ELECTRIC LAMPS OF THE VIBRATING FILAMENT TYPE HAVING A CONDUCTIVE COATING

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Filed: Sept. 5, 1972

App. No.: 286,551

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UNITED STATES PATENTS

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ABSTRACT

An incandescent lamp having a movable filament therein which is caused to oscillate in response to the field from a magnet in which at least a portion of the surface of the lamp envelope is coated with an electrically conductive material.

7 Claims, 5 Drawing Figures
1 ELECTRIC LAMPS OF THE VIBRATING FILAMENT TYPE HAVING A CONDUCTIVE COATING

Decorative incandescent lamps with vibrating filaments that simulate the flickering movements of a candle flame are commercially available. Lamps of this type have a filament of a relatively thin and flexible material which is formed in a loop of a desired shape. A permanent magnet is mounted either inside the glass lamp bulb or on the outside of the bulb with its magnetic field oriented to react with alternating current flowing through the filament to cause the lamp filament to vibrate. The alternating current applied to the filament is also of a magnitude to make the filament incandescent so that the impression of a flickering live flame is created for the purposes of esthetic appeal. A lamp of this general type is disclosed in U.S. Pat. No. 3,237,053 and French patent 368,913.

Some lamps of the foregoing type, out of a batch which are made by the same manufacturing techniques, become inoperative, that is, cease vibration, or begin to vibrate only slowly or intermittently after a relatively short period of time of operation. One reason for this, among others, is that the glass bulb accumulates an electric charge on its surface. This charge in turn creates a relatively strong electric field between the inner wall of the lamp bulb and the filament. The electric field produced by the static charge electrically attracts the filament, which is relatively thin and flexible. In some cases, the attraction is strong enough so that the filament will be moved completely over to the wall of the bulb where it will be held. This, of course, renders the bulb inoperative for its intended purpose of producing a vibrating filament.

The static charge is held by the bulb for a long period of time, due to the excellent insulating properties of the glass. In some cases, it is possible to discharge the built-up static charge merely by touching the lamp bulb. However, in other cases, this simple expedient will not work. When the thin filament is attracted against the bulb wall by the electric charge, it is often permanently damaged thereby rendering the lamp useless even if the static charge could later be dissipated.

The present invention relates to lamps of the vibrating filament type and more particularly to an arrangement for preventing the buildup of a static electric charge on the glass lamp bulb. In accordance with the invention, a coating of a light-transmitting electrically conductive material is deposited on the inside, the outside, or both walls of the bulb. The conductive coating, which is returned to an electric neutral point, acts to dissipate the electric charge which would be built up on the lamp bulb. The coating may also be of a suitable type, for example of a desired color, so as to produce a novel decorative effect. Thus, the coating performs the dual function both of reducing the buildup of the static electric charge and also of serving as a decorative coating. The latter is particularly esthetically pleasing when used in combination with the vibrating incandescent lamp filament.

It is therefore an object of the present invention to provide a novel incandescent lamp of the type having a vibrating incandescent filament with a coating of conductive material on one of the walls of the bulb to reduce the static electric charge buildup.

An additional object is to provide an electric incandescent lamp with a vibrating filament having a conductive coating on both the inner and outer walls, at least one of these coatings being of colored material.

Still a further object of the present invention is to provide a novel electric incandescent lamp having a vibrating filament with provisions to dissipate any static electric charge which is built up on the wall of the lamp bulb.

Other objects and advantages of the present invention will become more apparent upon reference to the following specification and annexed drawings, in which:

FIG. 1 is an elevational view, partially broken away, of a lamp made in accordance with the invention;

FIG. 2 is an elevational view similar to FIG. 1 of the turn 90° with respect thereto;

FIG. 3 is a view similar to that of FIG. 2 of another embodiment of the invention;

FIG. 4 is a cross-section of a fragment of the lamp bulb wall of FIG. 3; and

FIG. 5 is an elevational view similar to FIG. 1 showing another embodiment of the lamp.

Referring to FIGS. 1 and 2, the lamp of the subject invention includes the usual glass bulb 12 having a threaded base 13 which forms one electrical contact 14 for connection to an alternating current supply (not shown) and a second contact 15 at its bottom. This is a conventional lamp construction. It shall be understood that other conventional base constructions, for example a bayonet base, also can be utilized.

A filament 18 having the shape of a loop extends upwardly from a glass stem 20 mounted within the lamp bulb. The filament is mounted at its ends 18a and 18b to a pair of lead wires 21a and 21b which pass through stem 20 and are respectively connected to the contacts 14 and 15 of base 13. The connection between the ends of the filament and the lead wires can be made by any suitable arrangement, for example, by the use of a suitable electrically conductive cement. The filament 18 is preferably made of carbon and is relatively thin and flexible so that it can vibrate in a desired pattern. The filament itself is shaped as desired.

A pin 22 is mounted in the stem 20. The pin is not electrically connected to any other part of the lamp. It has a loop 23 at its upper end to hold a permanent magnet 25. The permanent magnet, which can be of metal, ceramic, or any other suitable material, is shown illustratively as being of elongated bar shape. It should be understood that any suitable shape can be utilized. Also, it should be understood that the permanent magnet can be located on the outer wall of the bulb.

The permanent magnet is oriented with respect to the filament 18 so that its magnetic field reacts with the alternating current applied to the filament to cause the filament to vibrate, pivoting about the connecting points to the lead wires, in accordance with the classical physical reaction of electromagnetic theory wherein a magnetic field reacting with electric current will produce motion. Since alternating current is used, the motion generally will be in opposite directions on each side of the plane of the filament when it is at rest.

