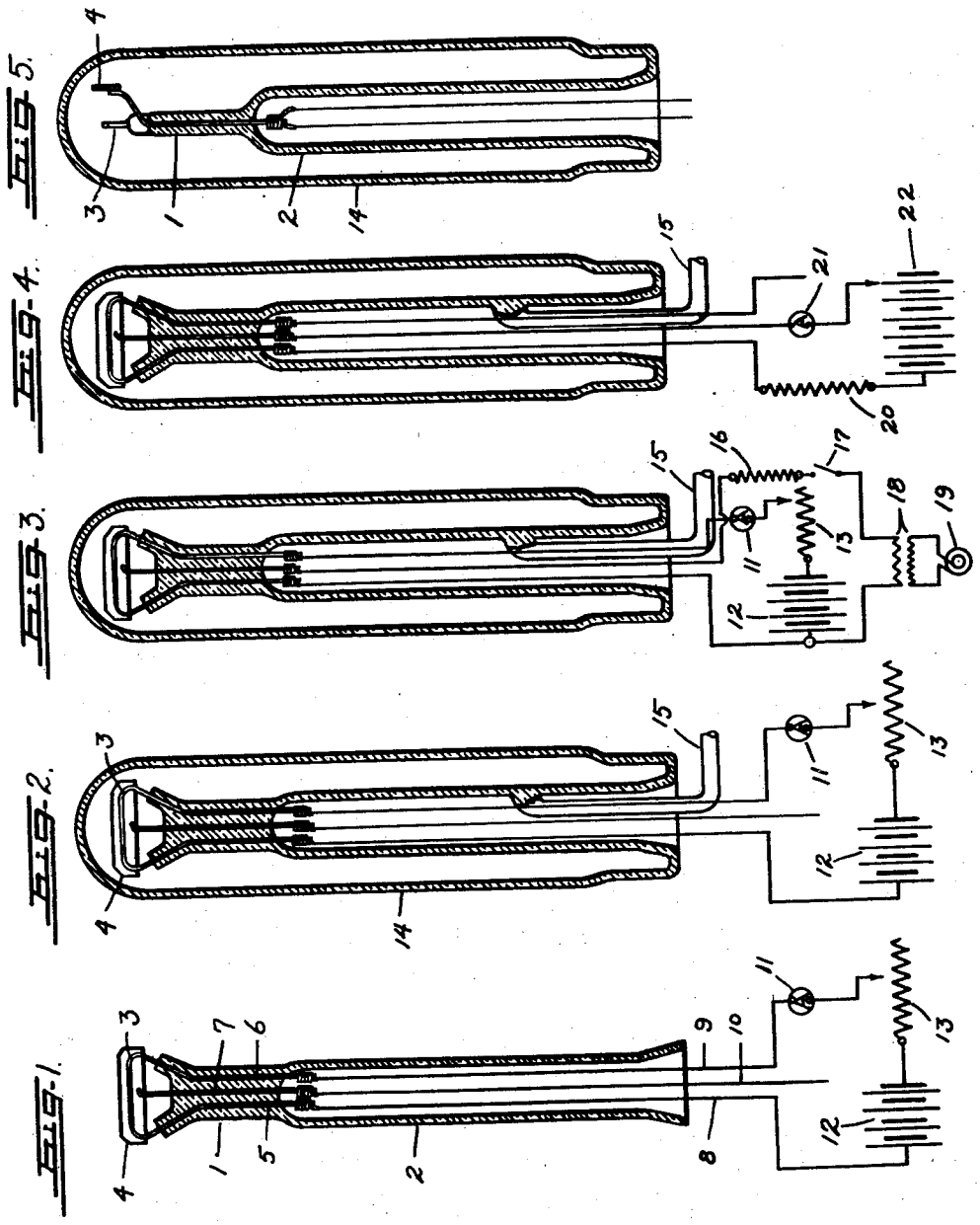
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GLOW LAMP

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GLOW LAMP

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4 Claims. (Cl. 176—122)

This invention relates to improvements in glow lamps and is a division of my copending application, Serial No. 381,666, filed July 27th, 1929.

