Jan. 3, 1933. H. C. RENTSCHLER 1,893,305

METHOD OF MAKING FAILURE INDICATOR LAMPS

Filed Dec. 13, 1930

Fig. 1.

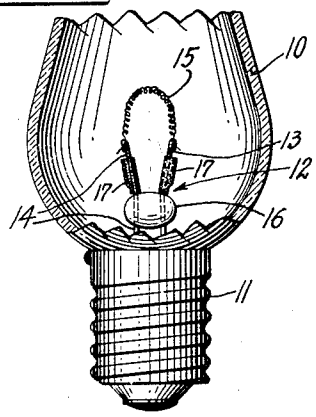



Fig. 2.

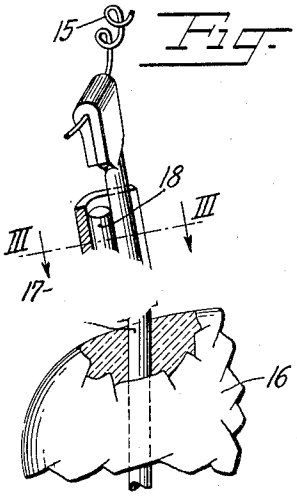



Fig. 3.

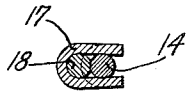



Fig. 4.

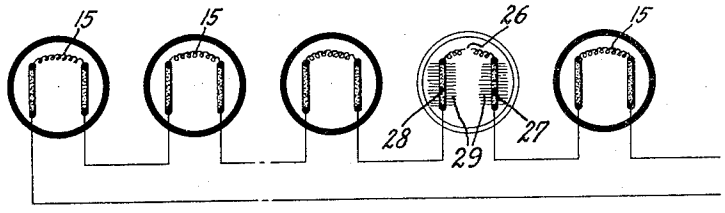



Fig. 5.

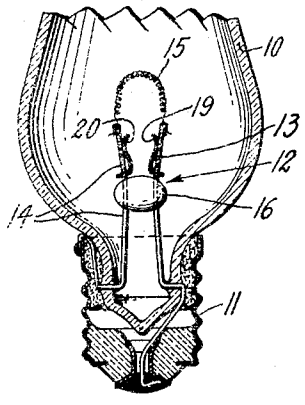



Fig. 6.

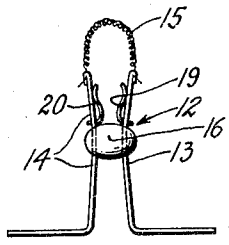



Fig. 7.

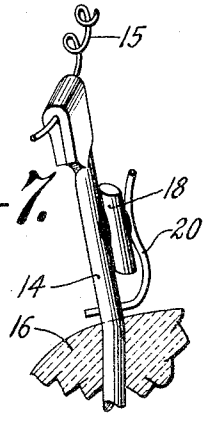
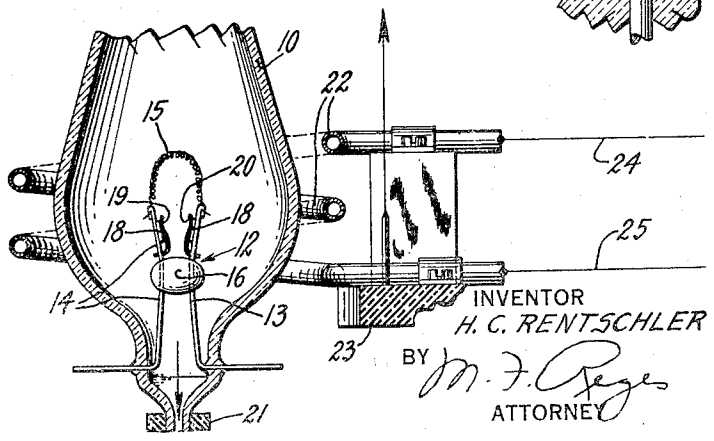



Fig. 8.




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Patented Jan. 3, 1933 1,893,305

# UNITED STATES PATENT OFFICE

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## METHOD OF MAKING FAILURE INDICATOR LAMPS

Application filed December 13, 1930. Serial No. 502,077.

