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GLOWLAMP

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Fig. 1.

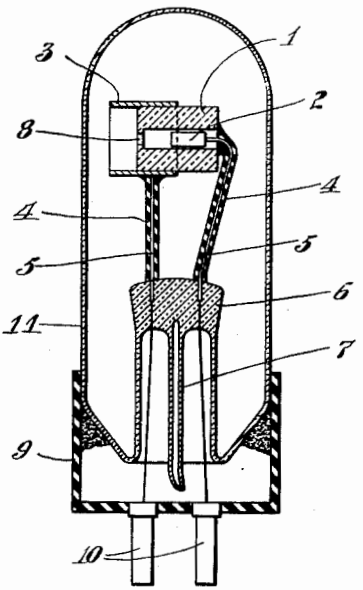
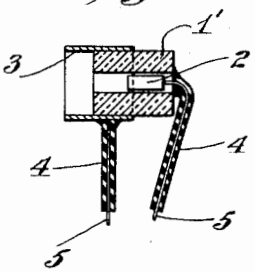


Fig. 2.



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1,954,420

GLOWLAMP

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5 Claims. (Cl. 176—122)

The present invention relates to gaseous glow lamps for television apparatus and the like.

More specifically this invention relates to gaseous glow lamps wherein the useful optical output is obtained in a concentrated beam or at a point of restricted area.

This invention relates particularly to the construction, form, size and mode of operation of such gaseous glow lamps used as a light source variable in accordance with changes of the electric exciting current applied thereto.

One object of this invention is the production of a concentrated beam of light capable of rapid fluctuation in intensity and of being directed, focused or otherwise acted upon by optical means.

Another object is the provision of a small, rugged and compact television lamp suitable for commercial production and use.

Another object of our invention is to produce a concentrated beam at a position where it can be readily projected through a transparent portion of the walls of an outside vessel with the minimum of optical distortion due to the character of these walls at that point and their presence in the path of this beam.

A further object is the production of a lamp operable on electrical potentials and currents not exceeding the values usual in television receivers.

A further object is to confine the greater part of light production in a tube of the gaseous glow type, to the neighborhood of the electrodes themselves, and to reduce to a minimum degree the diffusion of such glow throughout the entire gas containing chamber of such tube.

Other objects and uses of our invention will be apparent from the accompanying drawing.

Fig. 1 is a view partly in cross section of one form of our invention.

Fig. 2 is an alternative form of one detail of our invention.

In Fig. 1, 1 represents a chamber of insulating material, such as isolantite or the like, which is capable of ready degasification and of withstanding the moderate elevation of temperature which may be produced therein during operation. I have found a suitable size of such tube to be ⅜ of an inch in external diameter, with an interior diameter of $\frac{3}{16}$ of an inch.

2 represents an electrode which is situated within one end of this insulating chamber. This electrode may be either solid or of a hollow or cup like formation. The solid electrode shown in the drawing may conveniently be slightly spaced from the interior wall of the insulating chamber. In case that a hollow electrode is employed we prefer that the electrode fit snugly against this wall, but the degree of approximation of the electrode and chamber wall may be varied although we prefer that the distance do not exceed that corresponding to the minimum ionization potential. The lateral position relative to the insulator may be adjusted to secure the optimum shape and size of glow produced.

3 represents the other electrode of our tube, shaped in the form of a cylinder which may snugly embrace the exterior wall of chamber 1. The open end of this electrode may extend approximately ¼'' beyond the end of the insulator, although such extension is not essential and it may be flush with, or not reach the end of the insulator.

4 represents insulating sleeves which serve partially to support the insulating chamber and electrodes hereinbefore described and also to cover adequately the lead wires 5 which convey current to the electrodes of our invention, and pass at their other end through the press 6 to the exterior of the tube.

7 represents the usual exhaust tubulature which furnishes means for the exhaustion and filling of such a tube, and which is sealed off at its extremity at the conclusion of the manufacture of the tube.

8 represents a constriction in the size of the interior of insulating chamber 1 at the end which comes within the hollow electrode 3.

9 indicates a tube base of the usual type having prongs 10 to which leads 5 are connected.

