Feb. 19, 1935. P. J. KAYATT 1,991,749

GLOWLAMP

Filed July 14, 1932

Fig. 1

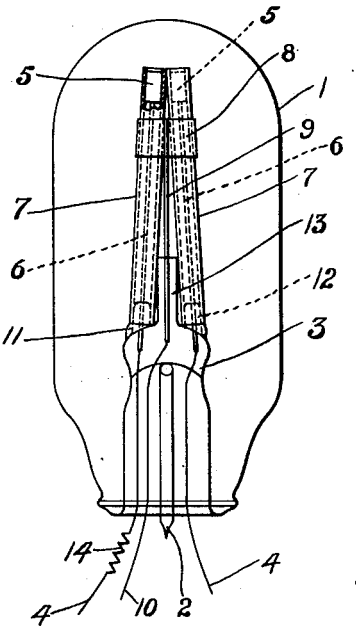


Fig. 2

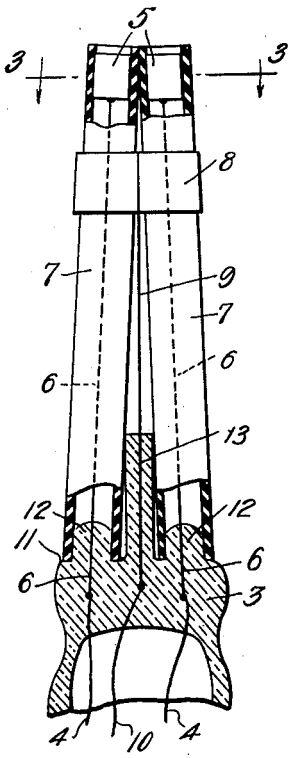
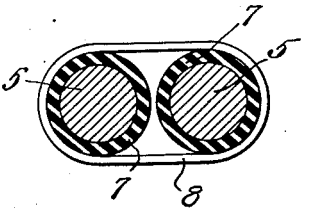


Fig. 3.



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GLOWLAMP

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8 Claims. (Cl. 176—122)

The present invention relates to gaseous glow lamps, as employed in television and the like.

More particularly this invention relates to such glow lamps whose luminous output is in the form of one or more concentrated beams of light.

This invention includes the mechanical and electrical features of a form of such glow lamp particularly designed to give a luminous beam proceeding from more than a single point.

One object of my invention is the production of a concentrated light beam capable of rapid variations in intensity according to the signal fluctuations of the electric current supplying energy to the same.

Another object is the production of such a concentrated light beam at several points or in a line in such a manner that this beam can be readily subjected to manipulation by means of suitable optical apparatus.

A further object is the production of a lamp having these characteristics and mechanically suited for commercial production, as well as possessing mechanical strength and rigidity, enabling its use when subject to vibration.

A still further object is the production of a lamp having the foregoing characteristics and capable of satisfactory operation within the range of voltages and currents usually found in television receiving apparatus.

A yet further object of this invention is to provide a glow lamp wherein the glow is confined to the immediate neighborhood of the electrodes and prevented from spreading throughout the entire tube.

Yet another object of my invention is to provide a glow lamp having several glow chambers or points communicating with a common gas reservoir in order to secure a long life by subjecting only a small portion of the gas contained therein to electrical excitation at one instant.

Another object of my invention is to furnish a glow tube yielding a luminous output from more than one electrode thereof.

Other objects and uses of this invention will be apparent from the accompanying drawing, which is a view partly in cross section of one form of this invention.

Fig. 1 is a side view of a lamp embodying my invention, part of the end of one insulator being broken away and sectioned to disclose the electrode.

Fig. 2 is a longitudinal sectional view showing the electrodes and insulators on a larger scale.

Fig. 3 is a transverse sectional view of the ends of the electrodes and their insulators, on the plane of the line 3—3 of Fig. 2.

Referring now to the drawing, the outer vessel 1 contains the electrode structure of my invention and serves as a common gas reservoir for the same. This vessel may be made entirely of transparent or translucent material such as glass or the like, or it may be constructed of an opaque material and provided with a transparent spot or window opposite the points of maximum light production. Such a window may be made of quartz in case that ultra-violet rays are to be obtained from the lamp. The gas filling of the lamp may be of any suitable gas, such as neon, helium, argon, mercury, vapor, or the like, according to the color and other properties of the light which it is desired to produce therefrom.

At 2 is shown the sealed-off exhaust tube which serves to allow the exhaustion of vessel 1 and the filling thereof with the desired gases.

3 represents the usual squeeze or press which is employed both as a mechanical support for the various elements contained within the tube and as a sealing means impervious to the passage of gases therethrough. This press also serves to allow the passage of current to the elements within the tube by means of conductors 4, 4 which may be made of suitable material for sealing within the press. The electrodes 5, 5 are connected to the conductors 4, 4 by leads 6, 6.

