Feb. 11, 1936. H. R. RUFF 2,030,401

ELECTRIC GASEOUS DISCHARGE DEVICE

Filed Sept. 3, 1935

Fig. 1

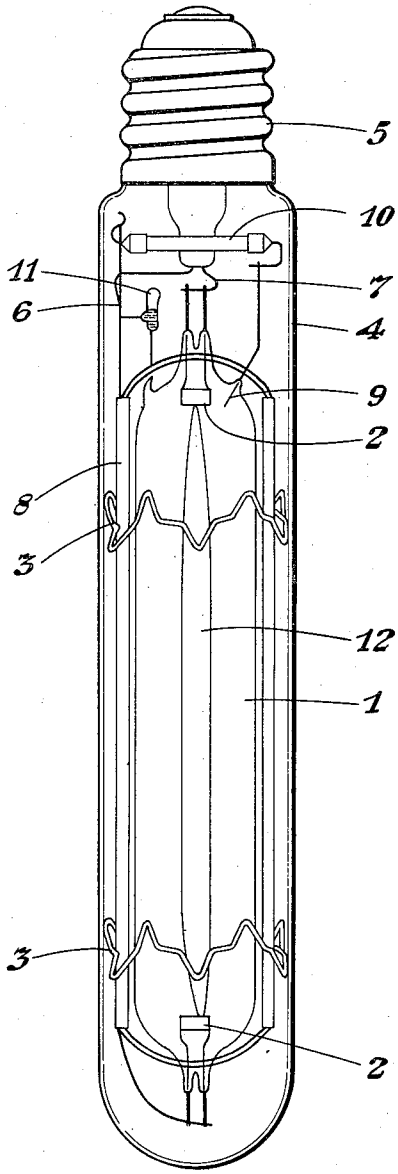


Fig. 2

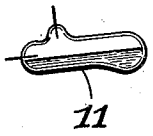
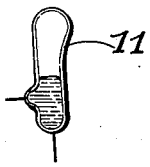


Fig. 3



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ELECTRIC GASEOUS DISCHARGE DEVICE

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4 Claims. (Cl. 176—122)

The present invention relates to electric gaseous discharge devices generally, and more particularly to discharge devices of the type which are operated with a relatively constricted arc.

A particular object of the invention is to provide a novel means for controlling the arc path within a discharge device to prevent the arc from impinging on the envelope wall. Another object of my invention is to provide a discharge device which can be operated in either a vertical or horizontal position. Still another object of my invention is to provide means to render the arc controlling means ineffective whenever it is not required. Still other objects and advantages of my invention will appear from the following detailed specification or from an inspection of the accompanying drawing.

The invention consists in the new and novel combination of elements hereinafter set forth and claimed.

In many devices where an electric discharge is employed operating in gases or vapors, it is often advantageous to be able to employ the completed device in such a position that the discharge or arc occupies a position more nearly in the horizontal than the vertical plane. Of such devices the use of electrical discharges as light sources affords one of the most important examples when the arc might be required to operate in such a substantially horizontal position in order to obtain a given control on a distribution of light from the resultant lamp. This invention relates to this type of device and will be described with particular reference to its use for an electric discharge lamp.

With such devices operating at low pressure, it is general that the discharge takes place over an extended volume, occupying practically the volume of the lamp. As the pressure is increased the volume of the actual discharge giving light decreases and concentrates, but should the device be operated horizontally will often still remain, so that the discharge arc passes horizontally between the two electrodes. As the pressure is still further increased, however, or the conditions of the bulb size, or current densities are changed, then the arc tends to bow upwards and eventually bows so that the main length of the arc lies along the inside surface on the upper side of the lamp. Such a condition is obviously disadvantageous as it entails the operation of the retaining envelope at an uneven temperature, meaning that either serious damage is done to this envelope and deterioration occurs, or else the design of the envelope is such that it could be operated more efficiently were an even temperature possible. Under many circumstances it is highly desirable to allow the discharge lamp to operate at pressures and under conditions when this arc would naturally bow upwards towards the envelope from the point of view of efficiency etc. and the purpose of the present invention is to provide a simple construction whereby a simple device forces the arc back into the center of the tube or lamp.

My novel construction utilizes a magnetic field which cooperates with the arc current to produce a force which counteracts the bowing tendency of the arc. In the preferred embodiment this field is produced by a coil which is connected in series with the arc, and in order to make the device universally adaptable this coil is enclosed within the lamp itself, along with a switch which automatically short circuits said coil whenever the arc path approaches the vertical, where the magnetic reaction is no longer needed.

