United States Patent [19]

Thaxton

[11] **3,753,261**

[45] **Aug. 14, 1973**

[54] **CONTINUOUS GROUND AND POLARITY MONITOR**

[76] Inventor: **Keith R. Thaxton,** 12671 Volti Ln., Mountain View, Calif. 94040

[22] Filed: **Dec. 9, 1971**

[21] Appl. No.: **206,288**

[52] **U.S. Cl.** ..... **340/252 P,** 340/253 R, 340/255

[51] **Int. Cl.** **G08b 21/00**

[58] **Field of Search** ..... 340/252, 255, 256, 340/253 R; 324/122; 174/66

[56] **References Cited**

UNITED STATES PATENTS

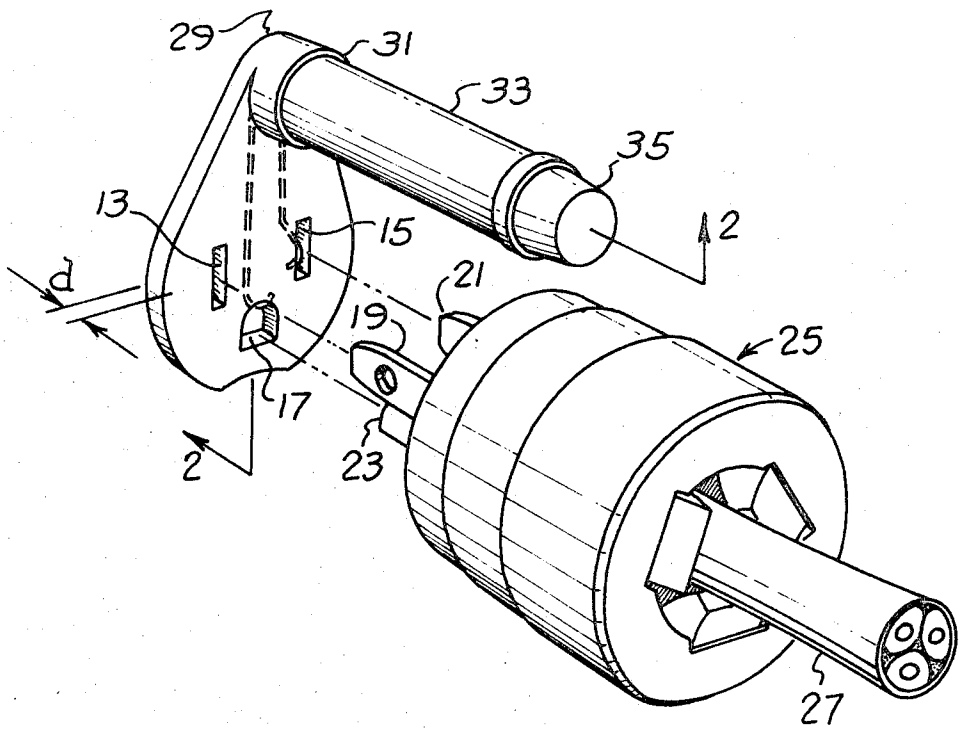
3,234,464	2/1966	Cook	340/252 R X
3,425,050	1/1969	Tellerman et al	340/256
3,171,113	2/1965	McNamara	340/255
2,385,620	9/1945	Fleckenstein	340/252 R
2,997,701	8/1961	Costanzo	340/252 R X
2,575,820	11/1951	Linton	340/252 R UX

Primary Examiner—John W. Caldwell
Assistant Examiner—Daniel Myer
Attorney—Stephen P. Fox

[57] **ABSTRACT**

A disk has three apertures therein for receiving the hot, neutral and ground prongs of an a.c. line plug. In use the disk is slipped onto the prongs and positioned between the body of the line plug and a mating electrical outlet socket. An indicator lamp is fixedly attached to the disk and electrically coupled across the hot and ground prongs by friction tight contact at the corresponding apertures in the disk. The indicator lamp glows as long as a ground connection and proper polarity are maintained in the electrical outlet.

