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D. CANADY

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GLOW DISCHARGE TUBE

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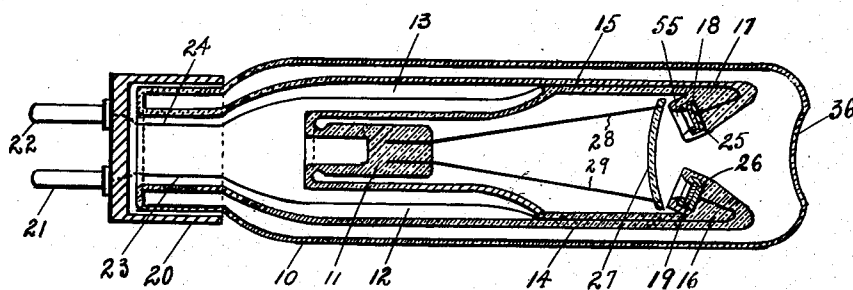


Fig. 1.

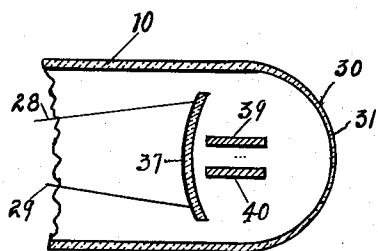


Fig. 2.

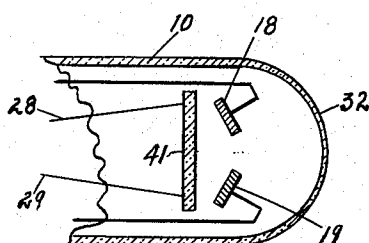


Fig. 3.

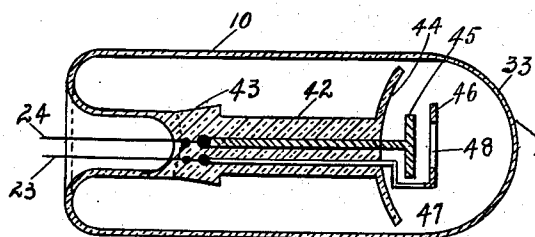


Fig. 4.

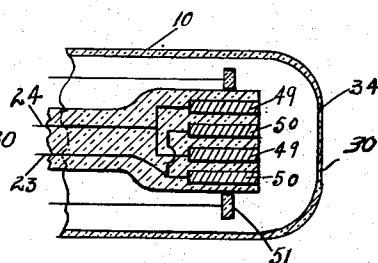


Fig. 5.

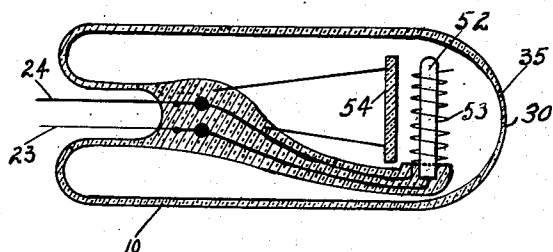


Fig. 6.

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GLOW DISCHARGE TUBE

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2 Claims. (Cl. 176—122)

An object of my invention is the provision of improvements in a glow discharge tube, particularly in regard to an arrangement of a cathode and an anode together with an adjacent non-translucent specularly reflecting mirror or reflecting surface or means which will effect a distribution of the glow to an end of the tube highly intensified.

My present invention relates to means for controlling and regulating the luminous intensity of a glowable gas or gases in a sealed envelope, by diverse electric instrumentalities and a reflecting means in association therewith in such a way and manner as to cause the glow rendered highly intensified to impinge on the end of the envelope.

Now it is well known in the art at present using glow lamps for producing a variable density sound tract on film that up to the present time the advantage of the glow lamp recording system has been retarded in practical usage by a number of shortcomings in the glow lamps themselves such as follows:—

(1) Low light intensity requiring that the lamp used be placed as close as possible to a mechanical slit or its equivalent, and hence in close proximity to the film.

(2) Lack of light uniformity the result of which required that each lamp be adjusted before it could be used with the film strip.

(3) Erratic electrical characteristics during the life of the glow tube thereby requiring constant watching and readjustment.

(4) Very short and indefinite life caused by the blackening of the bulb or by change in the gas pressure or by the gas in and/or on the surfaces of the electrodes themselves.

(5) A too large wattage consumption in the lamp thereby causing excessive heating of the lamp and elements with its consequent blackening and obstruction of light.

(6) Low sensitivity thereby requiring cooperatively large output from the recording amplifier used in connection therewith.

Therefore with my improved glow tube it is possible to overcome the aforementioned listed defects. And since the primary object of a glow lamp is to radiate actinic light, the glow tube must be so designed and constructed that the glowing gas within the bulb is greatly concentrated and localized as closely as possible to the end of the envelope through which the light is to pass.

