April 14, 1936. W. G. TAYLOR 2,037,099

ILLUMINATING LAMP

Filed April 29, 1931

Fig. 1

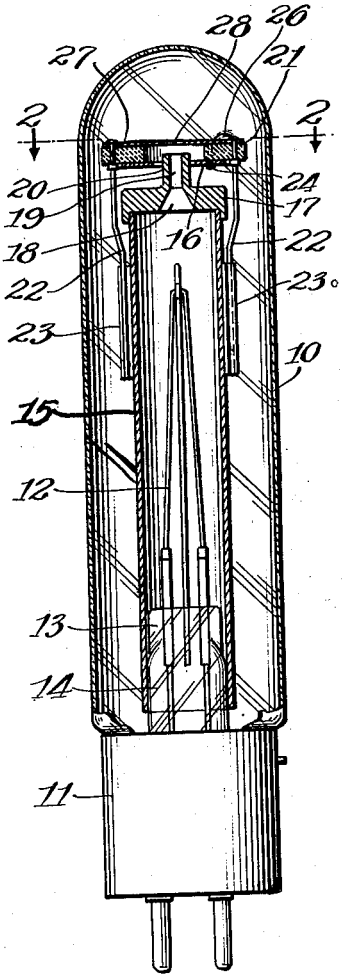


Fig. 3

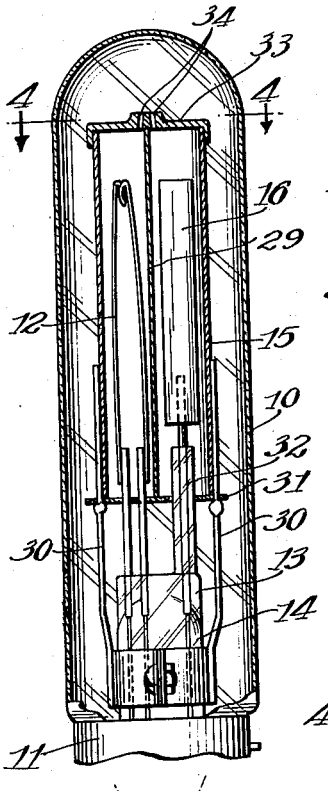


Fig. 4

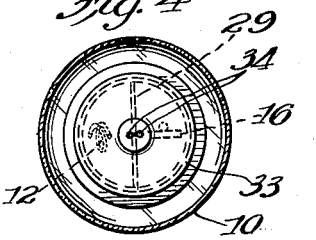


Fig. 5

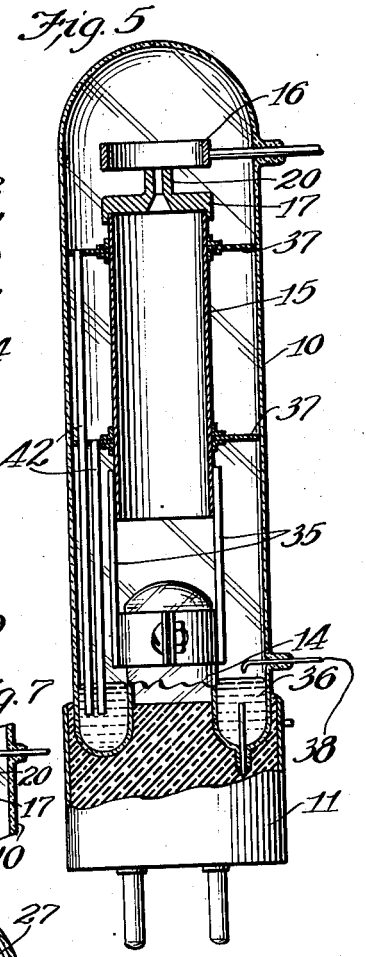


Fig. 6

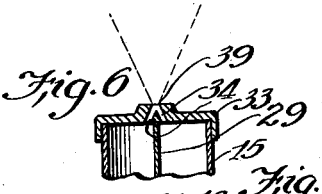


Fig. 7

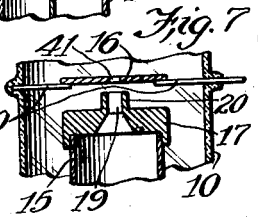


Fig. 2

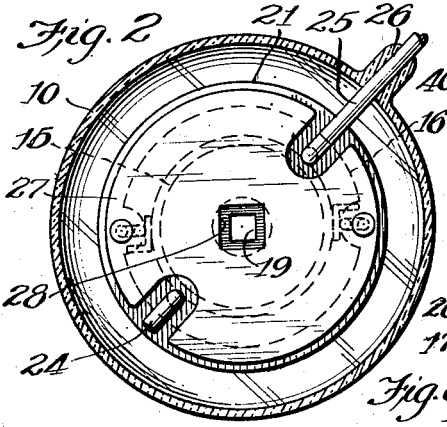
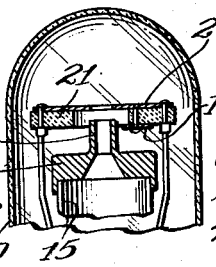


Fig. 8



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UNITED STATES PATENT OFFICE

2,037,099

ILLUMINATING LAMP

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Application April 29, 1931, Serial No. 533,677

11 Claims. (Cl. 176—122)

This invention relates to illuminating lamps and particularly to lamps in which the intensity of the emitted light may be modulated by variation of applied voltage.

The improved lamps are available for many purposes, for example as a source of light in television and other analogous purposes. They may also be employed for general illuminating purposes.

One of the objects of the invention is to provide an improved lamp capable of modulated illumination and adapted to provide a concentrated beam.

A further object of the invention is to provide an improved heated cathode glow lamp provided with means to obscure the anode glow.

A further object of the invention is to provide an improved heated cathode lamp adapted to provide a luminous discharge of the arc type.

A further object of the invention is to provide an improved glow lamp having an arc type discharge and adapted to operate under a substantial pressure of gas.

Other objects, advantages and capabilities of the invention will appear from the following description of preferred embodiments thereof, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a sectional elevation of a lamp embodying my invention;

Figure 2 is a transverse sectional view taken on the line 2—2 of Fig. 1;

