin in its utmost projected position at all times, except when retraction of the pin is caused by external force.

Electrical contact between the moving pin and the ground lead terminal is accomplished either by the threads and grooves or by the compressible spring, which, for such purposes, is made of a metal characterized by high electrical conductivity plus great tensile strength, such as beryllium copper.

Since the linear motion of the pin is accompanied by a rotational motion, no linear motion will be experienced when the pin is prevented from rotating. Such will be the case when the U-shaped pin is received into the standard, matching U-shaped socket opening. The mating of these two similar shapes will provide a "key" effect and thus full introduction of the "ground" pin and the two rigid blades into the receiving socket can be achieved.

Used in the two-blade socket, the face of the socket will provide resistance to the "ground" pin. Combined rotational retraction of the ground pin will occur, allowing only the two rigid blades to engage their receiving two-blade socket. When the plug is disengaged from the two-blade socket, the spring-loaded ground pin will reproject.

The present invention will now be discussed with reference to the accompanying drawings in which:

FIGURE 1 is a transverse sectional view of an electrical plug taken along the lines A—A of FIGURE 2 and illustrating in particular the "ground" pin, its threaded passageway and the compressible spring;

FIGURE 2 is a bottom elevation of the same electrical plug shown in FIGURE 1, showing the U-shaped ground pin;

FIGURE 3 is a partial section of a modification of the electrical plug taken through a portion of the plug similar to that indicated in FIG. 2; and

FIGURE 4 is a partial section of a further modification of the electrical plug taken through a portion of the plug similar to that indicated in FIG. 2.

Referring now to the drawings and more particularly to FIGURE 1, pin **6** is cast, stamped or machined from an electrically conductive material. It is composed of three functional elements; a prong **6***a*, a cylinder **6***b*, and one or more threads **6***c*, which are fashioned on said cylinder **6***b*. The cross-section of the prong **6***a* is confined within the diameter of the cylinder **6***b*.

The sleeve **3** is manufactured of some electrically conductive metal. It is provided with one or more helical grooves **3***a* along its interior wall exactly matching the pin threads **6***c*. A boss **4** serves as a terminal support for spring **5** and prevents the entrance of foreign matter into the passageway **3***b*. The opposite end of the sleeve **3** is open and the grooves extend up to the sleeve's lip **3***c* so that the spring **5** and the pin **6** can be introduced into the sleeve. The lip **3***c* is thereafter bent inwards so as to secure the containment of these components yet allow the free linear motion of the prong **6***a*.

The plug body **1**, made of some reasonably solid insulating material, holds the two flat blades **2** and the metallic sleeve **3**, each of them being connected within the body to their appropriate electrical leads by means of soldering, mechanical attachment or any other convenient manner.

FIGURE 2 is a bottom elevation of the same electrical plug described in FIGURE 1. The U-shaped prong **6***a* is shown to be confined within the cylindrical section **6***b* and by the already bent sleeve lip **3***c*. The two blades **2** are shown here in relation to the prong **6***a*.

FIGURE 3 is a section through the plug body showing in particular the passageway **13**, the pin **16**, and the spring **14**. A helix **12**, made of an electrically conduc-

tive metal, is embedded into the walls of the passageway so that approximately one-half projects into the passageway **13**. A helical groove **16***c* is fashioned into the cylindrical portion **16***b* of the pin **16**. This groove is mated to the helix present in the passageway **13**. A ground lead is attached to the embedded end of the helix in some convenient manner. A constant electrical contact is obtained by the physical contact of the groove **16***c* and the helix **12**. In order to prevent the total ejection of the pin **16** from the passageway **13**, a locking device **17**, fashioned as a washer, is secured at the opening of the passageway **13**. The peripheral edge of this washer **17** is threaded and secured into the plug **11** by a matching thread. The washer's opening permits the protrusion of the U-shaped prong **16***a*, yet prevents the ejection of the larger cylinder **16***b*.

FIGURE 4 is a section through the plug body showing in particular the passageway **23**, the pin **26**, and the spring **25**.

The pin **26** is comprised of a U-shaped prong **26***a* and a cylindrical section **26***b*, on which one or more helical threads **26***c* are fashioned. This thread, or threads **26***c*, mate with a groove, or grooves **24**, that are cut through the walls of the passageway **23** into the plug body **21**.

A disc **22**, made of an electrically conductive material, is seated at the end of the passageway **23**. An electrical lead is attached to this disc in some convenient manner.

A compressible spring **25** is made of a metal characterized by high electrical conductivity plus great tensile strength. This spring is located between the disc **22** and the rear end of the cylinder **26***b*, so that electric contact is maintained from the electrical lead through the spring to the ground pin.

A locking device **27** is provided which is similar to the washer **17** described in FIGURE 3.

It will be apparent from the foregoing that the present invention provides a three-prong plug which can be used selectively in conjunction with sockets adapted for ground wire connection or not adapted for ground wire connection without receiving any adjustment of the plug or any rearrangement of any parts thereof.

What is claimed and desired to be secured by United States Letters Patent is:

1. An electrical plug comprising in combination:

(a) a plug body of insulating material defining an internal passageway;

(b) a pair of blade contacts extending generally parallel to said passageway and projecting outwardly from a surface of said plug body;

(c) a ground pin non-circular in cross-section extending generally parallel to said pair of blade contacts and projecting outwardly from said surface of said plug body, said ground pin having an axial cylindrical extension inserted into said passageway of said plug body;

(d) spring means inside said passageway biasing said axial cylindrical extension and said ground pin in a direction longitudinally thereof; and

(e) cooperating guide means on said plug body and said axial cylindrical extension for causing a combined rotary and linear motion of said ground pin into said passageway defined by said plug body in response to axial pressure upon said ground pin opposed to the bias of said spring means.

2. The electrical plug according to claim **1** wherein one or more helical threads are fashioned on said axial cylindrical extension matching one or more helical grooves fashioned in the internal periphery of a metallic sleeve contained in said passageway of said plug body.

3. The electrical plug according to claim **1** wherein a metal helix is partially imbedded in said passageway walls and matching helical grooves that are cut or fashioned on the periphery of said axial cylindrical extension.

4. The electrical plug according to claim **1** wherein helical grooves are cut or cast into said passageway walls and one or more matching helical threads are fashioned on the periphery of said axial cylindrical extension.

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