Nov. 29, 1949 P. H. KUEVER, JR 2,489,649

LAMP FAILURE INDICATOR

Filed March 10, 1949

Fig. 1

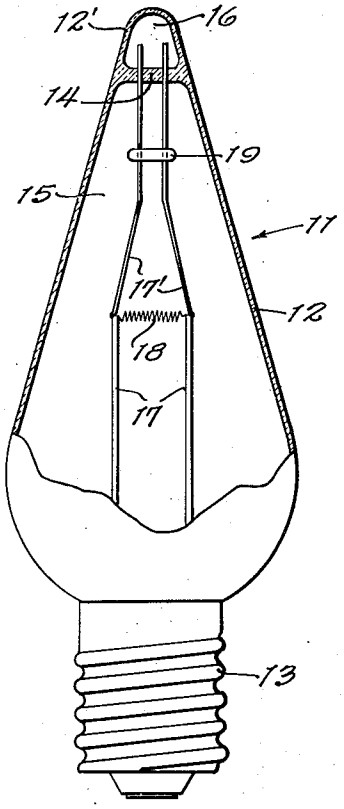


Fig. 2

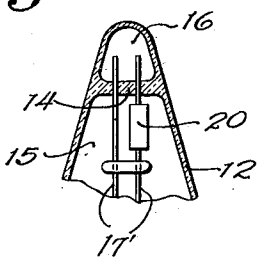
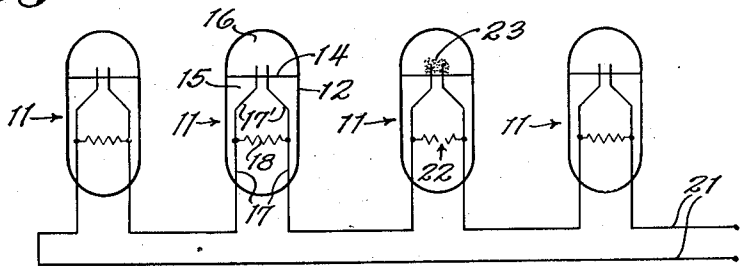


Fig. 3



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LAMP FAILURE INDICATOR

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7 Claims. (Cl. 315—129)

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This invention relates to electric lamps, and more particularly to a lamp of the type adapted to be energized in series with other similar lamps, as in the conventional arrangement of low-voltage lamps employed for Christmas-tree lighting. When the filament of one of the lamps in such a series arrangement burns out, the other lamps in series with it are extinguished so that it is difficult to determine which of the lamps is defective. To avoid this difficulty, it is an object of my present invention to provide a lamp having improved means for visually indicating failure of its filament.

For the purpose of indicating lamp-filament failure it has been proposed to introduce ionizable gas in the lamp bulb in an amout such that a glow-discharge is produced when the voltage across the filament supports increases as a result of rupture or burn out of the filament. However, the presence of such gas in the bulb has been found to have a harmful effect on the filament and tends to shorten its life. For instance, I have found that even a very small amount of neon gas in the bulb appears to reduce the temperature of an ordinary incandescent filament so that the cross-sectional area of the filament must be reduced in order to obtain normal brilliance; the filament then being so fragile that it is more subject to rupture by burn-out or shock.

It also has been proposed to provide small neon glow-lamps connected in parallel with, but physically separate from, each of the incandescent lamps of a series so that upon rupture of a lamp-filament the glow-lamp lights. An obvious disadvantage of such an arrangement is that there are more parts which may become damaged or electrically disconnected. Further, the mere loosening of the incandescent lamp in its socket will cause its associated glow-lamp to light and thereby give a false indication that the loose incandescent lamp is burnt out.

To overcome the above-mentioned disadvantages of the prior-art systems, I provide, as an integral part of the lamp, glow-discharge means for indicating filament failure, but I locate the indicating means in a sealed compartment of the bulb separate from the compartment which contains the filament. Further, I extend the filament supports or conductors into the separate compartment to serve as electrodes for the glow-discharge, so that the indication of filament failure is positive inasmuch as the glow can occur only in the event of actual rupture of the filament and resultant increase of voltage across the conductors.

For full understanding of the invention, and further appreciation of its features and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

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In the drawing:

Figure 1 is a view, mainly in longitudinal section, of a lamp embodying the invention;

Figure 2 is a fragmentary sectional view illustrating a modified form of conductor extension; and

Figure 3 is a schematic view of a series arrangement of lamps of the kind shown in Fig. 1.

Referring first more particularly to Figs. 1 and 3 of the drawing, the numeral 11 indicates a lamp having a bulb 12 of the generally pear-shaped type commonly used in Christmas-tree lighting. Attached at the bottom of the bulb is a conventional base 13. Near the tip of the bulb is a partition 14 which sealingly divides the bulb into a large main compartment 15 and a relatively small compartment 16; the partition 14 conveniently being of the same vitreous material as the bulb and integrally joined thereto. In production, the tip portion 12' of the bulb may be formed as an addition to a bulb whose top corresponds to the partition 14.

Connected in the usual manner to the contact elements of the base 13 is a pair of metallic electric conductors 17 which sealingly extend into the main compartment 15 of the bulb. Joined to the conductors 17, as by welding, is a pair of similar conductors 17', which extend upward into the small compartment 16; the material of the partition 14 being fused around the conductors 17' to preserve the seal between compartments 15 and 16.

Bridged across the conductors 17—17' in the main compartment 15 is an incandescent filament 18 of the usual low-voltage type. Fused around the conductors 17' near their upper ends is a vitreous button 19 whose main purpose is to hold the conductors in properly spaced relation during manufacture of the lamp; the button having no particular utility in the finished lamp inasmuch as the filament-supporting conductors 17—17' are then rigidly held at both of their ends.