And therefore it is an object of the invention to so design a glow tube such that the glowing gas within the bulb or envelope will be intensified through means immersed therein and concen-

trated at the end of the envelope before it passes through the envelope to a film.

It is also an object of the invention to so arrange the electrodes and their associated apparatus so that increased light intensity may be accomplished with a smaller voltage than that used at present in the present type of glow tube.

It is also an object of the invention to produce a glow tube, the voltage current curve of which is a straight line, that is, that as the current in milliamperes increases in multiples of 2 from 2 to 4 to 6 to 8 to 10 to 12 to 14 etc. the voltage required increases in direct relation thereto, thus assuming that the voltage at 6 milliamperes to be 400, then at 12 milliamperes the voltage is 450, and at 18 milliamperes the voltage is 500, thus giving a straight line curve which is at present rather unusual with the present gas filled devices.

The fact that the voltage-current curve is a straight line indicates that the glow tube maintains a constant impedance during all the signal "surges" of the glow tube.

It is also an object of the invention to produce a new glow tube such that the heat dissipation within the tube is very small and this is accomplished by keeping the voltage and milliamperes down to a minimum while at the same time securing from the tube maximum intensity.

It is also an object of the invention to construct a glow tube such that under different frequencies the characteristic curve of the glow tube is a straight line for all practical purposes.

Since much loss results from the present type of glow tubes due to the problem of spherical and chromatic aberration and coma, then it is an object of this invention to construct a workable unit giving greater brilliancy with small current, a lower temperature, a longer life to the tube, and a longer life to the batteries when such are used to operate the glow tube.

The reflected rays are, however, capable of being controlled by modifying the configuration of the reflecting means, for instance making the reflecting means of curvilinear configuration in which the radial plane of symmetry is perpendicular to the cathode and anode as distinguished from a plane reflecting surface.

It is well known in elementary optics that reflection occurs from any polished surface (mirrors) or the like—plane, concave, or convex or otherwise. The ray striking the mirror is called the incident ray, that returning from the reflected ray. I make use of this well known fact in my improved glow tube or lamp to increase the luminous intensity of the glow of the inert noble gas

such as helium, neon or argon or the like, or a mixture of the noble gas and a small quantity of gas such as hydrogen or nitrogen, and I thus materially increase the intensity of the brilliant glowable gas at the tube end.

This tube may be used in sound recording systems, television, picture transmission, and sound reproducing systems, and the like.

It is apparent that the distribution of the luminous intensity may be varied by change in the position, shape and form of the reflector or reflectors, the degree of diffusion of the reflecting surface, the position and form of the cathode and anode thereto as well as the material thereon to meet the particular size and shape, the proportions and dimensions of the electro-optical systems where the glow tube may be used, for example with linear photographic sound records on film strips and such like.

Further objects of the invention will appear more fully hereinafter.

The invention consists substantially in the combination, location and relative arrangement of the parts, together with the novel methods employed in accordance therewith, all as will be more fully hereinafter set forth, as shown in the accompanying drawing and pointed out with greater particularity in the appended claims.

Referring to the drawing:—

Fig. 1 is a longitudinal sectional view illustrating and embodying the principles of my invention.

Fig. 2 is a fragmentary view illustrating a modification of the glow tube showing the electrodes mounted parallel to each other, and a mirror in proximity thereto.

Fig. 3 is a fragmentary view illustrating another modification of the glow tube showing the same provided with a plane mirror.

Fig. 4 is another modification of the glow tube showing the mirror integral with the pedestal and the pedestal integral with the pinch or press. The base is not shown on the tube.

Fig. 5 is a fragmentary view illustrating another form of the glow tube showing a plurality of cathodes and anodes, and provided with a plane mirror associated therewith.

Fig. 6 is another modification of the glow tube in longitudinal section the same being provided with a plane mirror.

The same part is designated by the same reference character wherever it occurs throughout the several views.

In accordance with my invention, I employ a transparent receptacle or enclosing glass envelope 10 of suitable shape containing a noble glowable gas such as helium, argon or neon reputed to be inert or a mixture of one of the said gases with a small quantity of hydrogen, nitrogen or oxygen. The tube containing a gaseous filling which consists of one or more of the rare and the active gases will during operation render a glowable or luminous cloud or discharge rich in ultra-violet rays which can emerge from the envelope transparent to such rays. In the tube or envelope there is provided a stem, pinch or press 11 which coalesces with elongated hollow tubes 12 and 13, having restricted necks as at 14 and 15, and terminating in enlarged portions or discs 16 and 17, which portions are angularly disposed to each other and form the support for the cathode 18, and the anode 19 hereinafter described.

The glow tube is supported on a base 20 having the usual points 21 and 22 projecting therefrom.

