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POLARITY INDICATING APPARATUS

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Fig. 1

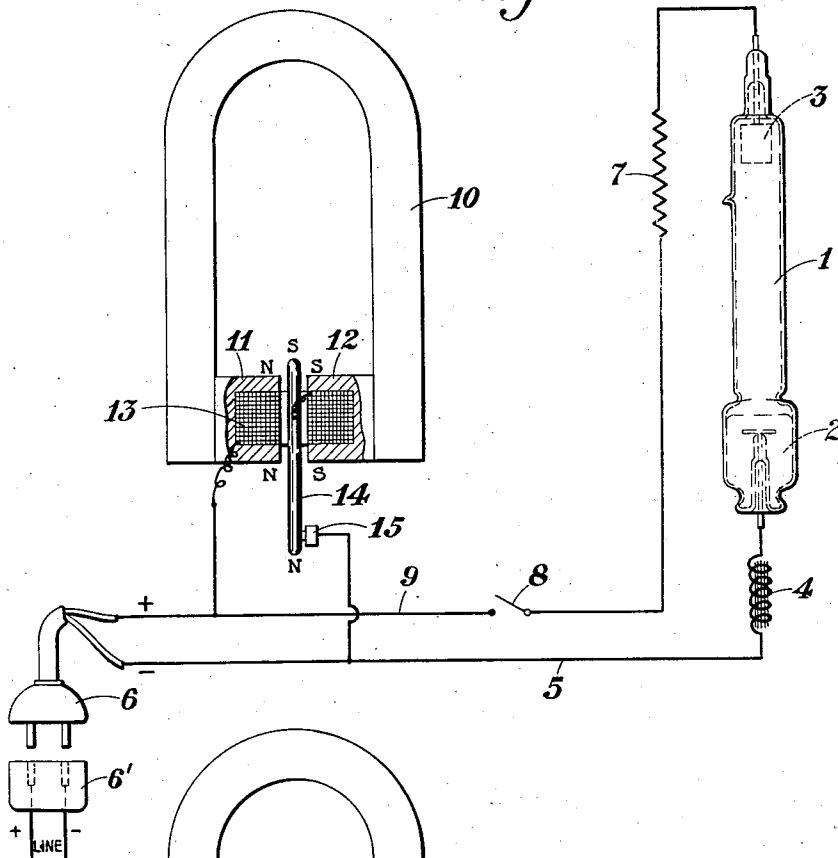


Fig. 2

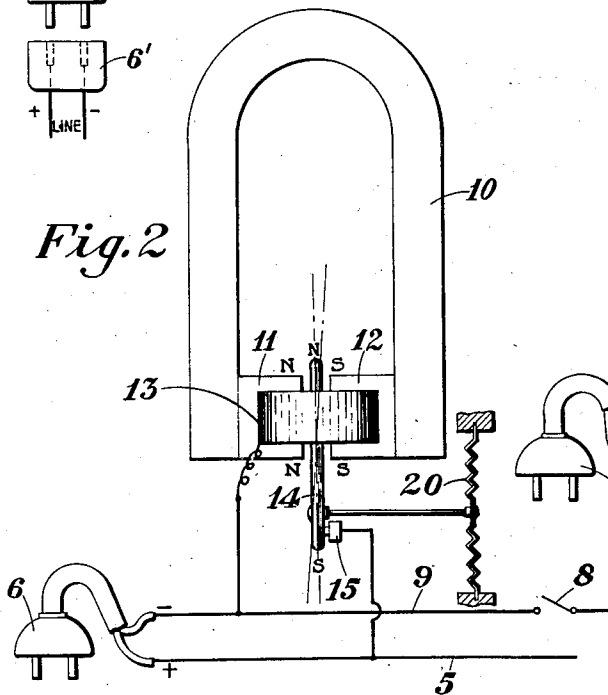
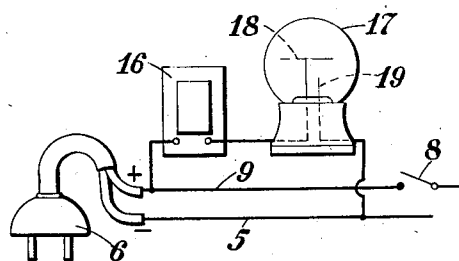


Fig. 3



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POLARITY INDICATING APPARATUS

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8 Claims. (Cl. 177-311)

The present invention relates to electric apparatus, and particularly to direct current apparatus which is intended for use only with a given polarity. The invention consists in a new and novel combination of apparatus, as hereinafter set forth and claimed.

