Dec. 21, 1937. L. J. DAVIES 2,103,029

ELECTRIC GASEOUS DISCHARGE LAMP

Filed Sept. 28, 1936

Fig. 1

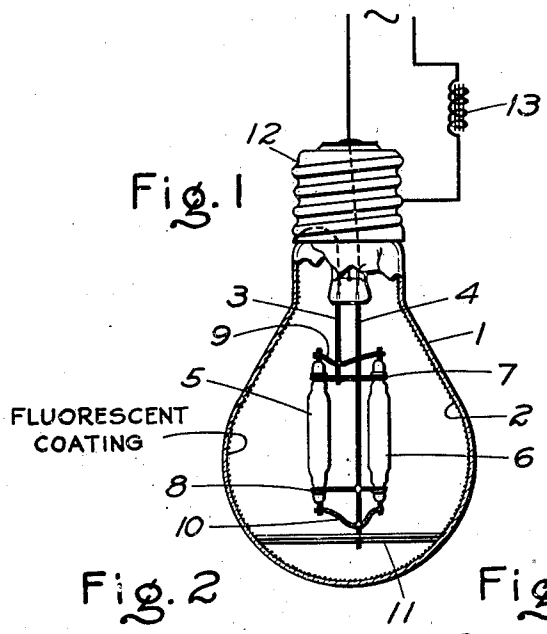


Fig. 2

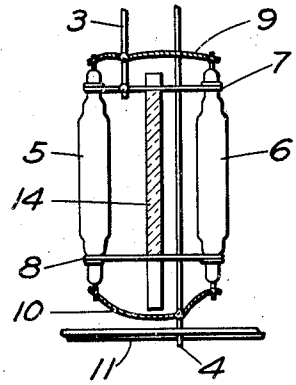


Fig. 3

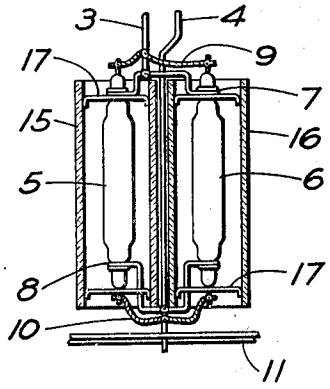
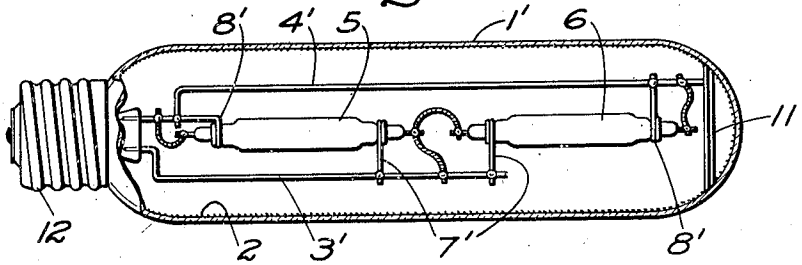


Fig. 4



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ELECTRIC GASEOUS DISCHARGE LAMP

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In Great Britain October 7, 1935

5 Claims. (Cl. 176—122)

The present invention relates to electric gaseous discharge lamps, and particularly to lamps operating with a relatively high vapor pressure.

A particular object of the invention is to provide a light source which will give off light immediately upon application of potential thereto under all conditions. A further object of the invention is to provide a light source of high efficiency. Another object of the invention is to modify the light emitted by the discharge lamp by the addition of fluorescent radiations thereto. Still other objects and advantages of the 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.

It is a well known fact that lamps of the type operating with a high pressure, constricted vapor discharge will not restart on the normal applied potential when the lamp is hot. In order to provide a light source which will restart immediately after any momentary interruption of the electrical supply, while at the same time retaining the many advantages of this type of lamp, it has been proposed heretofore to combine two of these lamps within a single fixture, with a common ballast, whereby only one thereof operates at any one time, the other remaining cool and ready to start immediately after the other lamp has been extinguished for any reason.

