

Dec. 19, 1944.

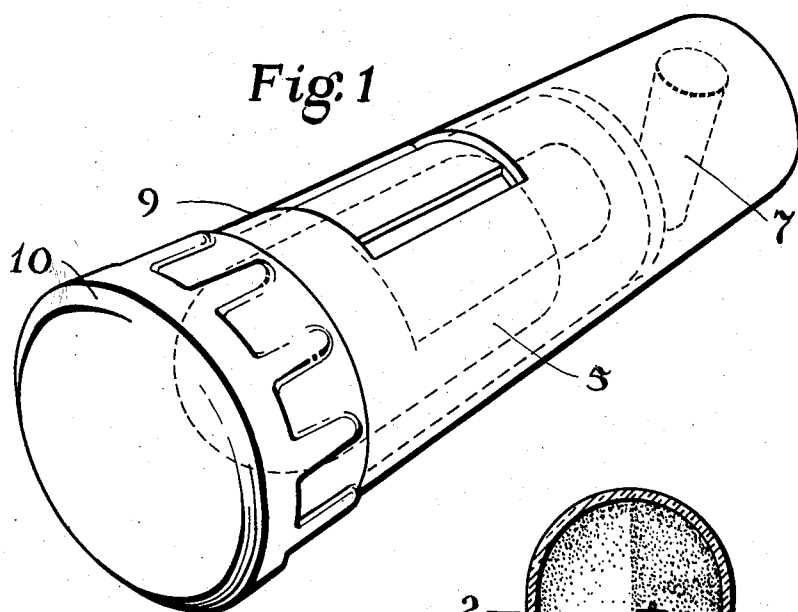
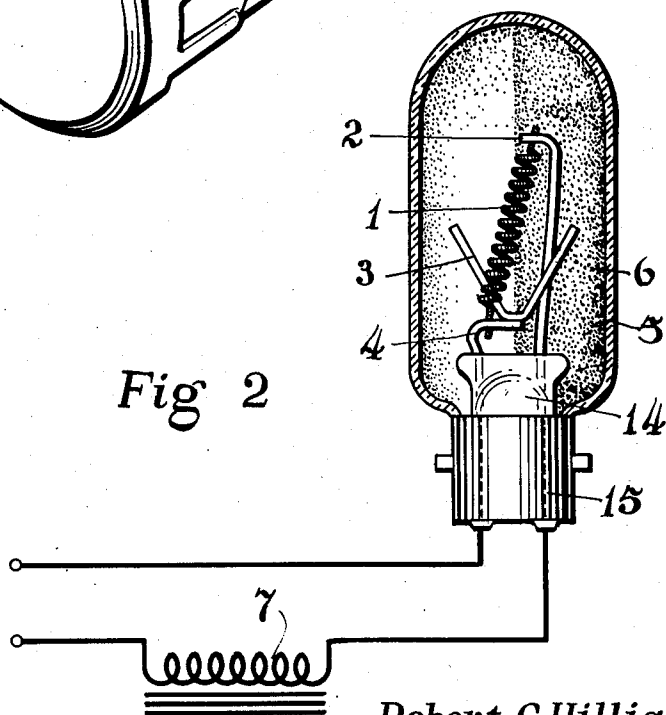
R. C. HILLIARD ET AL

