June 7, 1938. D. S. GUSTIN 2,119,675

SODIUM LAMP

Filed Jan. 31, 1936

Fig. 1.

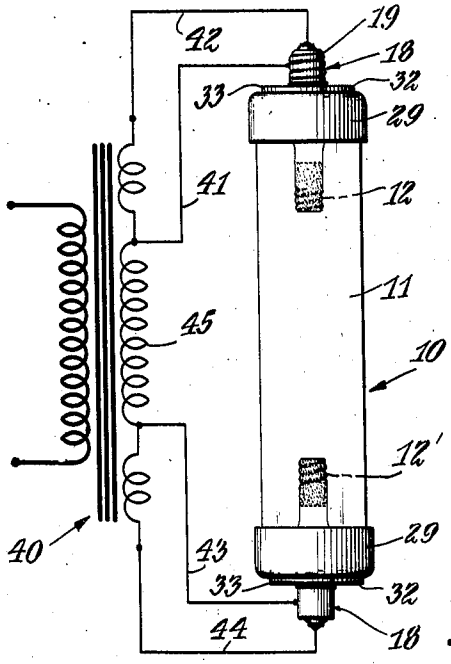


Fig. 2.

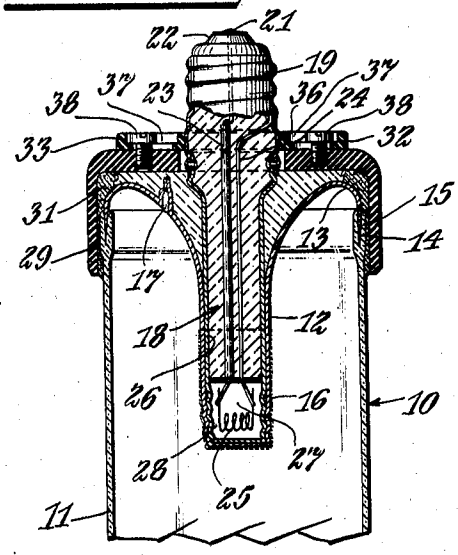


Fig. 3.

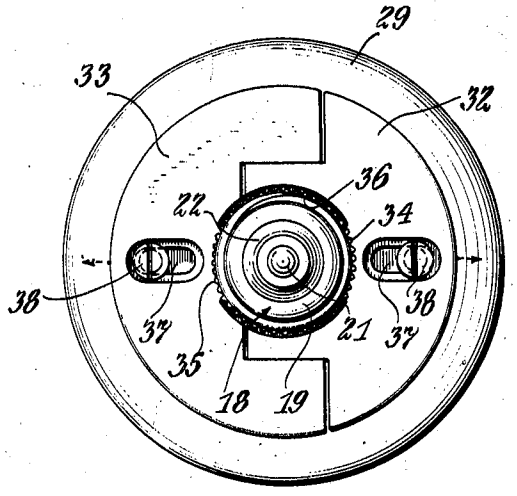
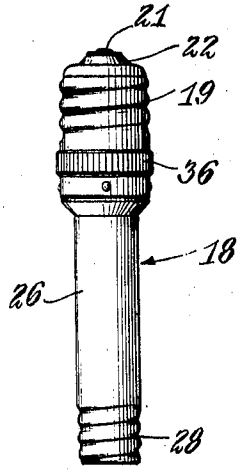


Fig. 4.



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UNITED STATES PATENT OFFICE

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SODIUM LAMP

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Application January 31, 1936, Serial No. 61,636

5 Claims. (Cl. 176—126)

This invention relates to a discharge device of the type employing electrodes which operate to support a glow discharge when heated to electron emission temperature.

Although the present device may be used for creating a glow discharge by the ionization of different forms of gases, it is particularly adapted to produce a discharge through the agency of a metallic vapor, such as sodium or the like, together with a small amount of a rare gas, such as argon or neon, to promote starting. Most sodium vapor lamps are constructed with a pair of cold electrodes and a heater or filament for causing the initial ionization of the vapor.

The present invention provides a pair of hollow electrodes which may be coated with an electron emissive material such as strontium or barium oxide. Within the hollow electrode is provided a heater in the form of a coil of any suitable refractory wire such as, for example, nichrome and the electrodes are so formed as to serve as closing ends for the envelope in which the discharge takes place. Furthermore, the heater elements are replaceable so that in the event that a heater burns out it may be conveniently replaced at low cost.

It is an object of the present invention to provide a discharge device with electrodes so arranged as to be heated by removable heater elements.

Another object of the invention is to provide a discharge device with electrodes serving as end closures for a bulb.

Another object of the invention is to provide a discharge device with tubular operating electrodes and replaceable heater units for said electrodes.

Other objects and advantages of the invention will be more clearly understood by reference to the following description together with the accompanying drawing in which

Fig. 1 is a side elevational view of a lamp having electrodes constructed in accordance with the present invention and showing a diagram of the source of electrical energy to operate the device;

Fig. 2 is an enlarged sectional view showing one end of a bulb and an electrode positioned therein;

Fig. 3 is an enlarged end view of the lamp; and

Fig. 4 is a side view of one of the heater units removed from the lamp.

