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W. E. LEYSHON
FLUORESCENT GLOW LAMP
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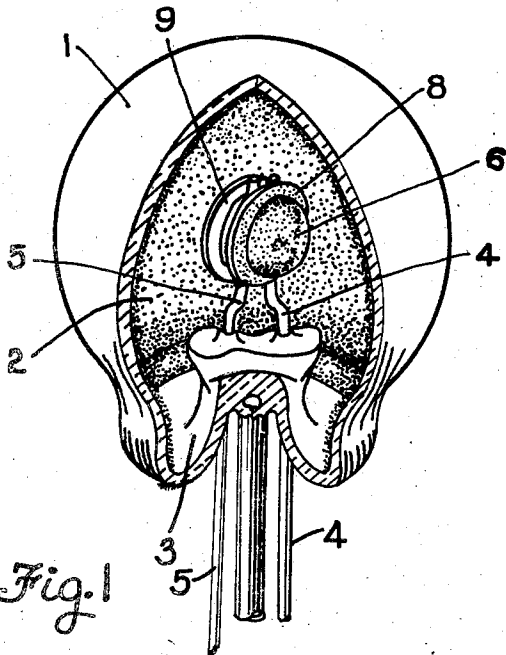


Fig. 1

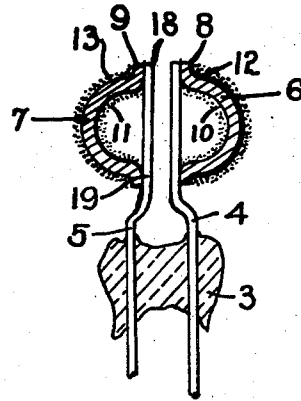


Fig. 2

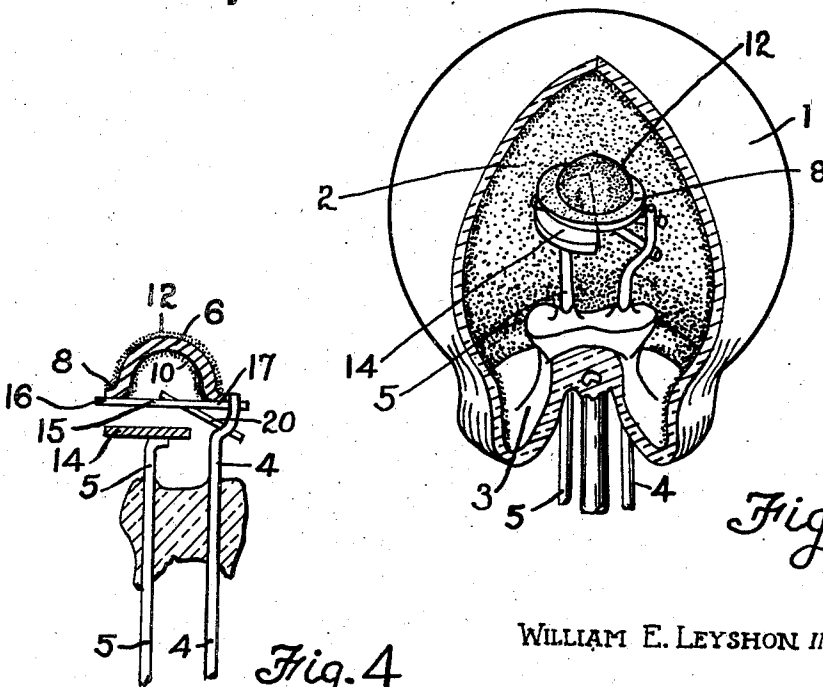


Fig. 3

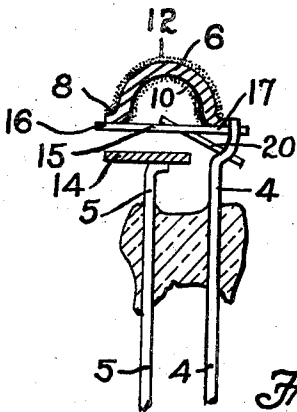


Fig. 4

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FLUORESCENT GLOW LAMP

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Application July 28, 1944, Serial No. 547,008

1 Claim. (Cl. 176-122)

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This invention relates to electric glow lamps, and particularly to those of the fluorescent type.

An object of the invention is to produce such a lamp which can be operated directly and efficiently from the usual 110 volt lighting circuits.

A further object is to produce such a lamp with a uniform glow from a fluorescent material in or on the lamp bulb. Still another object is to produce such a lamp of small wattage.