I have now found that far better results are obtained by mounting these two lamps within a single enclosing envelope, since by this means the devices are mounted relatively close together and the change in operation between the two devices does not result in an appreciable shift in the point of origin of the light. In some cases, however, as where reflectors of a focusing type are employed I prefer to utilize an envelope having fluorescent properties, since I have discovered that this envelope becomes in effect a primary light source which may be placed at the focus of a reflector or the like, with the result that the light distribution remains substantially constant irrespective of which of the enclosed lamps is actually supplying the light. In practice the enclosing envelope is ordinarily coated on the inner surface with the desired fluorescent material, this coating serving both to produce the desired luminescence and also to diffuse the visible radiations produced by the enclosed vapor discharge lamps. Where desired this diffusion is still further increased by the use of opal or other diffusing glass for the envelope, although this is not generally necessary. The fluorescent material used in the coating is preferably so chosen as to produce radiations which will complement the visible radiations emitted by the discharge devices to produce an approximation of white light. Thus where mercury vapor is employed in the discharge lamps I preferably utilize a material such as calcium silicate or a mixture of the silicates of cadmium and zinc, together with suitable impurities, such as manganese or copper, respectively, which will fluoresce in the red portion of the spectrum, although any other fluorescent material is used where desired. The luminous efficiency of this novel light source is extremely high, and the light emitted thereby is soft and pleasing to the eye.

For the purpose of illustrating my invention I have shown several embodiments thereof in the accompanying drawing, in which

Fig. 1 is an elevational view in part section of a lamp having an envelope internally coated with fluorescent material and containing two parallel connected discharge devices, together with a schematic diagram of the connections thereof,

Figs. 2 and 3 are elevational views of modifications of the internal structure of Fig. 1, and

Fig. 4 is an elevational view, in part section of a further modification of the structure of Fig. 1.

As shown in the drawing, with particular reference to Fig. 1, my novel device has a bulb 1 of conventional shape which is either clear, or coated on the interior surface with a fluorescent material 2 of any desired material, such as for example, calcium silicate together with a trace of copper together with a suitable binder. Such coatings are well known and hence a detailed description thereof is unnecessary. A pair of inleads 3 and 4 extend through the pinch seal of the envelope 1. A pair of electric gaseous discharge devices 5 and 6, here shown as being of the capillary type which has recently been introduced on the market, are supported by the wires 7 and 8 which are attached to the inleads 3 and 4 respectively, while the flexible leads 9 and 10 connect the inleads 3 and 4 respectively to the upper and lower terminals of said devices. A spring member 11 which is attached to the lower end of the inlead 4 bears against the bulb 1 in order to provide a yielding lateral support for the assembly within said bulb. A conventional base 12 is attached to the bulb 1, a suitable source of alternating current being connected thereto through a suitable ballast, such as the reactance 13. The lamps 5 and 6 are commonly made of fused silica, and thus emit a large amount of ultra-violet light which is effective to produce the desired luminescence in the coating 2. The envelope 1 is ordinarily filled with an inert gas, such as nitrogen, at a pressure of the order of half an atmosphere.

In the modification shown in Fig. 2 the construction is the same except for the addition of a quartz plate 14 which is suitably supported between the devices 5 and 6 by the support wires

7 and 8, said plate shielding either of the devices 5 and 6 from the heat emitted by the other when operating.

The construction shown in Fig. 3 is used when it is desired to still further shield the non-operating lamp device 5 or 6 from the heat generated by the operating device. In this structure the quartz tubes 15 and 16 are placed about the devices 5 and 6 respectively. Said tubes are conveniently supported by the wires 7 and 8, and are maintained concentric with the devices 5 and 6 by means of spring fingers 17.

In the modification shown in Fig. 4 the devices 5 and 6 are mounted in line with each other along the axis of a tubular envelope 1'. In this case the leads 3' and 4' support the devices 5 and 6 by means of wires 7' and 8'. The inlead 3' is connected to the terminals of said devices 5 and 6 which are adjacent the middle of the envelope 1' while the inlead 4' is connected to the other terminal of each of said devices, whereby said devices are connected in parallel, as in the other figures.