The tubes 7, 7 surround and suport the leads and electrodes and form light-confining chambers. These tubes may be constructed of ceramic insulating material or other suitable insulating material which can be readily degasified during the exhaust process and which can withstand such temperatures as may be produced during the operation of the tube. These chambers may be of any suitable size and relative dimensions. As an example, a satisfactory tube has been made employing such chambers having an external diameter of $\frac{3}{16}$ of an inch and an internal diameter of $\frac{1}{16}$ of an inch, with a length of 2 inches, but I do not confine myself to such specific sizes.

Toward the upper ends of these tubes is located a supporting band 8 surrounding and embracing the exterior of both tubes holding the outer ends in relatively fixed relation. This band may also have a supporting wire 9 and be supplied with an external connection by means of a conducting wire 10, if so desired.

Within each of the tubes and approximately at the upper end thereof, or slightly below this point, is located an electrode 5 which may be of a suitable metal, such as nickel, and formed either

as a solid or a hollow cylinder, although I prefer the hollow type. These electrodes may be in close contact with the interior walls of the tube chambers, or may be spaced therefrom at a distance preferably smaller than the minimum distance giving rise to gas ionization. These electrodes may likewise be constructed of or coated with such materials as serve to promote gaseous discharges at low voltages. Such materials are well known in the art as, for example, the alkali metals, aluminum, magnesium or the alkali-earth oxides.

The tubes 7 are supported from the press 3 partly by the supporting wire 9 and the supporting band 8 carried by the latter. The tubes may also derive a measure of support from the lead wires 6 which connect electrodes 5 with current conductors 4. It is also preferred that the space between the bottom of each tube chamber and the squeeze 3 be filled with a suitable insulating material 11.

This tends to obviate unwanted electrical discharges or gas ionization which might otherwise occur at these points. The tubes may be positioned by projections 12 integral with the squeeze, which extend into their lower ends.

The supporting wire 9 passes through a projecting insulator 13 which may conveniently be formed integrally with squeeze 3 and may be of an insulating material such as glass. This projecting insulator serves to reduce still further the tendency for a discharge between lead wires 6 and supporting wire 9 at a point adjacent to the base of the tubes 7.

The discharge chambers may be still further constricted at their upper ends above the electrodes 5, if it is desired to still further constrict the beam of light proceeding from each electrode.

With the structure of this invention, it is immaterial which electrode is employed as anode and which one as cathode. If the gas pressure and exciting voltages are properly chosen, the light will be emitted with practically uniform intensity from each electrode under the conditions of operation ordinarily encountered in television receivers.

Under certain conditions it may be desirable to use supporting band 8 as an auxiliary electrode, making a connection thereto by means of the lead wire 10 which is connected to the same. However, the connection to this supporting band is ordinarily employed only during the exhaust process for the purpose of supplying current thereto in order to aid in the liberation of the gases occluded in this band.

It is understood that a suitable "getter" may be employed at any suitable spot in this tube for the purpose of promoting the purity of the gases therein, as is well known in the art.

The electrodes of my invention operate at a temperature substantially below incandescence under normal conditions and therefore are of the type commonly referred to as cold electrodes.

For convenience in handling and making connection to this tube, it is usually desirable to mount the same in a base such as the type employed with thermionic vacuum tubes. If so used, leads 4 will, of course, terminate in the contact pins of such base. Lead 10 may also be terminated in a similar pin, if it is to be used during operation of the tube.

The mechanical structure of my invention is such that tubes may be produced to a high degree of uniformity and if they are mounted on suitable bases they may easily be substituted for one another for the purpose of replacement in case of tube failure, without requiring extensive adjustment of any optical systems which may be employed exterior to the tubes.

While this invention is not confined to any specific pressure of the gaseous atmosphere within the tube, it has been 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 50 mm. With such sizes of apparatus as given, a suitable potential is found to be from 250 to 400 volts with an average current of 25 to 100 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.

It has been found desirable to ascertain and secure the optimum operating pressure of gas within the tube by connecting thereunto a source of current supply correspondent to the desired operating values while the tube is still connected to the gas supply employed for filling the same and adjusting said pressure of gas for optimum luminous effects before the exhaust tube 7 is finally sealed off.

One advantage of this invention is that it allows a comparatively large quantity of gas to be contained within the vessel 1, while only a small quantity of this gas is electrically activated in any one instant of operation. It is well known that such gases when electrically excited tend to disappear from the interior of the tube, as far as their presence in a free state is concerned. This tends to reduce the gas pressure and to set a limit to the useful life of such tubes. By the construction of this invention it is possible to utilize the outer vessel 1 as a species of gas reservoir, continuously in communication with the interior of the chambers at the ends of the electrodes. Since the electrical discharge in this invention is confined in a great degree to the ends of the chambers in the tubes or the portions of chamber 1 immediately adjacent thereto, a structure according to this invention will have a useful life much greater than types hitherto employed where a great portion of the included gas was undergoing electrical ionization at all times.

When this tube is excited with a current of comparatively low intensity, a glow will ordinarily appear at each electrode chamber and may be utilized as two discrete spots of light. However, I usually prefer to employ a higher current density which has the effect of causing the glow from each chamber to unite together and give a substantially uniform line of light.

