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ELECTRIC DISCHARGE LAMP

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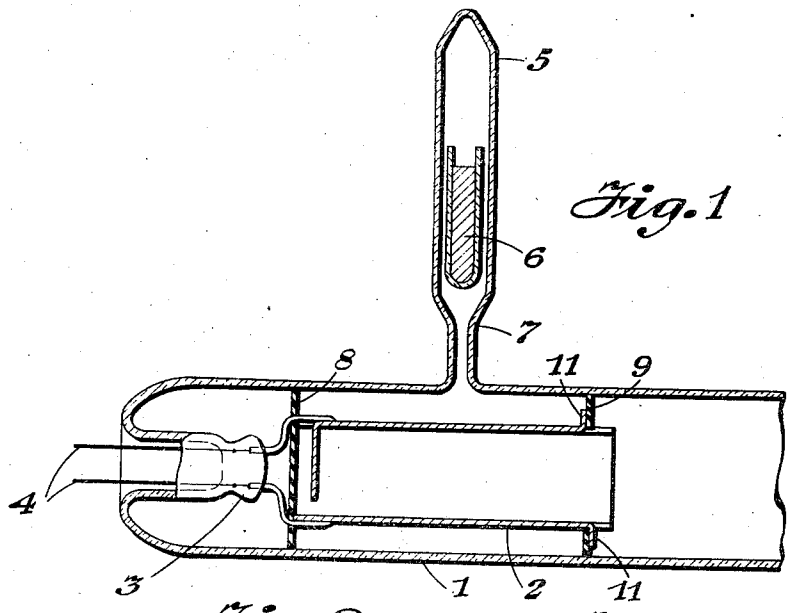


Fig. 1

Fig. 2

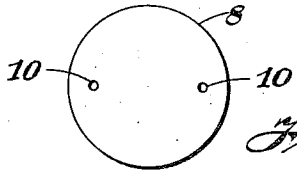


Fig. 3

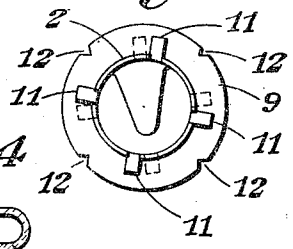


Fig. 4

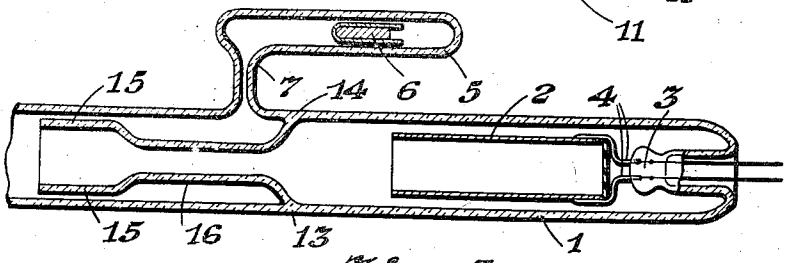
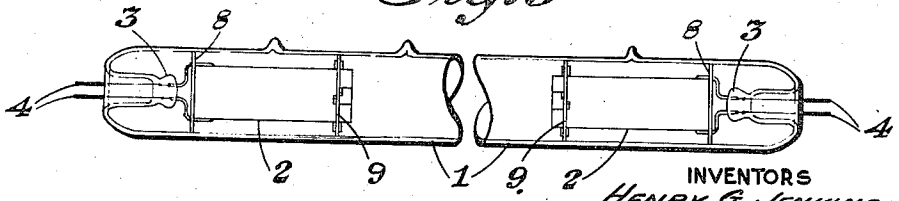


Fig. 5



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ELECTRIC DISCHARGE LAMP

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3 Claims. (Cl. 176—125)

This invention relates to electric discharge lamps of the type described in our British Patent 349,261, granted May 28, 1931 which corresponds to our United States Patent No. 2,030,404, granted February 11, 1936. The essential characteristic of such lamps is that they are provided with means for introducing a continuous stream of impurity which is cleaned up by the action of the discharge whereby the luminous column is caused to vary continually in form and/or position and/or intensity.

The preferred means described in our British Patent 349,261 is a side tube containing naphthalene separated from the main body of the tube by a porous plug.

The object of the present invention is to provide a gaseous electric discharge lamp device of the above type which is of a more simple structure and which is more effective in various instances than prior devices. Still further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from the following particular description.

We have discovered that, if anthracene is used instead of naphthalene, it can be placed in the main part of the tube and need not be separated from the discharge by a porous plug. At the same time metal (for example iron) electrodes can be used in place of the graphite electrodes described in the British Patent 349,261. Also when anthracene is used it is easier to obtain a satisfactory ripple effect, that is a wandering of the luminous column over the cross-section of the tube when the main gas filling is neon (giving red light) than when naphthalene is used.

According to the invention in lamps of the type specified the said means is a substance preferably anthracene, placed in the main body of the lamp, that is to say, so that its vapor has substantially unobstructed access to the region through which the discharge passes.

When the main filling is neon, the anthracene may be deposited on the walls of the tube near one or both electrodes. The electrodes are bombarded in the usual way to free them from gas; anthracene is then distilled into the main tube from a side tube, which may then be sealed off. The pressure of the neon is preferably 10–40 mm.

When the main filling is a mixture of argon and mercury the anthracene may be placed in a small open glass container, loose in the main tube, but retained in the neighbourhood of the electrodes by a constriction in the main tube. Again it is preferably introduced from a side tube after bombardment.

In either case cylindrical iron electrodes may be used.