The leading-in wires 23 and 24 are positioned substantially coaxially of the tubes to the restricted necks wherein they are sealed in the glass or quartz forming the same. At the terminal or end of the wires 23 and 24 there is provided discs of mica, asbestos paper, magnesite or other suitable material 25 and 26 to form an insulating wall between the glass or quartz that shields the metallic electrodes. The cathode may be made of metal having a high melting point for instance tungsten or iron. The disc of asbestos paper or other suitable insulating substance used to form the insulating wall is folded or turned over the perimeter of the electrode and is sealed in the glass or quartz constituting the column or support in which the electrode is placed.

This construction provides a shielding means and prevents the "creeping of the glow" and tends to confine the electric discharge to the exposed area of the cathode formed of suitable conductive substance, preferably metal.

Arising from the pinch or press and insulatingly supporting the same, there is provided a mirror or reflecting surface 27. The wires 28 and 29 that form the frame or support for the reflecting means are sealed in the pinch or press. However the reflecting means may be supported by the columns supporting the electrodes or by the envelope itself by means of wires sealed in the columns or extensions in the envelope, or the pinch may be made suitable to carry and support the mirror in desired position to the cathode and anode so that the impressed current will impinge thereon to increase the luminous intensity of the gas cloud in the glow tube. The gas cloud may have a spectral selectivity within the ultra-violet region of the spectrum.

The end of the envelope 30 may be made thinner than the remainder of the tube as shown at 31, 32, 33, 34 and 35, so that it will be of greater light-permeability and less absorptive of the light rays passing therethrough. The end of the glow tube may be incurved as shown at 36. The luminous cloud focused upon the end of the tube thus formed will emerge in a streak of light.

A mirror 37 having the desired form upon which is deposited a hard, brilliant, uniform film of silver, the silver deposit may be on the front or the back side of the mirror, and the mirror is placed behind the electrodes to focus the luminous cloud upon the end of the envelope in a well known manner.

In Fig. 2 the cathode 39 and the anode 40 are mounted parallel to each other, and the end of the glow tube is made thinner than the remainder of the tube so that the absorption of light will be less in passing through the transparent body forming the tube.

In Fig. 3 the cathode 18 and the anode 19 are similar to that shown in Fig. 1, but the mirror 41 is a plane surface, and the end of the glow tube is tenuous so that the absorption of light will be less in passing therethrough.

In Fig. 4 the pedestal 42 is integral with the press or pinch 43, and the mirror 44 is integral with the pedestal. The cathode 45 is plate-shaped, and the anode 46 is supported on a rod or wire 47. The anode is provided with a hole or aperture 48.

In Fig. 5 the cathodes and the anodes are arranged in an alternative manner as at 49, 49 and 50, 50. The mirror is shown at 51.

In Fig. 6 the anode 52 is a rod, surrounded by a cathode of cylindrical helix configuration 53.

A plane mirror is shown at 54, obviously it may be of any suitable form.

5 The mirror may be non-translucent thickly coated on its back with a coating not transparent to transmitted light and provided with a protective coating. The mirror may have a matte band peripherally or otherwise to confine the reflection to a definite area.

10 It is well known that metal particles disintegrate from the cathode. These particles may fly against the mirror and matte the surface thereof as well as adhere thereto and form a bridge leading from the cathode to the mirror, this is prevented by the gap between the cathode and the mirror, and the shielding of the cathode by an annular ring of glass 55 that extends upward from the surface of the cathode.

20 The tube thus constructed is exhausted by well known methods and filled with neon, argon or helium or a mixture thereof at proper pressure. If it is desired that the glow discharge should contain other rays, metal vapors capable of generating the rays may be added to the gaseous filling.

25 It is obvious that my invention is capable of being embodied in many different glow tube arrangements and should not be construed as limited to those herein illustrated and described, but only by the scope of the appended claims.

Many other modifications and changes in details will occur to those skilled in the art without departing from the spirit and scope of my invention as defined in the claims, but having now set forth the objects and nature of my invention, and having shown and described structures embodying the principles thereof and illustrated the method employed in accordance therewith, what I claim as new and useful, and of my own invention, and desire to secure by Letters Patent, is:—

1. A glow discharge tube containing a noble glowable gas, a rearwardly inclined cathode and anode for producing a glow discharge in the gas, a mirror of segmental cylindrical configuration rearwardly of and in proximity to said cathode and anode and supported between the cathode, anode and a press in the tube, the tube having a light-transmitting end portion of cylindrical segmental configuration forward of the cathode and anode, the said portion being utilized to maintain the initiated glow-discharge highly intensified in a light streak.

2. A glow discharge tube containing inert noble glowable gases, a rearwardly inclined cathode, a rearwardly inclined anode, a mirror positioned rearwardly of the cathode and anode and in proximity thereto, and fixed between the cathode, the anode and a press in the tube.

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