2,365,342

ELECTRIC GASEOUS DISCHARGE DEVICE

Filed Jan. 30, 1942

2 Sheets-Sheet 1



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Fig. 3

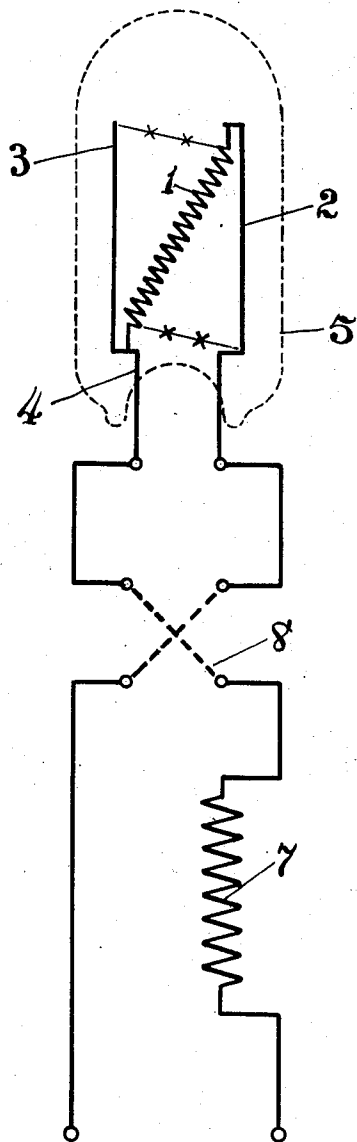
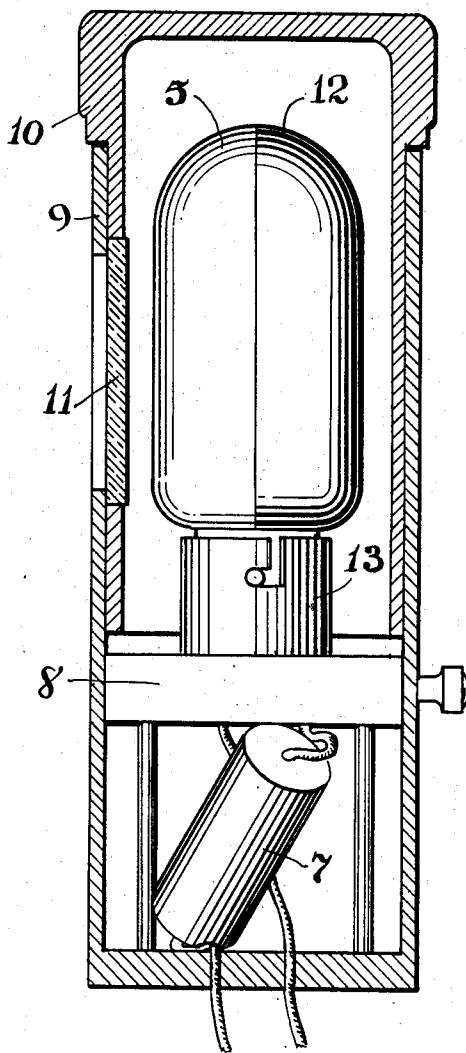


Fig. 4



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UNITED STATES PATENT OFFICE

2,365,342

ELECTRIC GASEOUS DISCHARGE DEVICE

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Application January 30, 1942, Serial No. 428,888

2 Claims. (Cl. 176-122)

This invention relates to electric gaseous discharge lamps and more particularly to a two-contact type operable at about 24 volts.

An object of this invention is to provide a lamp of this type which is capable of being quickly started at very low temperatures.

Another object is to provide a lamp of this type which will have no preferred socket polarity.

A further object is to provide a lamp having the above-mentioned characteristics and also the characteristics of high ultra-violet output and long life.

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

Figure 1 is a perspective view of the lamp holder showing the lamp in dotted.

Figure 2 is a section of the lamp and a diagram of the electrical circuit connected thereto.

Figure 3 is a schematic diagram of the circuit which may be used in operating this lamp.

Figure 4 is a cross section of the lamp holder showing the complete lamp assembly mounted therein.

In designing a light source for the illumination of instrument panels in airplanes, the requirement for the embodiment therein of many different features has created many problems. It has been found that by utilizing the ultra-violet light generated in a gaseous discharge device to excite a film of luminescent material on the object which it is desired to illuminate is much more desirable than to illuminate the object with an ordinary incandescent lamp.

The use of a gaseous discharge device involves the development of a certain amount of auxiliary equipment not necessary when a regular incandescent lamp is used. Since space and weight are two major problems to be considered when an airplane installation is concerned, a discharge device had to be designed which would be as unitary as possible. A further limitation which had to be considered was the fact that it had to be operated on direct current at about 24 volts.

