April 4, 1939. W. J. SCOTT 2,153,008

ELECTRIC DISCHARGE LAMP

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Fig. 1

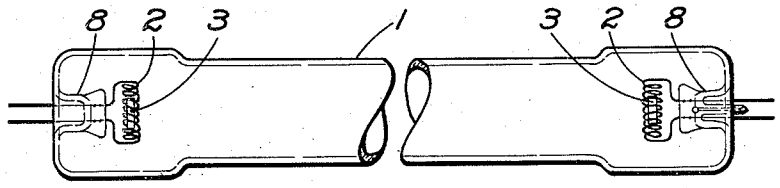
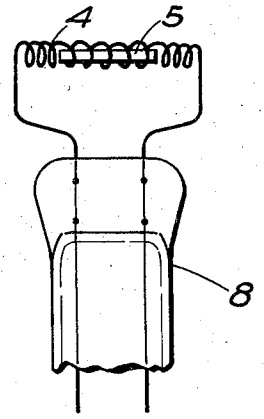


Fig. 2



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ELECTRIC DISCHARGE LAMP

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2 Claims. (Cl. 176—126)

The present invention relates to electric discharge lamps and more particularly to discharge lamps designed to run on alternating current supplies, and using a filling of a low pressure of a rare gas and/or a metal vapor. Hitherto it has been customary in some of these lamps to use a cathode consisting of a helix of tungsten wire containing a pellet of electron emissive material of substantially the same length as the cathode. We have found that with this type of cathode a certain amount of disintegration takes place on the anode cycle due to bombardment, and/or overheating of the pellet material, and particularly from the ends of the pellet, as, due to the voltage drop along the cathode,—whether separately heated, or self-heated,—the anode function tends to be fulfilled by the most positive end of the helix. One way of overcoming this is to have a cylinder or shield around the cathode which carries the current during the anode cycle so relieving the cathode of this function.

The object of this invention is to provide a simpler and more effective method of minimizing this cathode disintegration and consequent lamp blackening and life shortening which also has certain manufacturing advantages. Another object of the invention is to provide an electrode of the above type in which disintegration of the pellet is reduced to a minimum. To that end this invention consists in using an electrode consisting of a tungsten helix containing a pellet of emissive material substantially shorter, and situated centrally in the helix. On the cathode cycle the current is carried by electrons emitted from the central pellet. On the anode cycle the main part of the anode current will be carried by the end of the helix near the more positive current lead and a lesser part by the center of the helix which contains the pellet. This means that the heating and bombardment of the pellet will be less than if it had been situated at the ends of the helix, and consequently there is less disintegration. The best proportions for the pellet and helix dimensions will vary with the gas pressure and design of the lamp. In certain cases pellet disintegration may be minimized by using a closely wound helix so that the pellet is shielded from the discharge. This, however, may tend to raise the tube striking voltage and in such cases it may be advisable to have several turns at the center of the helix wound with a more open pitch than at the ends, so as to reduce the striking voltage. The axis of the helix may be straight, or curved into an arc, or zig-zag, so as to get the necessary anode and cathode areas and shapes.

A further advantage of this construction is that the pellet can be heated uniformly throughout, so there will be no cold spots at the end which are hard to outgas by thermal treatment during manufacture. Also a pellet of a semiconducting material can be used, as even if the central helix turns are short-circuited the ends of the helix will heat the pellet by conduction and radiation.

In the drawing accompanying and forming part of this specification two embodiments of the invention are shown, in which

Fig. 1 is a side elevational view of a gaseous electric discharge device having electrodes embodying the invention, and

Fig. 2 is a front elevational view of an electrode embodying the invention and useful in the gaseous electric discharge device illustrated in Fig. 1.

Referring to Fig. 1 of the drawing the gaseous electric discharge device comprises an elongated tubular container 1 having a stem 8 at each end thereof into which an electrode 2, 3 is sealed and having a gaseous atmosphere therein, such as a rare gas, a common gas, a metal vapor, or a mixture of such gases. Preferably the gaseous atmosphere consists of a mixture of a starting gas, and a metal vapor, such as a mixture of argon and mercury vapor or neon and sodium vapor. Each of the electrodes 2, 3 consists of a helically coiled, heating filament 2, such as a tungsten filament, and a bar 3 of electron emitting material, such as barium oxide, axially mounted in said helically coiled filament. Said coiled filament 2 is longer than said bar 3 and extends beyond both ends of said bar 3.

When the above described device is connected across the terminals of an alternating current source each of the electrodes 2, 3 acts alternately as anode on one half cycle and as cathode on the other half cycle of said current source The more positive end of the filament 2 acts as the anode with the result that the bar 3 is not subjected to a deleterious, heavy bombardment, as pointed out above, and, therefore, disintegrates less than prior electrodes of the bar and filament type.

The embodiment of the invention illustrated in Fig. 2 of the drawing is similar to that shown in Fig. 1 except that the coiled filament 4 has a smaller pitch at the parts thereof extending beyond the bar 5 than at the part thereof wrapped around said bar 5. This structure offers great protection to the bar 5 from bombardment without increasing the voltage required to start the discharge as pointed out above.

While I have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its use and operation may be made by those skilled in the art without departing from the broad spirit and scope of the invention.

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

1. An electrode for a gaseous electric discharge device comprising an elongated body of electron emitting material and a metal filament wrapped around said body, said filament extending beyond both ends of said body, the end portions of said filament out of contact with said body having a smaller pitch than the center portion of said filament surrounding said body.

2. A gaseous electric discharge device comprising a tubular container, a gaseous atmosphere therein and electrodes sealed therein at each end thereof, one of said electrodes comprising a body of material having high electron emitting characteristics and a coiled metal filament wrapped around said body and extending beyond said body, the axis of said filament being transverse to the discharge path between said electrodes, the coiled, end portion of said filament being out of electrical and physical contact with said body, being no larger in diameter than the portion of said filament in contact with said body, and being no further from the opposite electrode than the portion of said filament wrapped around said body.

WILLIAM J. SCOTT.