For the purpose of illustrating my invention I have shown a preferred embodiment thereof in the accompanying drawing, in which

Fig. 1 is an elevational view of a high intensity mercury vapor arc lamp constructed according to my invention, and

Figs. 2 and 3 are elevational views of the switch employed in this lamp, showing the position thereof when the lamp is in the horizontal and vertical positions, respectively.

As shown in the drawing my novel lamp comprises a tubular discharge tube 1 of glass or the like having a pair of thermionic cathodes 2 of any usual type sealed thereinto near the ends thereof. This tube contains a suitable gaseous atmosphere, such as mercury vapor and argon, although other vapors such as those of cadmium, zinc, thallium, or bismuth may likewise be utilized, either alone or in combination. The quantity of this vaporizable material is preferably so limited that it is entirely vaporized during operation of the lamp. Said tube is suitably positioned by the wire supports 3 within a heat conserving and protecting jacket 4 of glass, which preferably contains an inert gas, such as nitrogen at one half atmosphere pressure. Said jacket has a conventional screw base 5 affixed to one end thereof, the leads 6 and 7 from which are sealed into the adjacent end of said jacket. Said lead 6 is connected to the lower cathode 2 through the coil 8 which is wound lengthwise about the tube 1 parallel to the arc path therein, while the lead 7 is connected directly to the upper cathode 2. An auxiliary starting electrode 9 is connected to

the lead 6 through a comparatively high resistance 10. A small mercury switch 11 which is shown in detail in Figs. 2 and 3 is connected between the lead 6 and the last turn of the coil 8 so as to short circuit said coil when the lamp is in the position shown.

So long as this lamp is operated vertically the arc stream 12 is self-centering, and the coil 8, if connected in series with the arc, would only serve to objectionably deflect it to one side. By means of the switch 11, however, this coil is short circuited so long as the lamp is in this position, so that this difficulty is avoided. As the lamp is rotated in a clockwise direction, however, toward the horizontal position the gravitational forces resulting from the unequal heating of the gaseous atmosphere tend to force the constricted arc 12 toward the upper side of the tube 1. At the same time the mercury in the switch 11 is moving toward the position shown in Fig. 2, with the result that at a predetermined angle the coil 8 is connected in series with the arc. The turns of this coil are in such a direction and of such a number that the field produced thereby reacts with the field about the arc to produce a downward force on the arc 12 which just compensates for the upward gravitational force exerted thereon, whereby said arc operates along the axis of the tube, exactly as shown in Fig. 1, even though the lamp is horizontal. For best results it is, of course, essential that the lamp should be so oriented that the coil 8 lies in a substantially vertical plane when the axis of the tube 1 is horizontal.

In case this lamp is to be operated in only a horizontal position, so that the universal operating feature is unnecessary, the switch 11 can, of course, be omitted if desired.

As a further variation it is obvious that the coil 8 could be made with more turns and connected directly across the lamp operating voltage. In some cases likewise the coil 8 may be used to obtain non-axial adjustment of the arc when that is required for a specific problem of light distribution or the like.

While I have described my invention by reference to a particular embodiment thereof it is to be understood that various changes, omissions and substitutions within the scope of the appended claims, can be made therein without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. An electric gaseous discharge device comprising a tubular sealed envelope having electrodes at opposite ends thereof, a coil about said envelope in a plane which passes through the line determined by said electrodes, and a vitreous jacket about said envelope and coil.

2. An electric gaseous discharge device comprising a tubular sealed envelope having electrodes at opposite ends thereof, a coil about said envelope in a plane which passes through the line determined by said electrodes, said coil being connected in series with the discharge in said device, and a vitreous jacket about said envelope and coil.

3. In combination, an electric gaseous discharge device comprising a tubular sealed envelope having electrodes at opposite ends thereof, magnetic means associated with said device to control the arc position therein, and means responsive to movement of said device to render said magnetic means ineffective when said device aproaches a vertical position.

4. An electric gaseous discharge device comprising a tubular sealed envelope having electrodes at opposite ends thereof, a coil about said envelope in a plane which passes through the line determined by said electrodes, said coil being connected in series with the discharge in said device, and means attached to said envelope for movement therewith to short circuit said coil when said line approaches the vertical.

HAROLD R. RUFF.