Figure 3 is a sectional elevation of another embodiment of my invention;

Figure 4 is a transverse sectional view of same on the line 4—4 of Fig. 3;

Figure 5 is a sectional elevation of a further embodiment of my invention;

Figure 6 is a sectional detail view showing a modified form of the embodiment shown in Fig. 3;

Figure 7 is a sectional detail view showing a modified form of the embodiment shown in Fig. 1; and

Figure 8 is a sectional detail view of a further modification of this embodiment.

Referring to the drawing and particularly to Figs. 1 and 2, the lamp comprises an envelope 10 which may suitably be a glass tube of appropriate form. The envelope may be mounted on a base 11 of conventional type. The cathode 12 is in the form of a nickel ribbon, preferably coated with an oxide coating such as barium oxide, strontium oxide or the like to increase its electronic emissivity. The leads of the cathode pass through a press 13 and stem 14 and are connected to terminals carried by the base 11 whereby heating current is supplied to the cathode. The cathode is thereby actuated to exert an ionizing effect upon the gas.

The cathode 12 is enclosed by a cylinder 15 which may suitably be of metal. The lower end of the cylinder is closed in any suitable way to prevent the arc or discharge from passing around the exterior of the cylinder to the anode 16. This closure may suitably be effected by slipping the cylinder 15 over the stem 14, upon which it has a snug resilient fit.

The cylinder 15 projects beyond the cathode 12 and carries at its outer end a metal cap 17 which closes the open end of the cylinder. The cap is provided with a relatively small central opening 18 which converges upwardly somewhat and gives into a channel 19 provided in an outwardly projecting nipple 20. The channel 18, 19 is preferably located on the axis of the cylinder 15, although I do not intend my invention to be limited in that respect.