7 Claims, 4 Drawing Figures



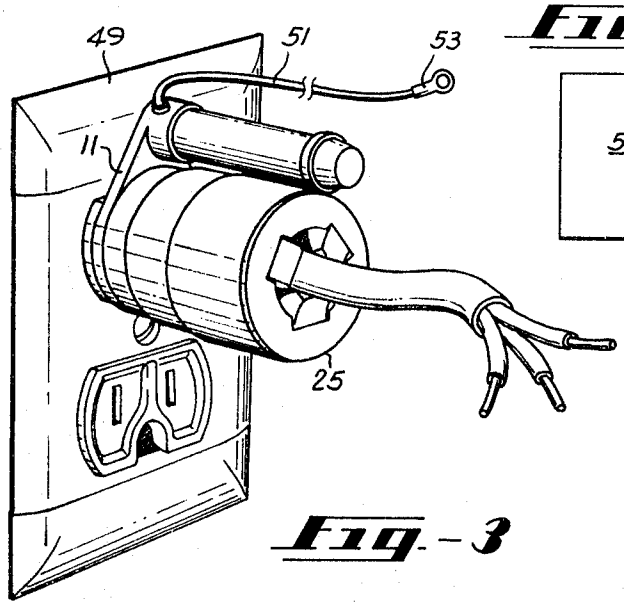


Fig. – 3

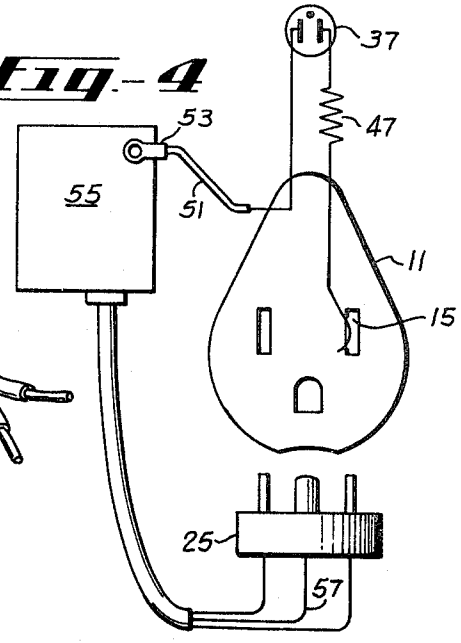


Fig. – 4

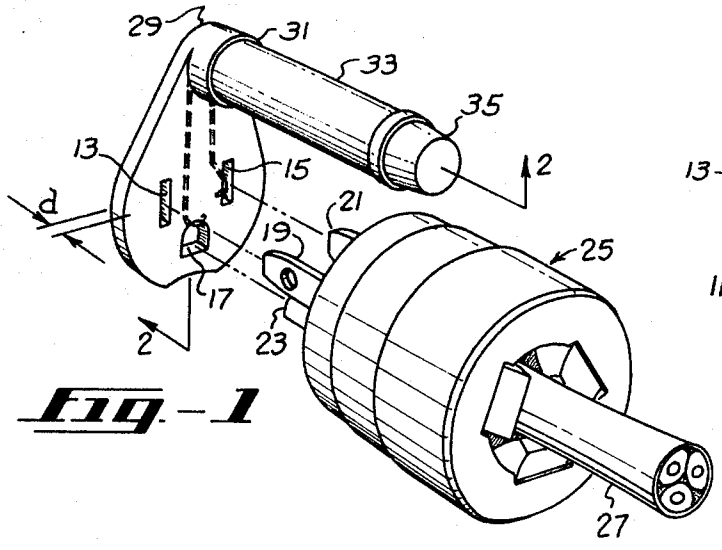


Fig. – 1

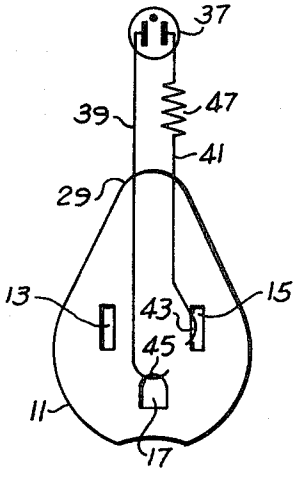


Fig. – 2

INVENTOR.
KEITH R. THAXTON
BY Stephen P. Fox
ATTORNEY

CONTINUOUS GROUND AND POLARITY MONITOR

BACKGROUND OF THE INVENTION

The present invention relates in general to electrical safety devices, and more specifically to a device for indicating the absence of a ground connection and proper polarity in an electrical outlet or appliance.

A three-wire system used to power an electrically operated appliance or instrument has two main current carrying conductors, commonly referred to as the hot and neutral conductors, and a third conductor which serves to safely ground the electrical equipment. The power or line plug from the electrical equipment has three prongs corresponding to the hot, neutral and ground conductors, and these prongs mate with corresponding conductors in a supply receptacle such as a wall socket or the like.

