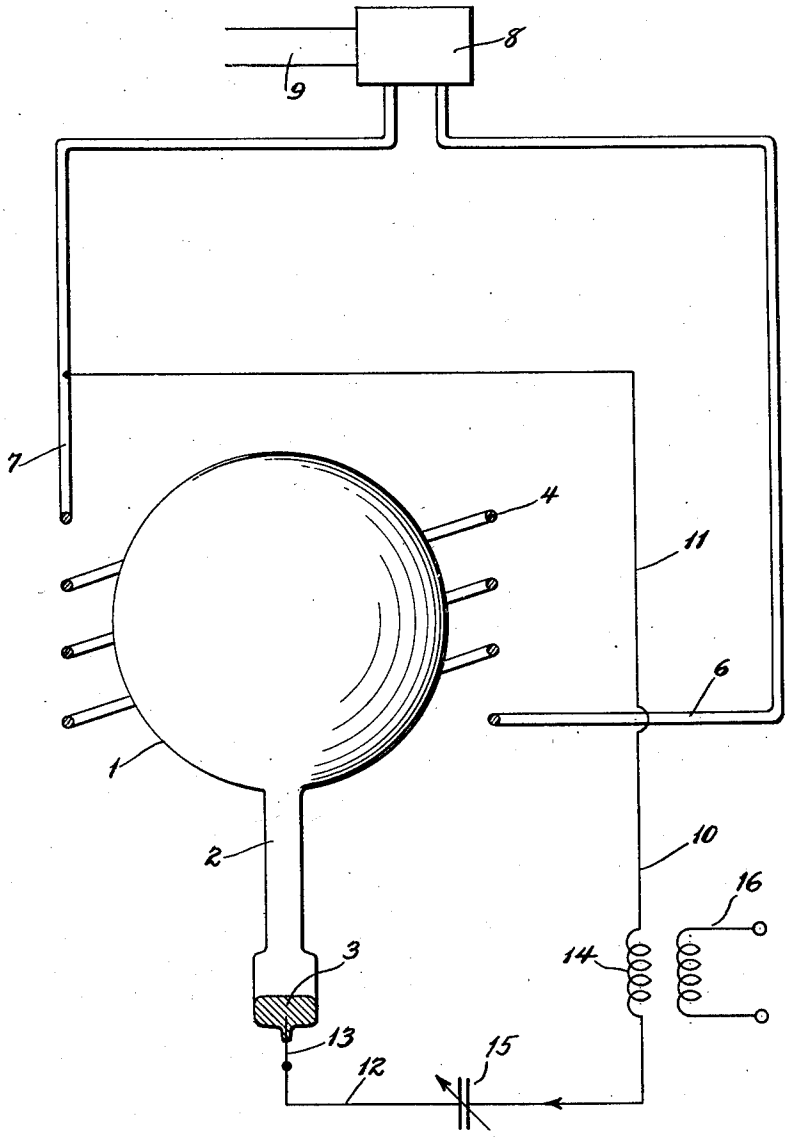
April 19, 1932. C. SPAETH 1,854,912

LAMP STARTING DEVICE

Filed Jan. 18, 1930



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Patented Apr. 19, 1932 1,854,912

UNITED STATES PATENT OFFICE

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LAMP STARTING DEVICE

Application filed January 18, 1930. Serial No. 421,680.

This invention relates to light sources adapted to be varied in brilliancy at high frequency. More particularly the invention relates to a light source capable of producing white light and adapted for use in television systems.

It is an object of my invention to provide a a source of substantially white light, the instantaneous brilliancy of which may be varied at very high frequencies.

In accordance with my invention I provide an envelope of glass or other suitable transparent material, containing a filling of rare gas such as neon, and having attached thereto an auxiliary chamber or reservoir containing a quantity of mercury. For energizing the gas within the envelope I provide an induction coil which is placed around the envelope and connected to oscillator means so as to produce a magnetic field. The mercury electrode is also provided with oscillatory energizing means which may be controlled by a tuning device. This may be done, for example, by providing a suitable connection through a tuning device, from the induction coil to a lead-in wire sealed through the wall of the envelope and contacting with the mercury in the auxiliary reservoir. By energizing the induction coil a current is made to circulate through the gas within the envelope and cause ionization, which results in the production of light.

Disregarding the effect of mercury the light produced will be characteristic of the gas used. For example, when the filling in the envelope comprises neon, the light produced will be orange red. The color of the emitted light may be modified, however, merely by adjusting the tuning of the auxiliary circuit of the mercury electrode. By adjusting the auxiliary circuit more nearly to resonance with the frequency of the energizing source, the current flow through the mercury electrode may be increased to such an extent that mercury vapor is produced, which vapor penetrates the entire inside of the envelope and adds to the characteristic red color of the neon, the blue color of mercury, thereby producing a whitish light.

By adjusting the tuning of the auxiliary circuit the color of the emitted light may be made of any value desired, between the extreme limits of substantially pure mercury color and the characteristic red neon color.

The above mentioned and other objects and advantages and the manner of attaining them will be made clear in the following description and accompanying drawing.