This invention relates to incandescent electric lamps which are operated in series and relates more particularly to a lamp having means incorporated therewith for indicating a breakage or failure of the filament within the lamp.

Certain types of incandescent electric lamps, such for example, as those employed for Christmas tree lighting and which may be termed miniature lamps, are operated when a given number are connected in series so that the combined voltage of the lamps equals the line voltage supplying the electrical energy.

It has been found that when using a plurality of lamps connected in series considerable inconvenience occurs upon a failure of one of the lamps, as for instance, when a filament breaks, since such failure interrupts the continuity of the circuit and the rest of the lamps are extinguished.

When a string or plurality of series connected lamps become extinguished, owing to a failure of one of the lamps, it is difficult to determine by inspection which lamp is defective and it becomes necessary in order to discover the lamp which has failed, to test by trial until the defective lamp is found. This procedure involves considerable time and inconvenience and has heretofore caused considerable annoyance in connection with series burning lamps.

Various methods have been proposed for avoiding the above disadvantages and lamps have been provided with cut-out materials so arranged that the cut out material will carry the load when the lamp has failed, permitting the remaining lamps to burn, thus indicating the defective lamp.

The present invention provides a lamp in which the use of cut out materials is avoided and in which visible indication is given upon the breakage of a filament in the lamp.

A lamp of the present type for indicating a failure of the filament by means of a glow discharge is shown and described in copending application Serial No. 502,052 filed December 13, 1930, assigned to the same assignee as is the present invention.

This application discloses a lamp in which a relatively small amount of magnesium is disposed in the coil of the filament or a portion of the filament is coated with a layer of magnesium, the magnesium being vaporized by the heat generated in the filament during operation and thus the lead wires supporting the filament are given a deposit of magnesium and serve as electrodes.

Although satisfactory results have been obtained by reason of the above method it has been found more advantageous to employ a lamp structure in which a relatively large quantity of magnesium is supported in position to be vaporized during the exhausting operation of the lamp bulb, thus providing the lead wires with electrode surfaces of clean or pure magnesium.

It is an object of the present invention therefore to provide a simple and effective method of providing an electrical device such as, an incandescent lamp or the like, with electrode surfaces to effect a glow discharge.

Another object of the invention is to provide electrode surfaces of substantially pure material to promote the starting potential.

Another object of the invention is to provide an incandescent electric lamp with vaporizable material so positioned as to be vaporizable when disposed in the field of a high frequency coil.

Other objects and advantages of the invention will be more fully described together with the accompanying drawing in which,

Fig. 1 is a side elevational view of an incandescent lamp with the bulb partly broken away and showing means for supporting a quantity of magnesium supported on the lead wires of the device.

Fig. 2 is an enlarged fragmentary view in perspective showing the magnesium supporting means;

Fig. 3 is a view taken on lines III—III in Fig. 2;

Fig. 4 is a diagrammatic view of a number of lamps connected in series and indicates a glow discharge in one of the lamps in which the filament is broken;

Fig. 5 is a vertical sectional view of a lamp and base and shows a modified form of holding the vaporizable material by the use of spring clips;

Fig. 6 is a view of a mount for a lamp ready to be sealed into a bulb;

Fig. 7 is an enlarged perspective view showing a clip holding a piece of vaporizable material, and

Fig. 8 is a sectional view of a bulb in position to be exhausted and having a high frequency coil therearound to vaporize the magnesium.

Although the present method is applied to lamps of the miniature or Christmas tree type it is obvious that the same may be practiced with other electrical devices wherein it it desirable to produce a glow discharge upon a break in the internal circuit of the device.

As illustrated a practical embodiment of the invention may include a bulb 10 having the usual base 11 secured thereto. A mount 12 is supported within the bulb by means of lead wires 13 and 14 which are sealed through the wall of the bulb in the usual manner. The upper ends of the lead wires are connected to the terminals of a coiled filament 15 and a glass bead 16 is provided to hold the support wires in fixed relation.

As shown more clearly in Fig. 2 the lead wires may be provided with a cup 17 in which a small piece of magnesium 18 is deposited. If desirable the lead wires 13 and 14 may be provided with spring clips 19 and 20 as shown in Fig. 5 and small pieces of magnesium 18 may be held in position by the clips.

