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ELECTRICAL DISCHARGE DEVICE

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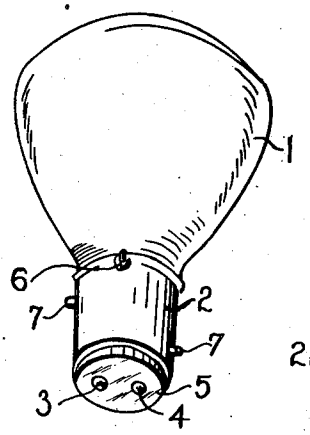


fig. 1

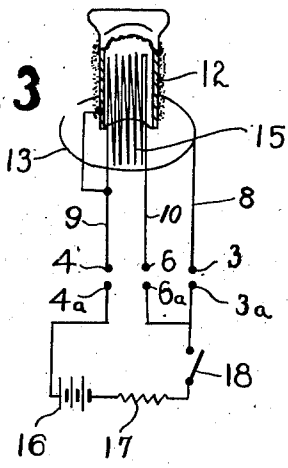


fig. 3

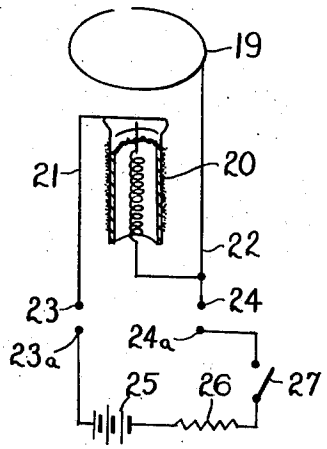


fig. 4

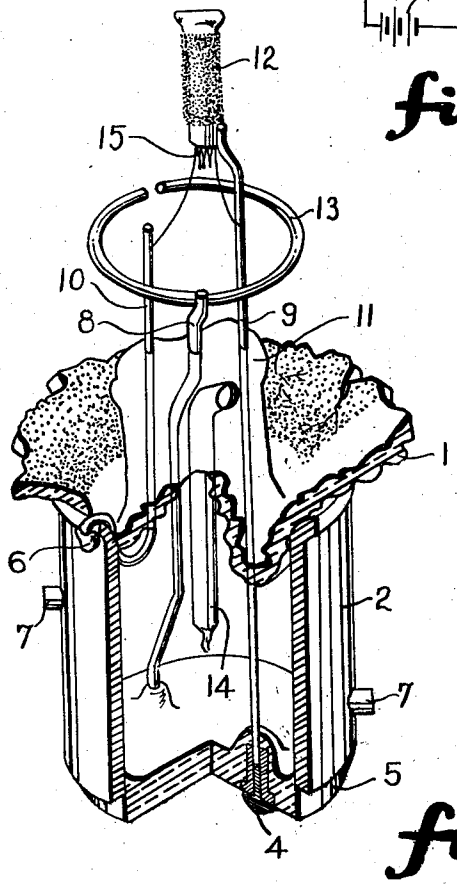


fig. 2

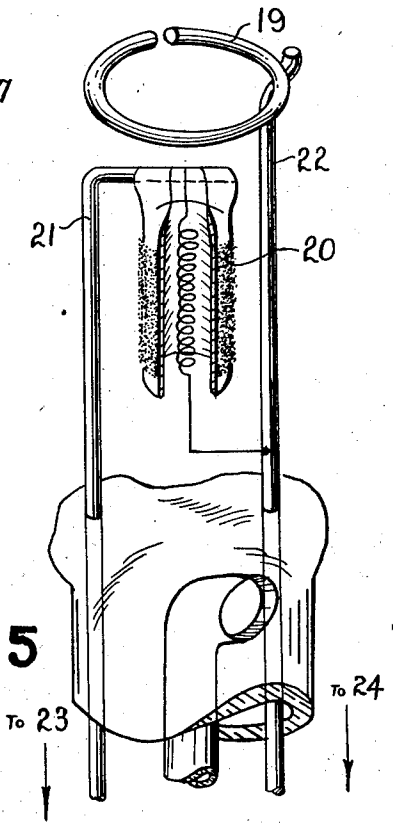


fig. 5

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ELECTRICAL DISCHARGE DEVICE

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Application July 8, 1943, Serial No. 493,934

1 Claim. (Cl. 176—122)

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This invention relates to discharge devices and has particular reference to electrodes therein.

An object of this invention is to provide improved electrode formation and arrangement in discharge devices.

Another object is to provide a self-starting discharge lamp.

Another object is to provide an improved "bulb type" fluorescent lamp.

Another object is to provide a self-starting discharge lamp arranged for automatic regulation of the discharge arc.

Further objects, advantages and features will be apparent from the following specification taken in conjunction with the accompanying drawing, in which:

Figure 1 is a perspective view of a lamp embodying this invention;

Figure 2 is an enlargement of Figure 1, broken and cut away to show the electrodes and their leads.

Figure 3 is a schematic operating wiring diagram of the structure of Figures 1 and 2;

Figure 4 is a schematic operating wiring diagram of an alternate structure; and

Figure 5 is an illustration of the alternate structure of Figure 4.

While this invention may readily be used in a variety of discharge devices, the illustrative embodiment herein shown and described comprises a small fluorescent bulb in dimension of the order of one inch by two inches and is designed for use on low voltage direct current of the order of 10–30 volts. This bulb contains argon and mercury; has an anode and a cathode for supporting an electron discharge, and a heater element for heating the cathode to emission. The electron discharge activates a coating of fluorescent material on the bulb, and this coating in turn gives off ultra-violet rays.