It is imperative for the safe operation of the electrical equipment that the integrity of the ground connection be maintained. This requires ground continuity from the line plug to the equipment, and equally importantly, a proper ground connection in the supply socket. Heretofore, it has been common practice to periodically test the ground conductor in supply sockets to insure that the ground is properly connected. In hospitals, for example, wall outlets are generally inspected once each month for proper polarity and electrical ground continuity, as well as for proper tension on a ground prong when extracted from the ground receptacle, thereby to insure the proper frictional contact between the ground prong and receptacle. Such routine monthly inspections are obviously time consuming and costly. In addition, such inspections are no guarantee against the ground continuity being broken at some time during the interim period between inspections. A ground connection can easily be broken by the presence of dirt on the electrical contacts or by the abusive jerking of a plug from its socket, for example. Consequently, the hospital patient or the operator of the electrical equipment may be unknowingly exposed to hazardous, and possibly fatal, electrical shock.

SUMMARY OF THE INVENTION

The present invention is a device which continuously monitors the continuity of the electrical ground to which the line plug of an appliance or instrument is connected. One embodiment of the invention, as illustrated, includes a wafer or disk like member having three apertures which are configured and spaced to permit the disk to be mounted on the three prongs of a line plug. Rigidly attached to the disk is an indicator lamp. The lamp is electrically coupled across the hot and ground conductors through a pair of electrical contacts which are exposed at two of the apertures in the disk to frictionally engage the corresponding prongs of the plug on which the disk is mounted.

In use, the prongs of a plug are inserted into the apertures in the disk, and the disk is pushed into place against the body of the plug, thereby to permit the plug to be inserted into a wall receptable or the like. The indicator lamp is disposed adjacent to the plug body so as to be in clear view of an operator or user of the associated electrical equipment. When a ground connection is absent, the lamp goes out, thereby to warn that the electrical equipment should not be used before the ground connection is restored.

Another embodiment of the invention includes a disk or wafer-like member and indicator lamp having one lead connected to the hot conductor as described above. However, the other lamp lead is connected to a length of cord, the end of which is connected to the chassis or cabinet of the electrical appliance. This arrangement serves to monitor the continuity of the ground wire in the line cord that extends from the appliance to the earth ground.

The invention features a device which is small, inexpensive and easily slipped onto the prongs of a line plug. Once the device is mounted in place on the plug, it will continuously monitor the appliance ground connection. The device obviates the need for routine, time consuming, and costly inspections of wall receptacles to detect broken ground wire conditions or poor frictional engagement of the ground prong and mating receptacle because the absence of a safe ground is indicated immediately and clearly by a dark lamp.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of one embodiment of the present invention along with an associated three-prong line plug.

FIG. **2** is a combined schematic and sectional view taken along line **2-2** in FIG. **1.**

FIG. **3** is perspective view illustrating another embodiment of the invention installed on a line plug which is inserted into a wall socket.

FIG. **4** is a combined diagramatic, schematic and sectional illustration of the embodiment of the invention shown in FIG. **3.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1,** there is shown a wafer-like member or disk **11** formed of an insulating material such as epoxy board or plastic. The disk **11** has three apertures, **13, 15, 17** therein which are spaced apart and shaped to receive the three prongs **19, 21, 23,** respectively, of a three-prong line plug **25.** The plug **25** may be of the conventional a.c. line type used wherever an equipment grounding conductor is required along with the two line conductors. The prongs **19** and **21** are connected respectively to the so-called neutral and hot conductors in the line cord **27,** whereas the prong **23** is connected to the grounding conductor in cord **27.** According to the common practice dictated by the National Electrical Code, prong **19,** i.e., the left-hand prong as viewed from the cord end of plug **25** in FIG. **1,** is always the neutral conductor, and prong **21,** i.e., the right-hand prong, is always the hot conductor of the power line.

As shown in FIGS. **1** and **2,** disk **11** narrows toward a portion **29** that is formed to define a cylindrical cup **31** into which a hollow elongated member or tube **33** is inserted and rigidly attached by a tight friction fit or suitable bonding material. Mounted on the end of tube **33** is a translucent plastic cap **35.** Contained within the tube **33** and cap **35** and disposed for view through cap **33** is an indicator means which is preferably a neon lamp **37.** However, other types of light emitting elements may be used, such as conventional incandescent lamps or electro-luminescent devices. Where it is desired to have low power drain and low leakage current, on the order of 100 microamperes or less, the light

emitting element used may be an electro-optical device such as a liquid crystal cell.

Neon lamp **37** is coupled by a pair of electrical conductors **39, 41** to electrical contacts **45, 43** at apertures **17, 15** respectively. As described hereinabove, the apertures **17, 15** receive the prongs of plug **25** which correspond to the hot line conductor and the ground conductor; therefore neon lamp **37** is coupled in circuit across these two conductors. A resistor **47** is connected in series with conductor **41** to drop the line voltage to a value suitable for operating neon lamp **37.** The electrical contacts **43,. 45** project slightly into the corresponding apertures **15, 17** to facilitate a tight frictional engagement, and consequently a good electrical connection with the prongs **21, 23** inserted into these apertures.