A particular object of the invention is to provide means to give an audible signal whenever the leads to electrical apparatus, which is intended to operate with only one polarity, are connected with incorrect polarity. Other objects and advantages of the invention will appear from the following detailed specification or from an inspection of the appended drawing.

Many types of direct current apparatus are well known to be adapted for operation on only one polarity. While in some cases connection of such apparatus to a source of reverse polarity results in no injury thereto, certain devices, such as mercury arc lamps, are subject to destruction if so operated. Some means of insuring the proper polarity of the potential applied to such devices is therefore not only desirable, but frequently essential, especially where the devices are portable units which are to be operated from unpolarized outlets, such, for instance, as ultraviolet generators intended for home use. I have discovered that a signal device, such as a polarized buzzer, which is permanently associated with the apparatus may be made to give an audible warning whenever the leads to the apparatus have a potential of reverse polarity applied thereto. Such a warning has been found to be especially effective, since the insistent note of the buzzer cannot fail to attract the attention of even a relatively careless user. Operation of the device with reverse polarity is thereby effectively prevented.

For the purpose of illustrating my invention I have shown two embodiments thereof in the accompanying drawing, in which

Fig. 1 is a diagrammatic representation of a conventional quartz mercury vapor arc lamp circuit, with a polarized buzzer, shown in part section, connected across the leads to said lamp, correct polarity being indicated as applied to said leads,

Fig. 2 is a similar view of a portion of the circuit of Fig. 1, showing the use of a diaphragm to accentuate the noise from the buzzer, the application of reverse polarity to said leads being indicated, and

Fig. 3 is a diagrammatic representation of an alternative embodiment of applicant's invention, showing the use of a non-polarized buzzer in com-

bination with a rectifier in place of the polarized buzzer of Figs. 1 and 2.

In the drawing, with particular reference to Fig. 1, there is shown a typical operating circuit for a standard quartz mercury vapor arc lamp 1 of the direct current type. This lamp has a mercury cathode 2 and a tungsten anode 3, said cathode being connected through an inductance 4 and lead 5 to one terminal of a conventional plug connector 6, while the anode 3 is connected through a resistance 7, switch 8 and lead 9 to the other terminal of said connector 6. Said connector 6 is adapted to be inserted in a conventional outlet 6' which is in turn connected to a suitable source of direct current.

As shown in Figs. 1 and 2 the polarized relay consists of a permanent horseshoe magnet 10 having the bifurcated pole pieces 11 (north) and 12 (south) extending toward each other. An annular magnet coil 13 is mounted in the openings in said pole pieces 11 and 12 with its axis normal to the lines of force in the magnetic field between said pole pieces. A soft iron armature 14 which extends through said coil 13 is pivoted in a suitable manner therein at a point which is equidistant from said pole pieces. A contact point 15 which is adapted to contact with said armature 14 whenever said armature is in a normal position of rest is connected to the lead 5, while a connection is likewise made from lead 9 to one end of the magnet coil 13 and from the other end of said magnet coil to the armature 14. Where desired, a diaphragm 20 may be connected to the lower end of the armature 14, as shown in Fig. 2.

In the circuit of Fig. 3, which is somewhat similar to that of Figs. 1 and 2, the buzzer 16, which is non-polarized, has one terminal connected to the lead 9, while the other terminal thereof is connected to the plate 18 of a conventional point to plate gas-filled rectifying tube 17, the point electrode 19 of said tube in turn being connected to the lead 5.

In the use and operation of the novel combination of apparatus shown in Figs. 1 and 2, assuming the plug connector 6 to be inserted in the outlet 6', and thus connected to a suitable source of direct current with the polarity as shown in Fig. 1, current flows from the lead 9 through the magnet coil 13, and thence through armature 14 and contact 15 to lead 5. The armature 14, which is normally balanced between the pole pieces 11 and 12 as a result of the equal forces exerted thereon by each of the said pole pieces, is magnetized by the current flowing through the coil

13, the upper end becoming south and the lower end north, with the result that the magnetic forces become unbalanced and the armature tends to rotate in a counter-clockwise direction. Rotation in this direction is opposed, however, by the contact 15, so that the armature 14 is maintained immobile, and makes no sound. The operator, being thereby notified that the polarity is correct, closes the switch 8 and manipulates the mercury arc lamp 1 in the usual manner to initiate the discharge therethrough.