Fig. 2 shows an insulating chamber 1' not employing such constriction which latter need be employed only when it is desired to concentrate the glow discharge to an area of smaller cross section than that of electrode 2.

Insulating sleeves 4 and chamber 1 serve to keep unwanted discharges from occurring along the length of the lead wires conveying current to the electrodes. It is preferred that such insulating sleeves 4 be firmly fastened and protected by such means as insulating cement at the points where they make contact with the walls of chamber 1, and/or of electrode 3.

One or both of the electrodes of our invention may be either made of, or coated with such materials as minimize the potentials necessary to initiate and/or maintain discharges in such luminescent gaseous tubes. Such materials are the alkali metals, alkali-earth oxides, magnesium, aluminum or other well known like substances.

The electrode structures and insulating chamber of our device are supported by lead wires 5

and the insulating tubes 4 surrounding the same. These tubes may be firmly fastened to the press 6 by any suitable means, such as projections upon the press which are to fit within or enclose the exterior of tubes 4 for a short distance, or insulating cement may be used to make such connections. These connections should be of a gas tight nature under usual circumstances, further to avoid unwanted discharges at such places.

With the form and size of structure herein described we make the interior electrode 2 the cathode and the exterior electrode 3 the anode, in order that the discharge without the chamber 1 be substantially of the "dark space" type and the visible glow be confined substantially within the chamber 1.

During the operation of our invention both the electrode thereof are maintained at a temperature substantially below incandescence. The structures of our invention hereinbefore described are completely immersed within an atmosphere of some ionizable gas such as monatomic gases of the inert group, mercury or the like. Gases commonly employed are neon, helium, nitrogen or argon. Such gases may be employed either in varying degrees of purity or in intentional admixtures, according to the character of the luminous output desired. It is well known that by proper selection of these gases such luminous output may be made to occupy various portions of the visible and invisible spectrum.

In order to maintain such a gaseous atmosphere around the structures of our invention, they may be suitably enclosed within a protecting and confining membrane in the shape of a vessel indicated at 11. Such a membrane may be entirely transparent or translucent. On the other hand, it is possible with our invention to construct such a vessel with walls opaque at all points except those adjacent to the luminous beam projected from the interior or insulating chamber 1 through electrode 3. It is also possible to use a completely transparent vessel which is enclosed by an outer protective and opaque coating, such as a metallic shield, at all points except the one through which the light is to be transmitted. This mechanical and/or electrical protection of our invention constitutes a feature of great commercial importance.

For convenience in handling and connecting it is preferable that a structure according to our invention be mounted at its lower extremity in some base as shown at 9, which is of the type customarily employed with thermionic vacuum tubes. In this case the leads 5 may terminate in two only of the contact pins in such base.

By manufacturing these tubes with uniform size of interior parts, and with such parts uniformly located with respect to the pins of the mounting base, one tube may be rapidly and easily replaced by another similar tube, in case of failure. Such rapid replacement can be made in a minimum of time, and will not necessitate extensive readjustment of any optical systems employed exteriorly to the tube.

While we have mentioned certain specific sizes of the parts of our structure, such sizes are purely illustrative, and we do not in any way restrict our invention to such sizes or ratio of sizes.

While we do not confine ourselves to any specific pressure of the gaseous atmosphere within our tube, we have found that when neon is employed a pressure of 6 to 12 mm. of mercury is very suitable, although a suitable discharge may be obtained at pressures ranging from 2 to 20 mm. With such sizes of apparatus as given, a suitable potential is found to be from 200 to 400 volts with a current of 15 to 50 milliamperes.

With suitable arrangement and sizes of parts, selection of gas and pressure, this invention may operate on substantially lower voltages, of the order of 100 volts. Likewise, with appropriate design and gas filling, this invention can be embodied in a form capable of employing voltages between 500 and 1000, or even higher. In this last case, it may be desirable to employ a base larger, or of different type than the ordinary radio tube base herein described.

We have found it desirable to ascertain the optimum operating pressure of gas within our tube by connecting thereunto a source of current supply, while the tube is still connected to the gas supply employed for filling the same and before tube 7 is finally sealed off, and adjusting the gas pressure until the desired concentrated glow is had at the rated operating voltage and current.