The filament compartment 15 is fully evacuated, and the upper compartment 16 is charged with neon, or other gas or gases capable of producing a visible glow when ionized. The pressure of the gas, and the spacing of the electrodes or conductors 17' in compartment 16, are such that a faint but visible glow occurs around and between the electrodes when the full voltage of the electric service line is impressed across them. When the filament is intact, the high-resistance ionization path in compartment 16 is shunted by the relatively low resistance of the filament, so that only a small fraction of the line voltage (insufficient to effect visible ionization) is then impressed across the electrodes.

In Fig. 3, a plurality of lamps, each of the same kind as that shown in Fig. 1, are shown interconnected in series and to wires 21 which, it is to be

assumed, lead to the lighting service supply. In the usual series arrangement for Christmas-tree lighting there are eight lamps whose filaments are therefore designed to operate at one-eighth of the line voltage; for example, there are eight 15-volt lamps in series in a 120-volt circuit. One of the lamps in Fig. 3 has a broken filament, indicated at 22, so that a glow discharge 23 appears in the upper compartment of that lamp due to the fact that substantially the full line-voltage is then impressed across the conductors of the lamp. The voltage-drop across the intact filaments of the other lamps is negligible due to the minute amount of current flow which produces the glow discharge, so that there is no appreciable heating of those filaments.

In Fig. 2 there is shown the upper fragment of a lamp identical with that of Fig. 1 except that a portion of one of the conductors 11' is constituted by a resistor 20 of the "carbon" type. This resistor may have a value of about 0.1 megohm and serves to prevent the possibility of the build-up of excessive glow-discharge current which otherwise might occur if the pressure of the gas is relatively high. However, I have found that such a resistor is not essential when the gas pressure is of a low order but still sufficient for the production of a clearly-visible glow.

The conductors 11—11' are spaced relatively widely apart in the main compartment 15 to conform with the length of the filament and are brought closer together in the small compartment 16 to define a suitable glow-discharge gap. Relative movement of the conductors 11—11' when the lamp is jarred (which movement might cause damage to the filament) is minimized due to the fact that these conductors are firmly held at both ends.

If, as is customary, a decorative coating is applied to the outside of the lamp bulb, the tip 12' may be left uncoated without detracting from the appearance of the lamp, so that in the event of burn-out of the filament the resultant glow discharge can be detected more readily.

The specific embodiments of my invention herein shown and described are obviously susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. An electric lamp, adapted to be energized in series with one or more similar lamps, comprising: a lamp bulb; a partition sealingly dividing said bulb into a first and a second compartment; a pair of spaced electric conductors sealingly extending through the wall of the bulb into one of said compartments and, sealingly and insulatingly through said partition, into the other of the compartments; an incandescent filament in said first compartment and bridged across said conductors, said first compartment being evacuated; and a charge of ionizable gas in said second compartment, the pressure of said gas and the space between the conductors in said second compartment being such that a glow discharge is producible in the second compartment only upon rupture of said filament and resultant increase of voltage across the conductors.

2. An electric lamp, adapted to be energized in series with one or more similar lamps, comprising: a lamp bulb; a partition sealingly dividing said bulb into a first and a second compartment; a pair of spaced electric conductors sealingly extending through the wall of the bulb into said first compartment and, sealingly and insulatingly through said partition, into said second compartment; an incandescent filament in said first compartment and bridged across said conductors, said first compartment being evacuated; and a charge of ionizable gas in said second compartment, the pressure of said gas and the space between the conductors in said second compartment being such that a glow discharge is producible in the second compartment only upon rupture of said filament and resultant increase of voltage across the conductors.

3. An electric lamp, adapted to be energized in series with one or more similar lamps, comprising: a lamp bulb; a partition sealingly dividing said bulb into a main and a relatively small compartment; a base attached to the part of the bulb defining said main compartment; a pair of spaced electric conductors sealingly extending from said base into said main compartment and, sealingly and insulatingly through said partition, into said small compartment; an incandescent filament in said main compartment and bridged across said conductors, said main compartment being evacuated; and a charge of ionizable gas in said small compartment, the pressure of said gas and the space between the conductors in the small compartment being such that a glow discharge is producible in the small compartment only upon rupture of said filament and resultant increase of voltage across the conductors.

4. An electric lamp, as defined in claim 3, wherein said bulb is generally pear-shaped and said small compartment is at the small end of the bulb.

5. An electric lamp as defined in claim 3, and wherein a portion of at least one of said conductors, between the point of connection of said filament with that conductor and the small-compartment end of the conductor, is of high-resistivity material.

6. An electric lamp, adapted to be energized in series with one or more similar lamps, comprising: an elongated lamp bulb; a partition dividing said bulb transversely into a main and a relatively small compartment, said partition being of material similar to that of the bulb and integrally joined thereto; a base attached to the end of the bulb which defines said main compartment; a pair of spaced electric conductors, arranged longitudinally within the bulb, sealingly extending from said base into said main compartment and, sealingly through said partition, into said small compartment; an incandescent filament in said main compartment and bridged across said conductors, said main compartment being evacuated; and a charge of ionizable gas in said small compartment, the pressure of said gas and the space between the conductors in the small compartment being such that a glow discharge is producible in the small compartment only upon rupture of said filament and resultant increase of voltage across the conductors.

7. An electric lamp, as defined in claim 6, wherein the spacing of said conductors is relatively wide in said main compartment to accommodate said filament, and relatively close in said small compartment for production of said glow discharge.

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No references cited.