Adjacent and around the upper end of the nipple 20 is mounted an annulus 21 of insulating material, preferably of a ceramic nature. This annulus is of substantial thickness, for example one-eighth of an inch and is so located that its lower face is substantially below the end of the nipple 20 and its upper face is substantially above same. The annulus 21 may suitably be supported on posts 22 carried by lugs 23 which are secured to the exterior of the cylinder 15, for example by spot welding.

The anode 16 is in the form of an annulus of metal secured upon the lower face of the insulating annulus 21 by means of pins 24. To one of these pins is connected the anode lead 25, which may pass through a press 26 in the envelope 10. The anode is suitably notched to clear the posts 22 so that the cylinder 15 is insulated from the anode 16.

A shield plate 27 is mounted on the outer face of the annulus 21, said plate being provided with an opening 28 in alignment with the passage 18, 19. The size and shape of the opening 28 depends upon the purpose for which the lamp is used. Thus for television work the opening should be small so that the anode glow is obscured. For this purpose it is preferred to make the opening 28 square, although it is obvious that any desired shape of opening may be used if desired. The plate 27 may be secured to the posts 22 and may be notched to keep it out of electrical contact with the pins 24.

It is preferred to provide within the envelope 10 a substantial gas pressure, for example several centimeters pressure of inert gases such as argon, neon, or helium, or suitable mixture thereof. I have successfully employed relatively inert gases such as nitrogen and I do not intend to be limited to the inactive gases. I may also introduce a small amount of mercury into the envelope 10 to modify the appearance and characteristics of the arc discharge. I have obtained excellent results with gas pressures between 2 and 8 centimeters.

When the cathode is heated and an appropriate voltage is applied to the anode an arc strikes between the cathode and the anode, said arc extending through the passage 18, 19 and spreading toward the anode. The shield plate 27 obscures the anode glow which tends to be irregular in location and intensity. The arc viewed through the opening 28 is constant for constant applied voltage and modulates in accordance with the variation thereof. The lamp is accordingly highly suited for television work since it provides a relatively small or spot source of modulated light of great intensity.

In the embodiment of the invention shown in Figs. 3 and 4, both the cathode leads and the anode lead pass through the press 13, the anode 16 being in the form of an elongated plate. The cylinder 15 is provided with a vertical partition 29 which divides it into two compartments, one of which contains the cathode and the other of which contains the anode. The cylinder 15 is supported on posts 30 which are secured to the stem 14 by a collar. The lower ends of the cylinder compartments are closed by a sheet of mica or the like 31 which may be secured in position by deforming the posts therebelow. The lead of the anode is protected from the cathode leads by a glass tube 32 which extends from the press 13 through the sheet of mica 31 into the anode compartment. The upper end of the cylinder 15 is closed by a cap 33 which is provided with adjacent openings 34 one of which opens into the cathode compartment and the other of which opens into the anode compartment.

When the cathode is heated and appropriate voltage is applied to the anode, an arc strikes between the cathode and anode, passing through the openings 34. It will thus be seen that adjacent twin point sources of light are provided by this embodiment which are particularly advantageous in television work since they tend to break up the line pattern which is usually observed in television images.

In the modification shown in Fig. 5, the anode 16 is in the form of a short cylinder or ring located around the nozzle 20 in the cap 17. The cylinder may be supported by posts 35 from a collar on the central stem 14. The cathode may take the form of an annular mercury puddle 36 into which the cathode lead extends. In order to prevent arcing around the exterior of the cylinder 15 I provide rings of mica 37 or other suitable material which effectively close the annular space between the cylinder 15 and tube 10. If desired a starting electrode 38 may be provided adjacent the cathode 36 to facilitate the striking of the arc. This embodiment is particularly suitable for purposes where a point source of light is desired and in which the anode glow is unobjectionable. In order to prevent accumulation of condensed mercury above the rings 37, I provide capillary tubes 42 which extend downward into the mercury puddle 36 and are sealed thereby.