In any of these devices upon the application of potential to the leads thereto either the device 5 or the device 6 will start into operation, the particular device starting depending upon minor variations between the two devices. Assuming that it is the device 5 which starts, the voltage across the terminals of the lamp 6 is immediately reduced, as a result of the voltage drop in the reactance 13, to a value below that required to start the device 6. Hence there is no tendency for this device 6 to start so long as the device 5 continues to operate. If the supply circuit be momentarily interrupted, however, after the device 5 is hot the restarting voltage of the hot device is far in excess of the applied potential, so that it will not restart. The device 6 is cool, however, and hence immediately starts at this potential, dropping the potential across the lamp 5 to a value at which it will not restart even after it has cooled. Hence the lamp 6 continues to operate until the line potential is again momentarily interrupted after which the device 5 will again start and operate. If the potential is removed for a period long enough for the previously operating lamp to cool it is obvious that either lamp will then start.

This alternation of the operation of the devices 5 and 6 would be undesirable in some cases, as with focusing type reflectors, for example, if it were not for the coating 2. This coating however, serves two functions. Thus first of all it serves as a diffusing surface for all of the visible light emitted by these devices. In addition, it converts the radiations of shorter wave length into visible radiations. As a result the surface of the bulb 1 becomes the apparent primary source of all of the light emitted, so that the light distribution remains virtually undisturbed regardless of whether device 5 or 6 is operating. The luminous efficiency of the device is, of course, greatly enhanced as a result of the added luminescence, while the color of the emitted light is easily given any desired characteristic by a suitable choice of fluorescent material.

The devices are preferably arranged so that the lamp that is not operating is not unduly warmed by the lamp that is operating. This is accomplished by separation of the lamp devices 5 and 6, as shown in Figs. 1 and 4, for example. Due to the coating 2 this separation of these light sources does not have any undesirable effect on the light, since the apparent source remains constant in position. Where additional diffusion is desired the envelope 1 is, of course, made of opal or other suitable diffusing glass, thus adding its effect to that of the fluorescent coating 2.

As shown in Figs. 2 and 3 the thermal separation of the devices 5 and 6 is further increased in some cases by the interposition of the quartz baffle 14 or the tubes 15 and 16. These greatly reduce the heat transfer between the devices 5 and 6, and in the case of the tubes or chimneys 15 and 16 the convection currents set up by the operating lamp actually induce a cooling flow of gas through the chimney about the other, non-operating, lamp. When desired the outer bulb is shaped so as to assist in directing the flow of cool gas from the bottom of the envelope 1 against the non-operating lamp.

With the axial arrangement shown in Fig. 4 each of the lamps presents a minimum of obstruction to the light emitted by the other, making a very efficient arrangement. As a corollary, the amount of heat picked up by either lamp from the other is also extremely small, so that this arrangement is highly desirable from this standpoint.

While I have described my invention by reference to the use of the so-called capillary lamps, it is to be understood that while this type of lamp is very desirable for this use, due to its compactness, other types of lamps can be used in my novel structure with entire success, and that various other changes, substitutions and omissions, within the scope of the appended claims, may likewise be made in the structure illustrated 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 lighting unit comprising in combination, an envelope having light diffusing properties, and a pair of vapor discharge devices within said envelope and connected in parallel, whereby said unit has substantially the same light distribution regardless of which of said devices is operating within said envelope.

2. An electric lighting unit comprising, in combination, an envelope having fluorescent properties, and a pair of vapor discharge devices connected in parallel and located within said envelope, whereby said unit has substantially the same light distribution regardless of which of said devices is operating within said envelope.

3. An electric lighting unit comprising, in combination, an envelope having fluorescent and diffusing properties, and a pair of vapor discharge devices connected in parallel and located within said envelope, whereby said unit has substantially the same light distribution regardless of which of said devices is operating within said envelope.

4. An electric lighting unit comprising, in combination, an envelope having a coating of fluorescent material on the inner surface thereof, and a pair of vapor discharge devices within said envelope and connected in parallel, whereby said unit has substantially the same light distribution regardless of which of said devices is operating within said envelope.

5. An electric lighting unit comprising, in combination, an envelope having a coating of fluorescent material on the inner surface thereof, a pair of vapor discharge devices within said envelope and connected in parallel, and a baffle between said devices to obstruct the flow of heat therebetween.

LEONARD J. DAVIES.