The two electrical conductors **39, 41** and resistor extending from neon lamp **37** are carried within tube **33** to disk **11** and the two conductors are preferably embedded in the disk from the narrow portion **29** thereof to the apertures **15, 17,** as indicated by the dashed outline of these conductors in FIG. **1.** The portion of the conductors disposed in disk **11** may be fine wires carried in channels molded in the disk or they may be fabricated in thin strips on the surface of the disk by suitable printed circuit techniques, for example. In either case, the disk **11** is preferably coated with potting material to insulate the electrical conductors thereon from the external environment and to provide mechanical strength.

The thickness, d, of disk **11** is preferably on the order 3/16 inch or less, so as to permit the disk to be mounted on the prongs of a line plug and still leave a substantial portion of the prongs exposed for insertion into a wall receptacle.

In FIG. **1,** the tube **33** for the indicator lamp is shown mounted in vertical alignment with the aperture **17** in disk **11.** However it is to be understood that the indicator lamp may be mounted in a different positional relationship with the three apertures **13, 15, 17.** For example, the lamp mounting may be moved 90° clockwise, thereby to permit a pluraltiy of line plugs and associated disks **11** to be used in a conventional multiple socket wall receptacle without spatial interference from the indicator lamps.

FIGS. **3** and **4** illustrate another embodiment of the invention. The physical configuration of the disk **11** and indicator lamp is substantially the same as that shown in FIG. **1,** and the disk **11** is shown in use when mounted on the prongs of plug **25** between the plug and a wall receptacle **49.** The embodiment of FIG. **3** includes a length of cord **51** extending from cup **31.** Attached to the end of cord **51** is a clip or a terminal lug **53.** Neon lamp **37** has one lead connected to an electrical contact **43** at aperture **15** for the hot line conductor in the same manner as described above with respect to FIG. **2.** However, as shown in FIG. **4,** the other lead from lamp **37** is connected to cord **51** instead of a contact at the aperture **17** in disk **11.** Terminal lug **53** is attached directly to the chassis or cabinet of an electrical appliance **55.** With this arrangement, the ground side of the lamp circuit is through cord **51,** appliance **55** and back through the ground wire **57** in the line cord to the ground conductor in the supply receptacle into which plug **25** is inserted. Thus the lamp continuously monitors the continuity of the ground connection from the earth ground to the appliance, thereby to insure that ground wire **57** or the chassis ground is not broken.

In use, as long as the indicator lamp remains on, the operator is insured that there is a ground connection. It is to be noted that the device of the present invention also insures that the proper line polarity exists in the wall receptacle. This is because the lamp will not light if the neutral and hot conductors are reversed.

I claim:

1. A ground-absence detector device for use with a three prong plug engagable in a mating electrical receptacle having hot and neutral line terminals and a ground terminal, the detector device comprising:

a wafer-like member having three apertures therein, said apertures being spatially arranged and configured to receive the three prongs of said three-prong plug, said wafer-like member having a predetermined thickness which is small enough to permit the installation of said wafer-like member on said prongs between the body of said plug and said mating receptacle;

an electrical indicating means affixed to said wafer-like member; and

means for electrically couping said indicating means across said hot line terminal and said ground terminal, said

coupling means including:

an electrical contact disposed at the aperture of said wafer-like member which receives the prong of said plug corresponding to said hot line terminal, said contact being configured to frictionally engage said last named prong;

a length of cord extending from said wafer-like member and having an end terminal connectable to a ground point on an electrical appliance associated with said plug; and

conductor means for coupling said indicating means to said contact and said cord.

2. The device of claim **1,** wherein said indicating means includes a light-emitting element having a visible portion, and means for mounting said element to extend said visible portion away from a plug on which said detector device is installed.

3. The device of claim **2** wherein said mounting means includes an elongated member extending from said wafer-like member beyond said plug body and having a longitudinal axis substantially parallel to the longitudinal axis of said plug.

4. The device of claim **2,** wherein said light-emitting element is a neon lamp and said last named electrically coupling means includes a voltage dropping resistor.

5. The device of claim **1,** wherein the predetermined thickness of said wafer-like member is less than three-sixteenths inch.

6. The device of claim **1,** wherein said conductor means is embedded in said wafer-like member.

7. The device of claim **6,** wherein said wafer-like member is coated with an electrically insulating potting material.

* * * * *