A particular use for this lamp is in so-called "black light" arrangements wherein the visible rays from the lamp are filtered out, usually by means externally of and separate from the lamp, and the ultra-violet rays are used to activate visible ray emanating fluorescent material on an object such as, for example, the dial of an instrument.

Accordingly, the particular lamp in illustration utilizes an argon, mercury and fluorescent material combination designed to produce a maximum of ultra-violet radiation and a minimum of visible rays. Other combinations may be used as desired, for example, to produce a maximum of visible rays.

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Lamps embodying this invention have the particular advantage of a self-starting characteristic. The lamp is simply plugged in on a live line and the cathode is automatically heated to emission, and the discharge arc is automatically initiated between the cathode and anode, with no external switching being necessary.

Further, this device automatically regulates itself so as to keep the cathode at the right temperature for proper emission. In operation the discharge arc and the cathode heater are arranged in electrical parallel so that if the arc fails, partially or completely, the current flow through the cathode heater is increased and the cathode again heated to such emission as will produce the desired discharge arc. Before the arc is struck the voltage drop across the cathode heater is of the order of 18 volts. When the arc is operating normally the voltage drop across the cathode heater is of the order of 12 volts, and that across the arc is of the order of 12 volts.

This bulb may be simply and easily mounted in or removed from a socket, just as an incandescent bulb may be handled.

As in Figure 1, the lamp comprises a bulbous glass envelope 1, mounted on a brass base sleeve 2 with electrode lead contacts 3 and 4 held in an insulation body 5 which may be glass or other suitable insulation. A third electrode lead contact 6 connects with the base sleeve 2. The sleeve 2 has brass pins 7 extending outward laterally for use in mechanically and electrically mounting the lamps in a socket, as for example in a bayonet type connection.

In Figure 2 the anode lead 8 and the cathode heater leads 9 and 10 are shown sealed in the flare sleeve 11 and extending to their respective contacts 3, 4, and 6. The cathode 12 is mounted on heater lead 9 and the anode 13 is mounted on anode lead 8. Tube 14 is for evacuation of the bulb, and for the introduction of argon and mercury.

During operation of the lamp, leads 8 and 10 are connected to each other externally of the lamp, see Figure 3.

The cathode 12 is a cylindrical nickel sleeve, open at the bottom, closed at the top, and with its outer central surface coated with barium-strontium oxides as electron emissive material. The cathode heater 15 is a tungsten coil, located within the cathode sleeve 12 and insulated therefrom through a coating of aluminum oxide on the tungsten coil. This coating prevents short circuits between the turns of the coil and between the coil and the cathode sleeve 12. The anode 13

is molybdenum in the form of a split ring located below the cathode **12** and lying in a plane substantially perpendicular to the longitudinal axis of the cathode cylinder.

Figure 3 illustrates the operating circuit of the lamp of Figures 1 and 2. The end of the lamp circuit is demonstrated by the contacts **3**, **4**, and **6**, which are the same as those in Figures 1 and 2. The external circuit comprises a battery power supply **16** with ballast **17** and switch **18**. The whole circuit is thus shown to have a parallel arrangement with the cathode heater **15** on one side and the anode, the cathode, and the discharge path defined thereby, on the other side.

Switch **18** is closed to energize the external circuit, and the lamp contacts **3**, **4**, and **6**, are engaged with contacts **3***a*, **4***a*, and **6***a*, to energize the lamp. Thereafter, the cathode heater **15** automatically heats the cathode **12** to emission. If the arc fails, wholly or in part, the heating effect of the heater **15** is automatically varied to again bring the arc to proper discharge.

The alternate structure of Figures 4 and 5 provides a two-contact arrangement whose operation is the same as that of the structure of Figures 1–3.

The anode **19** is positioned above the cathode sleeve **20**, the sleeve **20** is supported by lead **21** from above, and the heater element has one end connected to the inside top of the sleeve **20** and the other to anode lead **22**. The lamp contacts **23** and **24**, Figure 4, are comparable to the contacts **3** and **4** of Figure 1 and the external circuit has a battery **25**, ballast **26**, and switch **27**, and operates through contacts **23***a* and **24***a* in like manner with respect to the external circuit of Figure 3.

In both structures, the cathode heaters lie substantially completely within their respective cathode sleeves.

The circuit of Figure 4 is arranged in parallel in similarity with that of Figure 3.

We claim:

A low voltage direct current gaseous discharge lamp comprising a bulbous envelope having an ionizable atmosphere therein for enclosing its elements, a hollow cylindrical cathode centrally and vertically positioned within said envelope and having its upper end closed, a lead wire extending outside of said envelope and connecting with and supporting said cathode, a heater having its coils within and electrically insulated from said cathode having one of its terminals connected to the cathode, an anode comprising an elongated loop of wire, substantially circular in form, disposed concentric with said cathode, in a plane perpendicular thereto but substantially therebelow, the diameter of said anode being considerably smaller than the greatest diameter of the bulbous envelope and smaller than the diameter of the neck of the bulbous envelope, a second lead wire extending to the outside of said envelope connected with and acting to support said anode and a third lead wire connected to the other terminal of said heater and extending outside of said envelope whereby said heater coil and the arc between the anode and cathode may be supplied by the same or by separate sources of energy.

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