It has been found that for some reason the motion of the filament 18 will eventually cause a static electric charge to build up on the wall of bulb 12. The theoretical reason for the charge build up is not entirely known.
but it is believed that it is, in some measure, due to an electric induction effect. The majority of the charge concentration is on the inner wall of the bulb. This electric charge, when strong enough, will either stop the filament from vibrating or will strongly attract the filament to engage the wall of the bulb. This either stops the filament from vibrating, slows it down considerably, or weakens the vibrational amplitude. In some cases the filament is permanently damaged when it engages the bulb wall and will stop vibrating entirely or break and thereby render the lamp totally inoperative.

In accordance with the invention, the foregoing disadvantages are overcome by coating at least one of the wall of the bulb with a thin, light transparent electrically conductive coating. It is preferred that the coating be at least on the inner bulb wall. This is shown in FIG. 2 wherein the coating 30 fully coats the inner wall of the bulb. It also extends over at least a portion of the stem 20 to make contact with one of the leads 21a or 21b. This connects the coating to the neutral electrical points of the alternating current power supply on alternate half cycles of the applied voltage to discharge any static electric charge which is built up on the bulb wall. Instead of using the coating material to connect the coating to one of the lead wires, a conductive wire or strip can be utilized.

The conductive coating can be of any suitable material which has the necessary electrically conductive properties. For example, it can comprise a metal such as aluminum, silver, gold, copper, tin, etc. It can also comprise another electrically conductive compound, for example, tin oxides. Some semi-conductive compounds, for example gallium phosphide, gallium arsenide, indium arsenide, mercury selenide, can also be used. This will provide a slower rate of leak-off of the charge. The coating and its thickness are selected so that the bulb will still have substantial light-transmission quantities for the light given off by the filament. This can be accomplished by depositing on the bulb wall by evaporation or cathode-spattering under vacuum, or any other suitable method, the desired thickness layer of the coating material being used. Such coatings can be made very thin, as small as about ten angstroms.

While the coating layer 30 will absorb some of the light emitted from the incandescent filament 18, this absorption can be kept relatively low by using a very thin layer of the conductive material. Even when the optical absorption of the coating layer or layers is adjusted to less than 10 percent of the incident visible light, the electrical conductivity can be entirely sufficient for the purpose of this invention to prevent the accumulation of an electrical charge on the glass bulb wall. It should be understood that the coating material 30 can be selected for a particular esthetic effect, for example, by color or by the pattern of deposition.

FIGS. 3 and 4 show another embodiment of the invention. Here a coating layer 30 is deposited on the inner bulb wall and a layer 32 on the outer bulb wall. As before, the coatings are of any suitable electrically conductive material. The inner layer 30 is again electrically connected to one of the lead wires 21a or 21b, whichever is the one electrically connected to the threaded portion 14 of base 13. The outer layer 32 also has a lower portion 33 which extends to make electrical contact with the threaded portion of the base 13.

both the inner and outer coatings 30 and 32 are connected to the same electrical point there is no potential gradient between the two coatings and a charge cannot be built up. In some cases it might not be necessary to make the extending portion 33 since the threaded part of the socket into which the lamp is screwed would normally make contact with the lower end of the bulb.

In some applications, for decorative lamps with vibrating filaments, a certain amount of light adsorption through an electrically conductive layer on the glass bulb is desirable. If the coating is properly selected, the light absorption or partial absorption and partial reflection of the light from the filament on the opposite bulb walls can produce interesting and pleasing decorative optical effects. Further, if the electrically conducting layer is made extremely thin, it can produce multi-color effects through optical interference, thus creating the appearance of an "iridescent" coating on the lamp bulb. In some cases, the desired decorative effects can be obtained without electrically connecting the outer coating 32 to the source of alternating current voltage. It has been found that the inner coating provides the most significant effect with respect to the prevention of charge accumulation.

The accumulation of electrical charges can in many cases also be effectively prevented by coating the bulb only partially. As shown in FIG. 5, only the lower half of the bulb inner wall surface, from the bulb neck to the semi-spherical "bowl" of the bulb, has a coating 30 thereon. In general, the coating does not have to cover the entire bulb surface, either inside or outside.

Other suitable patterns, or configurations, for the coating also can be used. For example, a "wire mesh" or other suitable configuration which provides an electrically closed surface can be utilized on all or a portion of the one or both of the bulb walls. This provides an interesting decorative effect as well as seeming to prevent charge accumulation.

What is claimed is:

1. In an incandescent lamp the combination comprising, a bulb of transparent vitreous material, an incandescent filament located within said bulb, means for electrically connecting said filament to a source of alternating current, a permanent magnet located with respect to said filament to interact with the current flowing therethrough to produce vibration of the filament and to cause it to travel through a substantial portion of the internal area of the bulb and adjacent the inner wall of the bulb, an electrically conductive coating material which is at least partially light transmissive on at least one of the walls of said bulb, and means for electrically connecting said coating to a point of potential with respect to said current source to leak away a static electric charge from the bulb.

2. A lamp as in claim 1 wherein said electrically conductive coating is located on the inner wall of the bulb.

3. A lamp as in claim 1 wherein said electrically conductive coating is located on the outer wall of said bulb.

4. A lamp as in claim 1 wherein the electrically conductive coating is located on both the inner and the outer walls of the bulb.

5. A lamp as in claim 1 wherein the electrically conductive coating covers only a portion of the surface of the bulb wall.

6. A lamp as in claim 1 wherein said electrically conductive coating is arrayed in a predetermined pattern.

7. A lamp as in claim 1 wherein said electrically conductive coating is of metal.

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