As shown in Fig. 8 a bulb having the vaporizable material secured in position on the lead wires may be applied to an exhaust pump 21 and the bulb exhausted. It will be understood that the present lamp may be put through the usual exhaust schedule and at the last or final exhaust stage a high frequency coil 22 may be moved to encircle the bulb and produce a high frequency field to heat the magnesium vaporizing the same and precipitating a clean layer thereof on the leads 13 and 14. The coil 22 may be mounted on a movable support 23 and connected with conductors 24 and 25 to a suitable source of electrical energy, (not shown).

The bulb may be provided with a suitable gas to support a glow discharge and it has been found that a mixture of about 99.5% of neon and about .5% of argon at a pressure ob about 3 c. m. gives the required voltage discharge.

A lamp provided with the magnesium surfaced electrodes when used in series, as shown in Fig. 4, provides a means for indicating a break within the lamps, for example as shown if a break occurs in the filament at 26 the filament circuit of the lamps in series will be interrupted but by reason of the electrode surfaces 27 and 28 a glow discharge 29 will occur indicating the lamp in which the failure has occurred. Obviously if the lamps are used with an A. C. source of electrical energy both electrodes will glow alternately, if a D. C. source is used one electrode will glow continuously. The lamps remaining in the circuit will not pass sufficient electrical energy to become heated to visibility and serve as a ballast resistance for the regulation of the glow discharge in the lamp in which the failure has occurred.

It will be evident that by reason of the present invention an incandescent electric lamp convertible to a glow discharge device may be provided in a practical and effective manner. The operation of flashing or vaporizing the magnesium during the exhaust period of the bulb results in a withdrawal of the impurities and makes it possible to provide the electrodes with a clean and effective operating surface.

Although a preferred embodiment of the invention is shown and described herein, it is to be understood that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. The method of making an incandescent electric lamp having a filament convertible to a glow discharge device upon a break in the filament which comprises introducing into the lamp bulb a gas capable of supporting a glow discharge, providing the bulb with a quantity of material of low breakdown voltage, vaporizing the material to precipitate layers thereof on adjacent lead wires of the lamp to provide electrodes to produce a glow discharge upon a break in the filament.

2. The method of making an incandescent electric lamp having a filament convertible to a glow discharge lamp upon a break in the filament which comprises introducing into the lamp bulb, a gas capable of supporting a glow discharge, supporting a quantity of magnesium within the bulb, heating to vaporize the magnesium to deposit clean surfaces thereof on portions of adjacent conductors supporting said filament so that said portions constitute electrodes having a voltage drop sufficiently low to cause a glow discharge upon a break in the circuit within said bulb.

3. The method of making an incandescent electric lamp having a filament convertible into a glow discharge lamp which comprises, introducing into the bulb of the lamp a mixture of neon and argon gas, and flashing within the bulb a quantity of magnesium to cause a deposit of magnesium on portions of adjacent conductive filament supports causing said portions to constitute electrodes and produce a glow discharge upon a break in said filament.

4. The method of making an incandescent electric lamp having a filament convertible into a glow discharge lamp which comprises, introducing into the bulb of the lamp a mixture of neon and argon gas, and flashing

within the bulb a quantity of magnesium to cause a deposit of magnesium on portions adjacent conductive filament supports causing said portions to constitute electrodes and produce a glow discharge upon a break in the filament circuit within said bulb.

5. The method of making an incandescent electric lamp having a filament convertible into a glow discharge lamp which comprises introducing into the lamp a gaseous atmosphere and in flashing in the bulb thereof a material for deposit on the lead wires of the lamp to provide electrodes for causing a glow discharge upon a break in the filament.

6. The method of making a filament failure indicator for an incandescent electric lamp having a gaseous filling which comprises flashing within a lamp bulb a material for deposit on portions of the circuit within the lamp bulb to cause said portions to act as electrodes and produce a glow discharge upon a break in the circuit within said bulb.

7. The method of making a filament failure indicator for an incandescent electric lamp having a gaseous filling which comprises flashing within a lamp bulb a material for deposit on portions of the circuit within the lamp bulb to cause said portions to act as electrodes and produce a glow discharge upon a break in said filament.

In testimony whereof, I have hereunto subscribed my name this 11th day of December, 1930.

HARVEY CLAYTON RENTSCHLER.