One advantage of our invention is that a large volume of gas may be enclosed within the outer membrane 9, which may in this fashion be considered to function as a gas reservoir, enclosing a discharge chamber of smaller dimensions. Since it is well known that the gas pressure in a discharge tube of small volume tends to change during life, it can be seen that the tube of our invention having effectively a large reservoir of gas in the discharge path will have a long useful life.

Another advantage of our structure is that a beam of light may be produced which is of substantially uniform brightness throughout its cross section.

A further advantage is that a concentrated beam is produced such as can be readily manipulated by means of optical devices such as lenses, mirrors and the like. The action of such optical devices was inefficient when exerted upon the diffused radiance of previous forms of glow tube. They may be made, however, highly efficient when employed in connection with a concentrated glow of our invention.

Another advantage is that the concentrated beam is produced adjacent a point of the outer gas containing vessel which is easily made thin and uniform in its optical character.

Furthermore the outside envelop of our invention may be made opaque at all points except those immediately adjacent to the hollow electrode thereof, which permits, when desired, the suppression of unwanted light beams which otherwise might emanate therefrom.

Another advantage of our invention is that when the desired light is produced in the ultra-violet portion of the spectrum, it is possible to utilize a window of quartz or similar material of a moderately small size, which is advantageous in view of the high cost of such materials. Furthermore such a window employed with light in the visible spectrum will allow the production of light of great intensity, even though considerable heat production is thereby entailed.

Other changes in the parts and dimensions of our invention can be readily made by one skilled in the art, in order to adapt it to special purposes, and we do not limit ourselves to such special forms or sizes as have been hereinbefore set forth, except in as far as they are limited by the claims hereunto appended.

We claim:

1. A gaseous glow lamp comprising an outer

chamber translucent at least in part, an opaque insulating cylinder of material having high thermal capacity and resistance having enclosed in one end an electrode substantially in contact with the inner wall thereof and directly visible through the open end thereof, a hollow ring shaped electrode embracing at least partially the other end of said cylinder, connecting and supporting means for said cylinder and electrodes, said cylinder being so positioned that its open end is adjacent a lateral wall of said outer chamber, said chamber being filled with a gas glowing under electrical excitation, and said connecting and supporting means being mechanically and electrically shielded from said gas, so that the glowing gas discharge is confined to the electrodes proper.

2. A gaseous glow lamp including an outer gas containing chamber, an inner glow chamber, said inner chamber having its axis substantially at right angles to the axis of the outer chamber and communicating with the outer chamber through an orifice of constricted area, compared with the area of the inner chamber, a hollow electrode positioned within said outer gas chamber surrounding at least a portion of said inner glow chamber and another electrode positioned within said inner glow chamber but having at least a portion thereof visible through said orifice and said hollow electrode.

3. A television spot-source light including a transparent tube having a re-entrant stem, conducting lead wires sealed in said stem and supported thereby, insulating material covering said lead wires, substantially co-axial discharge electrodes supported by and connected to said lead wires, the larger electrode being hollow, an annular insulator of opaque material having high thermal conductivity and resistance between said electrodes and deriving its sole support through the lead wires, said insulator having an opening along its axis so that the smaller of said electrodes is visible through the larger electrode and through said opening.

4. A television reproducing lamp including an opaque insulating discharge chamber of material having high thermal capacity and resistance, one electrode within said chamber, another electrode at least partially embracing the exterior wall of said chamber and extending beyond the end of said chamber, so that the luminous discharge within said chamber can be viewed through said second electrode, insulated leads to said electrodes, supporting said insulating discharge chamber substantially at right angles to the axis of the lamp, an outer transparent chamber containing said discharge chamber and said electrodes, and an inert gas filling said outer chamber.

5. A gaseous glow lamp including an outer gas containing chamber, an inner glow chamber, said inner chamber having its axis substantially at right angles to the axis of the outer chamber, a hollow electrode positioned within said outer gas chamber surrounding at least a portion of said inner glow chamber and another electrode positioned within said inner glow chamber but having at least a portion thereof visible through said hollow electrode.

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