Such a line of light is frequently of great advantage with certain types of scanning apparatus which lend themselves to the employment of a line of light rather than a single spot. By spreading the light-producing discharge over a considerable path I am enabled to employ a higher current intensity without accentuating sputtering or other harmful results which tend to unduly shorten the life of glow tubes of the spot type.

This form of glow tube has electrical resistance characteristics of a negative character and accordingly it is desirable that some resistance element such as shown schematically at 14, or its equivalent be placed in series with the tube when it is connected to a supply capable of giving a large amount of current.

In many cases the tube will be connected in series with the anode circuit of a vacuum tube amplifier, and in such cases the electrical resistance characteristics of the vacuum tube circuit will be sufficient to protect the glow tube from possible dangerous values of current due to its negative resistance characteristics. In the case of a parallel connection I have found that a series protective resistance of from 2000 to 10000 ohms is preferably connected in series with the glow tube. However, in case that the voltage supplied to the glow tube lies outside the range of values previously mentioned, it may be found necessary to vary this protective resistance accordingly.

Other changes in the parts and dimensions of this invention can be readily made by one skilled in the art, in order to adapt it to special purposes, and it is not limited 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.

I claim:

1. A television glow lamp including a transparent bulb with a re-entrant stem, a gas filling for said bulb, an internal press at one end of said bulb, two longitudinal hollow insulators substantially imperviously sealed to said press at their lower ends and open at their upper ends, a lead wire passing through said press and through a portion of each insulator, an electrode at least partly within the upper end of each insulator and connected to its respective lead wire, a supporting band embracing both insulators near their upper end, and a supporting wire sealed in said press and affixed to said supporting band the ends only of the electrodes being exposed and located close together so that a spot of light is produced between the ends of the electrodes which is visible through the bulb when the lamp is in operation.

2. A glow lamp construction including two longitudinal hollow insulators open at their open ends, electrodes at the upper ends of said insulators, a single internal press carrying the lower ends of both said insulators, lead wires passing through said press and said insulators and connecting to said electrodes, and mechanical binding means substantially embracing both insulators near their upper ends the ends of the electrodes being located close together and exposed to view and the insulators serving to confine the glow from the electrodes to the ends thereof so that a spot of light is produced which is visible from outside the lamp.

3. A glow lamp comprising an envelope having an internal press, two electrodes having leads sealed in said press, insulating shields open at their outer ends supported on said press and laterally surrounding said leads and electrodes and inclined towards each other at their outer ends, the ends of the electrodes being located close together and exposed within the envelope so that a spot of light is produced between the ends of the electrodes which is visible through the envelope when the lamp is in operation, means for mechanically connecting said shields near their outer ends and means connected to the press for supporting said means for mechanically connecting said shields.

4. A television lamp comprising a gas filled envelope, lead wires sealed in a wall thereof and having electrodes arranged near the opposite wall thereof, insulating means supported by a wall of the envelope and surrounding the inner ends of said leads and parts of the electrodes, a metallic band embracing the insulating means adjacent the outer end thereof and a supporting wire for said band having one end mounted in a wall of the envelope the ends only of the electrodes being exposed and located close together so that a spot of light is produced at the ends of the electrodes, the insulating means serving to confine the light to a single spot.

5. A gaseous glow lamp comprising a gas-filled envelope containing a plurality of tubular chambers of insulating material, each of which is open at its outer end and having the ends located adjacent each other and lying substantially in a single plane, an electrode within each chamber adjacent the open end thereof, conductors extending through the envelope into said chambers for supplying current to said electrodes, the ends of the electrodes being located close together and exposed so that light is produced at the ends of the electrodes both of which are simultaneously visible through the envelope when the lamp is in operation.

6. A gaseous glow lamp including an envelope containing a plurality of electrodes having their ends juxtaposed within the envelope and substantially symmetrical insulating shielding means surrounding all portions of the electrodes except the exposed ends for confining luminous discharges substantially to the free ends of the electrodes so as to produce light visible simultaneously on both electrodes when the lamp is in operation.

7. A television lamp including a bulb having a re-entrant stem, two insulators side by side with their adjacent end surfaces substantially in a single plane and supported from said stem, an electrode within each insulator adjacent the end thereof distant from said stem, conductors passing through said stem and insulators and affording connection to said electrodes, and a gas filling of said bulb capable of luminous electrical excitation, the end surfaces of the electrodes being located close together and exposed with an unobstructed gas path therebetween so that a spot of light is produced at the end surfaces of the electrodes which is visible through the bulb when the lamp is in operation.

8. A gaseous glow lamp comprising a bulb having a supporting and sealing stem projecting inwardly, conductors passing through said stem, electrodes at the end of each conductor, two substantially parallel insulating chambers enclosing said conductors within said bulb in a manner substantially impervious to electric discharges, said chambers having open ends with an uninterrupted gas path between the ends, said electrodes being exposed only adjacent the upper end surfaces of said chambers so as to produce a single spot of light when the lamp is in operation, means for supporting said insulators from said stem, and a bulb filling of electro-luminescent gas, the upper end surfaces of said chambers being substantially parallel to but discrete from one another.

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