In the modification shown in Fig. 6 the openings 34, which communicate into the cathode and anode compartments, converge to a single opening 39 on the outer face of the cap 33. The degree of convergence is considerable so as to give a wide angle of substantially uniform illumination.

The modification shown in Fig. 7 is generally similar to that shown in Fig. 1, but in this case the shield 27 is omitted and the anode 16 is mounted above the outer end of the nipple 20. The anode is supported in any suitable way, for example by means of posts 40 which extend through the glass envelope, one of said posts being adapted to serve as the anode lead. In this modification the anode is provided with an opening 41, which is preferably somewhat smaller than the opening 19 in the nipple 20. In consequence of this arrangement the anode glow makes its appearance on the inner face of the anode and is obscured from observation through the opening 41.

In order to stabilize the anode glow, that is to insure its appearance at a definite position, it is sometimes advisable to place the anode 16 in unsymmetrical relation with respect to the nipple 20. For example in Fig. 8 I have shown a modification of the embodiment illustrated in Fig. 1, in which the anode 16 is in the form of a plate located at one side of the nipple 20.

Although the invention has been disclosed in connection with the specific details of preferred embodiments of the invention, it must be understood that such details are not intended to be limitative except insofar as set forth in the accompanying claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An illuminating lamp comprising a gas filled envelope, a heated cathode, a chamber enclosing the cathode provided with a restricted opening, an anode on the exterior of said chamber and a shield within the envelope provided with an opening permitting the luminous discharge to be viewed adapted to obscure the anode from view.

2. An illuminating lamp comprising a gas filled envelope, a heated cathode, a chamber enclosing the cathode provided with an outwardly projecting nozzle, an annular anode located around said nozzle and a shield on the outer side of said nozzle provided with an opening in alignment therewith.

3. An illuminating lamp comprising an envelope filled with gas of substantial pressure, a heated cathode, a chamber enclosing the cathode provided with a restricted opening, an anode on the exterior of said chamber and a shield within the envelope provided with an opening permitting the luminous discharge to be viewed adapted to obscure the anode from view.

4. An illuminating lamp comprising an envelope filled with gas of substantial pressure, a heated cathode, an anode, a pair of adjacent opaque chambers of conductive material enclosing the cathode and anode, said chambers being provided with adjacent restricted openings whereby the discharge may pass between the cathode and anode.

5. An illuminating lamp comprising an envelope filled with gas of substantial pressure, a heated cathode, a chamber enclosing the cathode provided with an outwardly projecting nozzle,

an annular anode located around said nozzle and a shield on the outer side of said nozzle provided with an opening in alignment therewith.

6. An illuminating lamp comprising an envelope containing a pair of electrodes, a pair of chambers enclosing said electrodes, each of said chambers being provided with a restricted opening whereby the discharge may pass between said electrodes, said openings being located adjacent each other.

7. An illuminating lamp comprising a tube containing a liquid metal cathode, a relatively long passage through which the discharge is adapted to pass, a discharge nozzle at the end of said passage and an annular anode adjacent and around said nozzle.

8. An illuminating lamp comprising an envelope, a pair of chambers therein having a common end wall, and an electrode in each chamber, said end wall being provided with openings which extend from the chambers outwardly and converge to a common outer opening.

9. An illuminating lamp comprising an envelope containing an electrode, an opaque chamber of conductive material within the envelope enclosing said electrode, and a heated electrode without the chamber, said chamber being provided with a restricted opening to permit the discharge to pass between the electrodes.

10. An illuminating lamp comprising an envelope containing a pair of electrodes, and a pair of opaque chambers of conductive material enclosing said electrodes, one of said chambers being provided with a restricted opening whereby the discharge may pass between said electrodes.

11. An illuminating lamp comprising an envelope containing gas, a chamber therein having a nozzle adapted to project light outwardly of the envelope, an anode within the chamber, and a heated cathode outside said chamber, said chamber and nozzle being formed of opaque material of good electrical conductivity.

WARREN G. TAYLOR.