A feature of the invention is production of a fluorescent glow lamp without the usual mercury vapor filling. Other features are a cupped or hemispherical electrode an alkaline earth oxide coating on the outside of said electrode a zirconium coating on its interior surface, and a filling including krypton or xenon gas. All of these features are not necessarily present in each device of my invention, and other features, objects, and advantages of the invention will be apparent from a study of the specification taken in connection with the accompanying drawing in which:

Figure 1 is a cut-away perspective view of a lamp according to my invention;

Figure 2 is a profile view in section of the electrode structure of the same lamp;

Figure 3 is a perspective view of an embodiment of my lamp for use with direct current; and

Figure 4 is a profile section of the electrode structure of said lamp.

In Figure 1, the glass bulb 1 is coated on its interior surface with the fluorescent coating 2, which may comprise the usual inorganic fluorescent materials, such as manganese activated zinc silicate. The bulb 1 is closed at its neck by the stem 3, through which lead-in wires 4 and 5 are sealed. Hollow hemispherical electrodes 6 and 7 having flanges 8 and 9 are respectively each connected to and supported from, one of said lead-in wires 4 and 5, extending completely across the corresponding electrode and being welded or attached to the flange at two diametrically opposite parts, as 16 and 17, 18 and 19, for resistance to mechanical shock. The hollow or open ends of the electrodes face each other and are spaced a short distance apart. A coating of powdered zirconium 10, 11 is on the inside of each of said electrodes 6, 7 and a coating 12, 13 of one or more of the alkaline earth oxides is on the outside of the electrodes 6, 7. The bulb is filled with inert gas at some millimeters of mercury pressure, for example, 25 millimeters.

In operation, the lamp is connected to a source of voltage through a ballast resistor which may conveniently be placed in the base of the lamp. The current density at the electrodes will ordi-

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narily be kept low enough to produce glow discharge. In the latter type of discharge, the negative glow spreads all over the electrode and the radiation from the glow excites the fluorescent coating 2, giving off considerable light. The gas pressure should be high enough to confine the glow to the electrodes.

A small amount of mercury vapor has been customarily used in the fluorescent lamp art to secure ultraviolet radiation, but I have secured better results in small bulbs without the presence of mercury, which tends to diminish the light output by condensing on the bulb 1 or coating 2. During manufacture the bulb is evacuated in the usual manner prior to filling with the desired gas pressure, and I have found that a cold trap is desirable to keep mercury vapor from getting into the bulb from the mercury diffusion type exhaust pump. A cold trap is formed in the usual manner by cooling a small part of the exhaust line to condense out the mercury at that point, thereby preventing the vapor from entering the bulb being exhausted.

The zirconium is best used in the form of a powder or dust, milled and suspended in a lacquer, such as a solution of nitrocellulose in amyl acetate. The oxide coating 12, 13, is best applied by suspending powdered barium dioxide in a similar lacquer. During the exhaust process, the electrodes 6 and 7 may be heated to red heat by placing a high frequency induction coil around the bulb for a time. This will break down the carbonates into oxides and will remove the lacquer also, leaving the powdered materials in a firmly-adherent coating on the electrode.

Where some material such as cadmium borate is to be used in the coating 2 to give a red or pink light, the inert gas used is preferably neon, whose characteristic red light will supplement that produced by excitation of the coating 2. A small amount of krypton is preferably added to the neon. I have found neon at a pressure of 35 millimeters of mercury, with less than 1% of krypton to be satisfactory.

Where a material such as zinc silicate, activated with manganese, is used as the fluorescent coating, I find that a gas filling of helium, with a small amount of krypton, less than 1% in most cases, satisfactory. The helium may be conveniently used at a pressure of 25 millimeters of mercury. In this mixture, a large amount of ultraviolet radiation in the neighborhood of 2500 Angstroms is produced by the small amount of krypton added, so that the combination is very

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effective for exciting the usual silicate and tungstate fluorescent materials.

The lamps of Figures 1 and 2 can be used on direct current, but in that case the negative glow will form on only one electrode and one-half of the lamp will thus appear dark. The construction of Figures 2 and 3 is better for direct current. The electrode 14 is the anode, and is supported from lead-in wire 5 to which it is welded. The electrode 6 is supported from, and perpendicular to, lead-in wire 4, by cross piece 15, attached to the flange 8 at two diametrically opposite places 16, 17. Brace 20 provides further mechanical support.

I have found that the lamp voltage will be high unless the anode 14 has an appreciable area, say at least half the area of the other electrode 7. Anode 14 preferably has an area not greater than that of the other electrode 6.

What I claim is:

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A negative discharge type glow lamp comprising a glass envelope having a base portion, an inert gas atmosphere in said envelope a coating of fluorescent material on the inner wall of said envelope, a pair of hemispherical electrodes having their concave faces facing and spaced a short distance apart, lead wires connected to said electrodes and extending through said base portion, said lead wires supporting said electrodes with the plane of their peripheral edges extending toward said base portion, and each lead wire to which each electrode is connected extending completely across the concave face of the hemispherical electrode and connected thereto at two diametrically opposite points on the peripheral edge of said hemispherical electrode, and an electron emissive coating on the outer surface of said electrodes.

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