But while, according to the invention, it is necessary that the vapor of anthracene or the like should have free access to the discharge it is not desirable that the discharge should have free access to the solid from which the vapor is generated. For, if it has, the solid will be blackened. Thus the main part of the solid, and even flakes of it, must be prevented from reaching the space between the electrodes. Further, since the discharge sometimes extends behind the electrodes in the absence of an obstruction, although it may not be visible there, it is desirable to place between the region where the solid is situated and the region between the electrodes an obstruction which, while permitting the substantially free access of the vapor, hinders the passage of the solid or of the discharge. The access of the vapor is to be regarded as substantially free if the vapor pressure of the substance during operation in the region between the electrodes is not so much less than the equilibrium vapor pressure corresponding to the temperature of the solid that the appearance of the discharge is different from what it would be if the vapor pressure were the said equilibrium pressure.

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

Fig. 1 is a side, sectional view of one end of a lamp device during the manufacture thereof and embodying the present invention,

Fig. 2 is a plan view of one element of the embodiment of the invention illustrated in Fig. 1,

Fig. 3 is a plan view of another element of the embodiment of the invention illustrated in Fig. 1,

Fig. 4 is a side, sectional view of one end of another embodiment of the invention during the manufacture thereof, and

Fig. 5 is a side elevational view of a completed gaseous electric discharge device embodying the invention, one end of which is shown in Fig. 1.

Like numbers denote like parts in all the figures.

Referring to the drawing, 1 is the main envelope of the lamp, 2 a cylindrical iron electrode supported from the pinch 3 by the leading-in-wires 4. 5 is a side tube containing anthracene 6 and separated from the main envelope by a sealing-off constriction 7, see Figs. 1 and 4. The diameter of the tube 1 is about 28 mm., and the length of the whole lamp is about 2 metres.

In Figure 1 this constriction 7 is situated oppo-

site the centre of the electrode 2. The space surrounding this electrode, into which the constriction opens is partially closed at each end by mica plates 8, 9. The plate 8, shown in Figure 2, is a complete disc pierced with two holes 10, through which pass the leading-in-wires 4. The plate 8 thus nearly closes the end of the cylinder 2 adjacent to the pinch. 9 is an annulus supported round 2 by strips of metal 11 turned back out of the cylinder 2, see Fig. 3. The outer edge of the annulus 9 has notches 12 to permit the free passage of vapor while restricting the passage of the discharge or of the solid material. After the electrodes have been de-gassed in the usual way, anthracene is distilled into the space between 8 and 9 and then 7 is sealed off.

By slight modifications of this arrangement the temperature that the anthracene attains during operation, and therefore the vapor pressure, may be controlled. Thus if the lamp is to be used in a cold situation and it is desired to keep the anthracene as hot as possible, the constriction 7 may be placed nearer the end of the electrode remote from the pinch (which is the hotter end) and the disc 8 replaced by an annular washer similar to 9 just on the pinch side of the constriction. If, on the other hand, it is desired to keep the anthracene cool, 9 and 7 may be displaced towards the pinch: or 9 may be abolished entirely and 7 placed between 8 and the pinch; sufficient space must then be left between 8 and the envelope and/or the cylinder 2 to allow the vapor to pass. The cool position is generally preferably for blue ripple tubes (filled with a mixture of mercury and argon); for red ripple tubes (filled with neon) a higher temperature is usually required.

In Figure 4 the constriction 7 is on the side of 2 remote from the pinch and opens into the space between the main envelope 1 and an inner tube 13, sealed to 1 at one end 14, but free from it at the other so as to leave an annular opening 15 through which the vapor can pass freely. 13 is constricted at its central portion 16. Anthracene is distilled into the space surrounding this constriction and 7 sealed off. It is there warmed by the heat developed by the discharge passing through the constriction; its temperature can be raised further by surrounding the tube with lagging. Of course lagging can be used to adjust the temperature of the solid also in the lamp shown in Figure 1 or even when there is no obstruction between the solid and the discharge.

The method of manufacturing tubes according to the invention needs no special description. The electrodes are de-gassed by a discharge through a mixture of neon and helium in the usual way. When they are free from gas, the lamp is completely evacuated and the anthracene distilled into the main envelope, and the constrictions sealed off, with the pump still in operation. If a red ripple tube is required in a lamp of the kind shown in Figure 1 or 4, neon is introduced to a pressure of about 10 mm.; if a blue ripple tube is required, argon is introduced to a pressure of about 5 mm. together with a globule of mercury. A complete lamp of the type illustrated in Fig. 1 is shown in Fig. 5.

No special ageing process is necessary, but the full ripple effect usually is not developed until the lamp has been in normal operation for some hours.

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

1. An electric discharge device comprising an envelope having iron electrodes sealed therein and containing a discharge supporting gas, said envelope having a source of anthracene vapor therein for introducing a stream of said impurity into the discharge path between said electrodes, said impurity producing a ripple discharge in said gas.

2. An electric discharge device comprising an envelope having electrodes sealed therein and containing a discharge supporting gas, said envelope having a source of anthracene vapor for introducing a stream of said vapor into the discharge path between said electrodes, said anthracene vapor producing a ripple discharge in said gas.

3. An electric discharge device comprising an elongated tubular envelope having the same external diameter throughout its length, electrodes sealed therein and a discharge supporting gas therein and a source of anthracene vapor therein for introducing a stream of said vapor into the discharge path between said electrodes, means mounted along the discharge path between said electrodes in said envelope and interposed between said path and said source to protect said source from the discharge between said electrodes, said vapor producing a ripple discharge in said gas.

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