Assuming, however, that the plug connector 6 is reversed and thus has a potential applied thereto as indicated in Fig. 2, current flows from lead 5 through contact 15 and armature 14 to the magnet coil 13, which it traverses in the reverse direction, and thence to lead 9. The armature is, of course, magnetized by the current flowing through the coil 13, the upper end becoming a north pole and the lower end a south pole, the unbalanced magnetic forces thereupon causing rotation of said armature in a clockwise direction. The circuit through said magnet coil 13 is thereupon broken at contact 15, whereupon the armature 14 becomes demagnetized and returns to its normal contact making position. This obviously continues periodically, the armature vibrating between the positions indicated by the dot and dash lines in Fig. 2, causing a noise, which is especially insistent when the diaphragm 20 is used, that immediately attracts attention and warns that the polarity is incorrect. The operator thereupon reverses the plug connector 6, whereupon the armature 14 is silenced and the operator proceeds to close the switch 8 and to start the arc in the usual manner.

In the circuit of Fig. 3, assuming the plug connector 6 to be connected to a suitable source of direct current of the indicated polarity, the plate electrode 18 of the conventional point to plate gas-filled rectifying tube 17 is positive, while the point electrode 19 thereof is negative, so that no appreciable current can pass therebetween, due to the small area of the negative electrode. As a result the buzzer 16 is inoperative, and the operator proceeds as in Fig. 1 to close the switch 8 and to start the arc. If the potential applied to the plug connector 6 be reversed, however, the plate electrode 18 is negative and serves as a cathode, passing an appreciable current which flows from the lead 5 to the point electrode 19, thence through the gaseous atmosphere within the tube 17 to the plate electrode 18, and then through the buzzer 16 back to the lead 9. The buzzer armature is thereby caused to vibrate, producing the desired warning note. The operator thereupon reverses the plug connector 6 and proceeds in the usual manner to start the arc.

While I have indicated the use of a switch 8 in each of the embodiments of my invention, it is obvious that where the buzzer is designed to protect a device such as the mercury arc lamp 1, in which the circuit is incomplete until the lamp has been manually tipped to cause the mercury to bridge the electrodes thereof, this switch may be omitted; or it may, if desired, be located between the plug 6 and the point of connection of the buzzer circuit, in order to permit the device to be semi-permanently plugged into a suitable outlet without causing the buzzer to continuously absorb energy while the lamp or the like is not in operation.

While I have illustrated my invention by reference to specific embodiments thereof, it is to be understood that various changes, omissions or

substitutions, within the cope of the appended claims, may be made therein without departing from the spirit thereof.

I claim as my invention:

1. In combination, a direct current device which is subject to destruction if operated with reverse polarity, leads to said device, and means connected to said leads in shunt to said device for giving an audible signal when a predetermined polarity is applied to said leads, the circuit through said device being normally open.

2. In combination, a direct current device which is subject to destruction if operated with reverse polarity, leads to said device, and means connected to said leads in shunt to said device for giving an audible signal when the polarity applied to said leads is the reverse of that required by said device, the circuit through said device being normally open.

3. In combination, a direct current device which is subject to destruction if operated with reverse polarity, leads to said device, means connected to said leads in shunt to said device for giving an audible signal when a predetermined polarity is connected to said device, and a switch in said leads between said device and said signal.

4. In combination, a direct current electric gaseous discharge device which is subject to destruction if operated with reverse polarity, leads to said device, and an audible signal, said signal having an operating coil connected to said leads in shunt to said device and a polarized armature which intermittently opens the circuit through said coil when a predetermined polarity is applied to said leads, the circuit through said device being normally open.

5. In combination, a direct current mercury vapor arc device which is subject to destruction if operated with reverse polarity, leads to said device, an audible signal, said signal having an operating coil connected to said leads in shunt to said device and a polarized armature which intermittently opens the circuit through said coil when a predetermined polarity is applied to said leads, and a switch between said coil and said device.

6. In combination, a direct current mercury vapor arc device which is subject to destruction if operated with reverse polarity, leads to said device, an audible signal having an operating coil connected to said leads in shunt to said device and means operated by said coil to intermittently open the circuit through said coil when the polarity applied to said leads is the reverse of that required by said device, the circuit through said device being normally open.

7. In combination, a direct current mercury vapor arc device which is subject to destruction if operated with reverse polarity, leads to said device, an audible signal having an operating coil connected to said leads in shunt to said device, means operated by said coil to intermittently open the circuit through said coil when the polarity applied to said leads is the reverse of that required by said device and a switch between said coil and said device.

8. In combination, a direct current device which is subject to destruction if operated with reverse polarity, leads to said device, and an audible signal and a rectifier connected in series across said leads in shunt to said device, whereby said signal is operative only when the polarity applied to said leads is the reverse of that required by said device, the circuit through said device being normally open.

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