Glow lamps of the class disclosed in this invention may be used for a variety of purposes as in the recording of sound photographically upon a film, television or for other purposes where it is desired to produce a glow of high intensity.

It is an object of this invention to provide a glow lamp of high light intensity having a comparatively long life under normal conditions of use.

Other objects and advantages relate to details of the lamp structure, the arrangement and relation of the parts thereof and to the method of producing the same, all as will more fully appear from the following description, taken in connection with the accompanying drawing in which:—

Figure 1 is a view of the electrode assembly of a lamp before sealing in outercasing.

Figure 2 shows electrodes assembled in the bulb in readiness for the drying and evacuation process.

Figure 3 shows a view of the lamp and connections for activating and out-gasing the electrodes.

Figure 4 is a view of the lamp and circuit connections for the final steps in the process of manufacture.

Figure 5 is a sectional view of the completed lamp shown at right angles to the other figures.

Tungsten wires 5 and 6 are sealed in lamp press 1 in any well known manner. To the upper ends of wires 5 and 6 is secured with silver filament 3 which is to act as the cathode and may preferably be formed of a platinum strip .011 inches wide and .0005 inches thick although .0023 may be preferable or various other sizes may be used. The strip is bent into U-shaped form in conformity with the illustration of the electrode 3 in Figure 1. A nickel plate 4 supported by a tungsten wire 7 is sealed in press 2 in a position as shown in the drawing.

Silver lead wires 8, 9 and 10 are welded to tungsten wires 5, 6 and 7 respectively which support the electrodes 3 and 4. In circuit with the cathode 3 and connected through leads 8 and 9 is a battery 12, ammeter 11 and a variable resistance 13. Resistance adjustment is so made that a current varying from 2 to 3 amperes will heat the electrode 3 to at first a dull red heat and later to a bright red.

During the heating process, calcium nitrate is applied to the filament 3 which is quickly converted to calcium oxide. The calcium compound is applied until the entire exposed portion of filament 3 is covered. It will be necessary to decrease the resistance 13 from time to time as the coating is applied as it requires more current to heat the increasing cross section of filament.

Barium nitrate is then applied to the heated filament and is uniformly spread over the entire surface. Care must be taken not to allow any compound to spatter on the nickel plate 4 as this surface is to act as the anode and must be clean.

The barium nitrate changed to barium oxide due to heating of the compound in air is applied until the filament has a total thickness of approximately .035 inches. The heating of the filament strip is continued until all the nitrate is converted into oxide.

The calcium oxide is used merely for protection as barium nitrate has a corrosive effect upon platinum. The electrodes are then assembled in the lamp as illustrated in Figure 2. A baking furnace is then placed over the tube and the structure is baked until the temperature rises to 100 degrees centigrade during which time the coated platinum filament is disconnected from the direct current source or battery 12 and an oil pump vacuum is maintained through connecting tube 15. The furnace is shut off and the structure allowed to cool for 15 minutes. The furnace is then allowed to heat until a temperature of 200 degrees centigrade is obtained after which it is again allowed to cool for 15 minutes. This periodical heating and cooling is continued until a temperature of 400 degrees centigrade is obtained.

The baking process has for its purpose the volatization of any moisture in the tube and the coated platinum strip. During the process of sealing the electrode assembly into the outer casing, considerable barium hydroxide is produced which is also decomposed by the baking process.

To eliminate any final trace of moisture, the platinum coated filament is heated by means of battery 12 connected through resistance 13 and ammeter 11. The heating currents will be of the order of 3 amperes and at the same time the bulb is pumped to a high vacuum with a mercury pump operating in conjunction with an oil pump for from fifteen to twenty minutes.

The electrodes still contain a considerable amount of gas and in order to eliminate final traces of gas, the electrodes are connected in circuit, as shown in Figure 3. Battery 12 is again

used as a source for heating the filament 3. Alternating current from generator 19 is stepped up to 1200 volts by means of transformer 18. The secondary terminals of transformer 18 are connected to electrode 3 and electrode 4 respectively. A current limiting resistance 16 and a switch 17 is included in the transformer secondary circuit connection. Filament 3 is heated to a dull red heat by means of a current from battery 12 and the high potential from transformer 18 is intermittently applied across the electrodes.