A selected embodiment of the invention may, as shown, comprise a tubular bulb 10 consisting of a cylindrical glass tube 11 having its ends closed by a reentrant tube 12 provided with a flange 13, the edge 14 of which is desirably alined with and sealed to the edge 15 of the tube. The reentrant tube 12 constitutes an electrode, the outer surface of which is provided with a coating 16 of electron emission material. Each end of the tube 11 is provided with an electrode of the construction just described. These electrodes may be made of sheet metal, such as molybdenum, which will wet with the glass. It has been found in practice that molybdenum is a good material and seals made with glass known under the trade designation of G–705 A. J. Code No. 705, (see page 735, vol. 220, Journal of Franklin Institute and pages 394–6, 403 and -5, vol. 5 of Physics) have been satisfactory. The electrodes may be spun or drawn from the sheet material, and a tubular extension 17 may be provided through which the bulb may be exhausted and the tube sealed by pinching off.

Each electrode is provided with a replaceable heater unit 18 consisting of a plug 19 in the form of a metal shell having an axial contact 21 insulated from the sheet by a glass web 22. Extending from the inner surface of the plug, is a stem of insulative material through which conductors 23 and 24 extend. One end of conductor 23 connects with the contact 21 and one end of conductor 24 connects with the metallic shell 19. The other ends of the conductors project from the stem and connect with the terminals of a heater element 25 in the form of a refractory coil having the required properties to serve as a heater.

Around the stem 18 is a casing 26 which may be of sheet metal so proportioned as to fit the stem and leave a chamber 27 in which the heater element is disposed. The end 28 of the casing is provided with threads to engage threads formed in the electrode 12 so that when the heater unit is inserted it may be screwed into firm contact with the electrode wall. Each end of the tube 10 may be provided with a cap 29 held in place by a suitable cement 31 and the space between the cap and inner surface of the electrode may be filled with an insulation material.

For the purpose of holding the heater element in place the cap is provided with locking plates 32 and 33 provided with teeth 34 and 35 to engage with teeth 36 provided on the heater unit. When the heater unit has been inserted and screwed into the electrode the plates 32 and 33 are moved so that their teeth engage the teeth 36. Each plate is provided with a slot 37 through which tap bolts 38 extend. The tap-bolts may be

tightened to hold the plates and consequently secure the heater unit against removal.

The present device may be supplied with electrical energy by any suitable means and, as shown, a transformer 40 connected to a supply source (not shown) has a secondary winding tapped to provide a source of electrical energy for each heater element. Conductors 41 and 42 provide electrical energy for one heater unit and conductors 43 and 44 provide electrical energy for the other heater unit.

The heaters elevate the temperature of the coatings on the electrodes rendering them electron emissive and causing an ionization of the gas. A potential is applied to the electrodes 12 and 12' by reason of the winding 45 of the transformer 40, and when the ionized gas becomes sufficiently conductive, current flows between the electrodes to support a discharge.

The present construction provides a discharge tube which will have a long life since in devices of this character the heater element has a relatively short life whereas the other parts have a long operating life. With the present replaceable heater unit the more expensive part of the device consisting of the bulb and electrodes may be operated over long periods of time and when necessary new heater units may be supplied.

Although a preferred embodiment of the invention is shown and described herein, it is to be understood that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A discharge device comprising a bulb open at one end, an electrode extending into said bulb and having one end sealed to the end of the bulb to provide a closure, and a removable heater element threadably connected to said electrode, said element comprising a metal shell partly filled with insulative material to leave a cavity and a heating device in said cavity.

2. A discharge device comprising a bulb having one end open, a tubular electrode having one end closed and positioned within said bulb, a flange integral with the open end of said electrode and sealed to the open end of said bulb to provide a closed container, a heater element positioned within, and threadably connected to said electrode, and means to prevent unscrewing of said element comprising a cap secured to said bulb and formed with an aperture through which passes the outer end of said element and plate means adjustably secured to said cap and formed with teeth engageable with corresponding teeth on said element.

3. A discharge device comprising a tubular bulb, a metallic closure sealed to one end of said bulb, an electrode integral with said closure and extending into said bulb, and a heater element threaded into said electrode, said element comprising a shell partly filled with insulating material, leaving a cavity, and a refractory filament mounted in said cavity and adapted to be energized.

4. A discharge device comprising a tubular bulb, a metallic closure with an outer flange portion sealed to one end of said bulb and having an electrode integral therewith and extending into said bulb, said electrode having its inner or active end portion helically threaded, and a heater element for said electrode, said element being removably secured to said electrode by cooperating helical threads formed thereon.

5. A discharge device comprising a cylindrical bulb of generally uniform diameter open at one end, a metallic closure member, said closure member comprising a reentrant tube with a central portion forming an electrode extending into said bulb, and a flange portion connected to said central portion by a flared intermediate part, said flange portion being generally cylindrical and of a diameter corresponding with that of said bulb, sealed to the end of said bulb wall, and forming an aligned extension thereon, and a heater element threaded into said electrode, said element comprising a shell partly filled with insulating material leaving a cavity, and heating means disposed in said cavity.

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