In the drawing, reference numeral 1 indicates an envelope of glass, quartz, or other suitable transparent material, containing a filling of rare gas, e. g., neon, and having an auxiliary electrode chamber or appendix 2 containing a quantity of mercury or other suitable light modifying material 3. Placed around the outside of the main portion of the envelope, which may be either spherical, cylindrical, or of any other desired shape, is an induction coil 4. This acts as the primary of an exciting transformer, the secondary of which is the gas within the envelope. Energizing current is supplied to the two terminals 6 and 7 of the coil from a source 8. This source may be, for example, a vacuum tube oscillator of high frequency which is adapted, in the well-known manner, to have its output current modulated in accordance with a feeble signal current input which may be received from a distant point over input line 9 and suitably amplified. For instance, when the oscillator 8 is put into operation, an intense magnetic field is created by the coil 4, thereby inducing a current in the gas within the envelope 1, which acts as a short circuited secondary therefor. As a result of this, the gas is ionized and caused to produce light. By suitably increasing the strength of the energizing current, which should be of high frequency, the gas may be caused to emit a very concentrated light of high brilliancy. This light will be emitted at substantially uniform intensity over the entire projected area of the lamp bulb, thereby giving a relatively wide source of light, the brilliancy of which may be varied. The unnatural color which would result from the use of a single gas, such as neon, within the bulb, is overcome by an auxiliary energizing circuit 10 which serves to conduct current to the mercury electrode 3. This auxiliary circuit comprises a lead wire

11 connected to one side of the line leading from the source of current 8, and a conductor 12 connected to a lead-in wire 13 sealed through the wall of the envelope 1 and contacting with the mercury 3. Between the conductors 11 and 12 are connected an inductance coil 14 and a variable condenser 15. Magnetically coupled to the inductance coil 14 is an energizing primary coil 16 which is connected to a suitable source of high frequency current. By adjusting the variable condenser 15 it is possible to vary the amount of current circulating through the inductance coil 14, condenser 15 and the rest of the circuit, including the mercury 3. As the current is increased in this circuit a portion of the mercury 3 is vaporized, the vapor filling the envelope 1 and mingling with the rare gas therein. The mercury vapor is also ionized and caused to emit light by the passage of the induced current therethrough, the result being that the blue light emitted by the mercury combines with the red light of the neon gas and thereby produces a more nearly white color. If the condenser 15 is adjusted so that but a slight amount of current is passed through the mercury electrode circuit, only a slight amount of vapor will be generated, consequently the light emitted from the envelope will be substantially neon red in color. However, by adjusting the condenser 15 so that the auxiliary circuit 10 is more nearly in resonance with the energizing source of the primary coil 16, more mercury vapor is evolved and light emitted from the envelope may be substantially white. By still more nearly approaching resonance the amount of mercury vapor evolved may be great enough to cause the emitted light to have the characteristic mercury color.

Instead of utilizing a primary energizing inductance 16, the auxiliary circuit 10 may be adjusted approximately to resonance with the frequency of the oscillatory source 8, whereby a portion of the current passing to the coil 4 may be diverted to the circuit of the mercury 3, thereby evolving mercury vapor sufficiently to modify the color of the light emitted from the envelope 1.

By modulating the output potential of the source 8 by varying the potential of the control circuit 9, it is possible to vary the brilliancy of the light emitted from the envelope 1 without varying the color thereof appreciably. When the auxiliary circuit 10 is once adjusted so that the emitted light is substantially white, or of any desired color, the color of the light will remain unimpaired while the brilliancy thereof is varied.

The modulating current of the control circuit 9 may be received from a distant station either by radio or direct connection. This current, if relatively feeble, may of course be suitably amplified in any known manner to any level desirable for controlling the oscillator 8.

While I have specified neon as the gas preferably used in the envelope, any of the rare gases, for example, helium, argon, xenon, or krypton may be used as well. The resulting light will, however be modified accordingly.

What is claimed is:

1. In a light source, an envelope containing a filling of rare gas, an auxiliary chamber attached to said envelope, a quantity of mercury in said chamber, means for energizing the gas in said envelope by magnetic induction, and separate means for vaporizing a quantity of said mercury.

2. A device in accordance with claim 1, wherein the energizing means comprises a coil of wire surrounding said envelope.

3. In a television light source, an envelope containing a filling of rare gas, an auxiliary chamber attached to said envelope, a quantity of light modifying material in said envelope, means for supplying alternating current of high frequency for energizing said rare gas, a high frequency circuit for rendering effective said light modifying material, and means for tuning said circuit in order to control the degree of effectiveness of said light modifying means.

4. A device according to claim 3 wherein the rare gas is neon and the light modifying substance is mercury.

5. In a television system, an envelope containing a filling of rare gas, a quantity of light modifying material for said envelope, a vacuum tube oscillator for energizing said rare gas, means energized by said oscillator for rendering effective said light modifying material, tuning means for controlling the flow of current to said means first mentioned, and control means for varying the effectiveness of said oscillator.

6. In a light source, an envelope containing a rare gas, a reservoir attached to said envelope, a quantity of mercury in said reservoir, a lead-in wire for said mercury, a coil of wire surrounding said envelope, a source of high frequency current for energizing said coil, and a control circuit connection from said coil to said lead-in wire including an inductance and a tuning capacity.

7. A device in accordance with claim 6, wherein a source of oscillating current is coupled to said control circuit.

8. A gaseous discharge lamp having a main energizing circuit, an auxiliary color modifying circuit, an oscillatory current supply source common to both of said circuits, and means for modulating the frequency of said oscillatory current.

In testimony whereof, I have signed my name to this specification, this 16th day of January, 1930.

CHARLES SPAETH.