Switch 17 is allowed to be closed only for a short period of time, say 5 to 10 seconds. At first a bright luminous discharge, bluish in color is noted, indicating that gas is being driven from the electrodes being treated with the high voltage alternating current. As this process is continued, the luminous discharge becomes less and less and finally a green flash appears between electrodes. At this point the electrodes are apparently out gased and the cathode electrode 3 is sufficiently activated for the next process.

The current is then disconnected and the activated coating on the filament is found to be photo-electric. The vacuum pump is shut off from tube 15 and gas is then admitted to the bulb while the electrodes 3 and 4 are connected in a circuit including a source of potential of about 650 manually variable volts in series with a resistance of about 8000 ohms.

A circuit diagram of this connection is shown in Figure 4. The gas preferred is a combination of helium and nitrogen in the ratio of about 95 parts helium to 5 parts nitrogen, although a ratio of 97 parts of helium to 3 parts of nitrogen has been used with success and may be the preferred ratio under certain conditions. The presence of nitrogen in the bulb causes the barium oxide coating to form a compound believed to be barium nitride.

When the gas within the bulb reaches a pressure as, for instance, 15 m.m. where a discharge starts between the electrodes and the glow practically fills the space between electrodes 3 and 4, a current of about 2 to 3 milliamperes is flowing and the gas admitted through tube 15 is shut off. The apparatus is permitted to run in this condition until the glow is evenly distributed over the entire cathode and the current will have risen to approximately 30 or 40 milliamperes, although under certain conditions, the current may be somewhat less as, for instance, 25 to 30 milliamperes.

Usually the glow starts in a non-uniform manner and later spreads out uniformly over the entire U-shaped electrode. Wherever the filament becomes activated and glows, it will be found that the coating has turned dark brown to black. This active product that has been formed is at present believed to be a barium nitride and is photo-electrically active.

The voltage in the circuit is then reduced to about 370 volts through the same resistance of about 8000 ohms and more gas is admitted to the bulb until a current of approximately 18 milliamperes is flowing in the plate circuit. The negative glow under these conditions will be found closely surrounding the cathode and the glow is substantially lavender in color and separate from the anode glow which is quite pink in color on the surface of the anode. The bulb is then sealed off from the connecting tube 15 and is complete as far as the manufacturing process is concerned.

The activated coating on the cathode has a substantial photo-electric character and the entire combination produces a light of high actinic value. The pressure which I have found in practice to be preferable is approximately 15 to 25 millimeters of mercury although a fairly wide range is possible, between 10 and 40 millimeters of mercury, the important feature being that the pressure is such as to maintain the glow medium tightly on the surface of the cathode. The electrodes 3 and 4 are preferably arranged in close relation as, for instance, about one quarter of an inch apart although considerable variation is possible.

Although I have described a particular glow lamp structure for the purpose of illustration, I do not wish to be limited to the same as many changes and modifications may be made without departing from the spirit and scope of the appended claims.

I claim:

1. A glow lamp comprising a bulb, a plurality of electrodes within the bulb, at least one of which comprises a coating of nitrided alkaline earth material, and a gas within the bulb comprising a high percentage of helium and a comparatively low percentage of nitrogen.

2. A glow lamp comprising a bulb, a plurality of electrodes within the bulb, at least one of which comprises a coating of a nitrided alkaline earth metal, and a gas within the bulb comprising a high percentage of helium and a comparatively low percentage of nitrogen.

3. A glow lamp comprising a bulb, a plurality of electrodes within the bulb, at least one of which comprises a coating of nitrided barium, and a gas within the bulb comprising a high percentage of helium and a comparatively low percentage of nitrogen.

4. A glow lamp comprising a bulb, a plurality of electrodes within the bulb, at least one of which comprises a coating of a nitrided alkaline earth material, and a gas mixture in the bulb having a comparatively low percentage of nitrogen.

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