Thus the lamp of our invention embodies the simplicity and unity which is desired. A low impedance ballast is connected in series with a high impedance filamentary cathode so that on starting most of the power and voltage appears in the cathode. The arc strikes almost immediately, the cathode being substantially short-circuited by the discharge with the result that

most of the power is consumed in the arc and the ballast.

In Figure 2, the glass bulb 5 has the coating of luminescent material 6 on the inner walls thereof. A quantity of inert gas at low pressure and a small amount of mercury vapor may be sealed in the bulb 5. The stem 14, through which the bulb is evacuated, is sealed in one end thereof and has the lead-in wires 2 and 4 supported therefrom. The filamentary electrode 1 preferably of the type shown in U. S. Patent 2,258,158, coated with one or more of the alkaline earth oxides, is suspended between these two lead-in wires. The anode 3 is supported from the lead-in wire 4, each of its ends extending upwardly towards the top of the lead-in wire 2. When the lamp is desired to be used as a directional source it may be desirable to have the lamp itself directional. This can be done by applying a heavier coating of luminescent material to the far surface than to the front surface. For the efficient output of both ultra-violet and visible light, it has been found desirable to use calcium tungstate as the luminescent material. The lead-in wires 2 and 4 extend down through the base 15 and are connected to the line, lead-in wire 2 being connected through the low resistance ballast 7.

Figure 3 illustrates schematically how a reversing switch 8 may be utilized to double the life of the lamp by reversing the polarity and thus causing the arc to strike from the opposite end of the filamentary electrode 1.

Figures 1 and 4 illustrate the facility with which this lamp of the two-contact type may be fitted into a small container. This container consists of two concentric cylinders 9 and 10 with openings in each so that as cylinder 10 is rotated, light from the lamp held in socket 13 may be varied in intensity and concentration. The lamp may have a suitable coating of aluminum or silver paint 12 on the inner side thereof as shown in Figure 4 rather than a heavy layer of luminescent material on the inside wall of the inner end of the lamp as shown in Figure 2. As shown in Figures 1 and 4, the container is so constructed as to provide for the resistance 7 so that the entire lighting equipment may be housed in one compact unit.

An optical filter 11 may be placed in the cylinder between the lamp and the opening therein. This filter will transmit the ultra-violet rays and suppress substantially all of the visible rays, the ultra-violet rays exciting a layer or film of luminescent material on the article to be illumi-

nated. Thus the utility of this light under "black-out" conditions is readily apparent.

As stated above, the filamentary cathode has an impedance higher than the ballast impedance. We have found that this ratio may range from substantially 2 to 1 to substantially 4 to 1. If this ratio is permitted to drop any substantial degree below 2 to 1 the ratio between the arc current and the starting current will be low and will result in poor operating efficiency. If this ratio is permitted to substantially exceed 4 to 1, the operating efficiency will be increased but the life will be shortened considerably due to the excessive abuse which the filamentary electrode would be forced to withstand.

What we claim is:

1. An electric gaseous discharge unit having a substantially immediate starting characteristic, said unit comprising: a first hollow cylindrical container having one end closed and the other open and a single side wall opening; a mounting plate in said container; a lamp, coated with luminescent material, mounted on one side of said mounting plate and in registry with said side wall opening, said luminescent coating being heavier in opposition to said opening than in adjacency thereto to make the lamp directional; an

impedance ballast mounted on the other side of said mounting plate; and a second hollow cylindrical container, having one end closed and the other open, and a single side wall opening; said containers being assembled in telescoping, open-end to open-end and relative rotary adjustable relation with each other; with said side wall openings movable into and out of register with each other by relative rotational adjustment of said containers and with an optical filter mounted in one of said openings.

2. A gaseous discharge device comprising: a bulb; an inert gas at low pressure therein; a pair of electrodes therein; and a single filamentary cathode therein exposed to said gas and having one of its ends connected to the outer end of one of said electrodes and its other end connected with the other of said electrodes adjacent the inner end thereof; said other electrode comprising a V-shaped member with a free end well removed from the connection of said other end of said filament, whereby an arc may be struck from one end or the other of said filament to the opposing electrode so as to effectively short out said filament.

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