July 11, 1939. R. B. MORGAN 2,165,805

GLOW DISCHARGE DEVICE

Original Filed Jan. 6, 1930

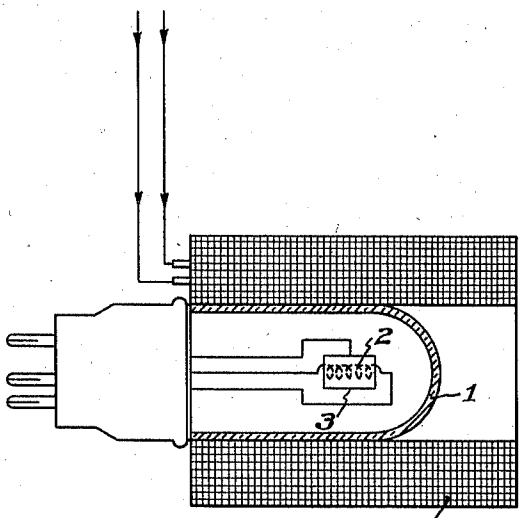


FIG. 1.

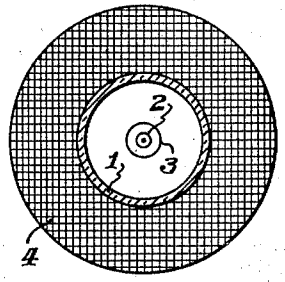


FIG. 2.

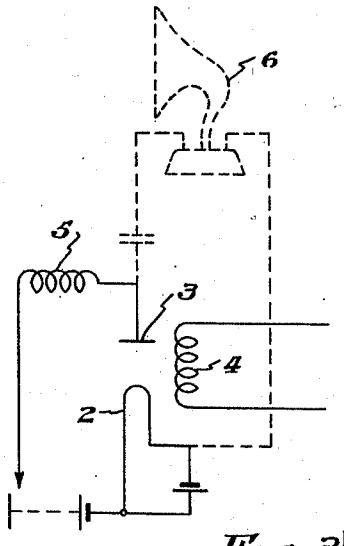


FIG. 3.

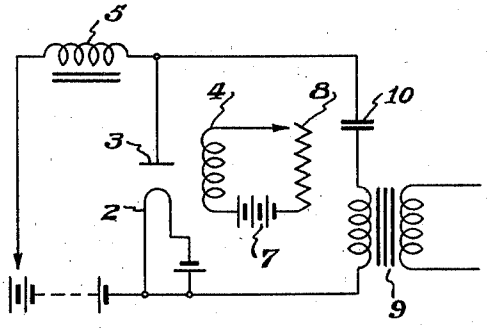


FIG. 4.

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GLOW DISCHARGE DEVICE

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Original application January 6, 1930, Serial No. 418,920. Divided and this application February 14, 1936, Serial No. 63,963. In Great Britain February 12, 1929

2 Claims. (Cl. 176—122)

The present invention relates to glow discharge tubes, and more particularly to the use of such tubes in the recording or transmitting of mechanical or electrical oscillations with the aid of light, this application being a division of my copending application Serial No. 418,920, filed January 6, 1930.

According to the present invention, light, modulated in intensity in accordance with electrical or mechanical oscillations, is generated by means of a discharge tube the light from which is magnetically controlled or influenced.

The invention further provides a discharge device comprising an envelope containing mercury vapor and having disposed therein a filamentary cathode, an anode surrounding said cathode, and a coil arranged around said envelope, said filamentary cathode lying substantially along the axis of said coil.

The invention is illustrated by way of example in the accompanying drawing, in which

Figs. 1 and 2 show views in part sectional side elevation and in end elevation respectively of a discharge tube in accordance with the invention, and

Figs. 3 and 4 illustrate diagrammatically two circuit arrangements according to the invention.

Referring to Figs. 1 and 2, an envelope 1, which may be of quartz or glass, is filled with mercury vapor at a suitable pressure. Within the envelope 1 are mounted a filamentary cathode 2 of helical shape and a cylindrical anode 3 (for example of nickel) surrounding the cathode 2. Around the outside of the envelope 1 is fixed a coil 4. The filament 2 lies along the axis of the coil 4. In this way, when current is passed through the coil 4, a magnetic field is established in the discharge space around the filament 2 and parallel to the filament axis. The effect of this magnetic field is greatly to intensify the light emitted and to concentrate it in an axial direction. Preferably, the longitudinal axes of the envelope 1, the cathode 2, the anode 3 and the coil 4 are all substantially coincident.

Referring to Fig. 3, in which like parts are given the same references as in Fig. 1, the anode 3 is connected through a choke coil 5 to a point of positive potential relative to the cathode 2. The potential difference between the anode 3 and the cathode 2 may, for example, be about 20 volts.

When applying the arrangement described to the recording of sound, electrical oscillations from a microphone are impressed, after suitable amplification, on the coil 4. A steady direct current is also passed through the coil 4 or through a separate coil arranged coaxially therewith. The value of this direct current is so adjusted that the steady magnetic field produced thereby brings the tube into such a state that a small change of field strength produces a large change in the light emitted in a direction axially of the coil in accordance with a linear relation. When adjusted in this way, the oscillatory currents in the coil 4 cause the intensity of the light emitted to vary correspondingly. These variations in light intensity may be used in known manner to produce a photographic sound record.

The light is, of course, emitted in a direction axially of the coil 4 and is in the form of a cylindrical column of light extending as far as the wall of the envelope.

In the circuit of Fig. 3, the choke coil 5 serves to prevent alternating currents generated between the electrodes, 2, 3 of the tube from flowing through the anode current source. As shown in dotted lines, these oscillations may be used with or without amplification to operate a monitoring device such as a loudspeaker 6.

Referring now to Fig. 4, instead of varying the intensity of the magnetic field produced by the coil 4, this field is maintained constant and the light variations are obtained by impressing electrical oscillations upon the electrodes of the tube. The magnetic field, nevertheless, influences the light emitted by greatly increasing the intensity of the glow. The anode 3 is connected, as before, through a choke coil 5 to a positive potential point, and the coil 4 is fed with direct current from a source 7, the value of this current being adjustable by means of the variable resistance 8. Electrical oscillations, which may be derived as before from a microphone, are impressed upon the primary winding of the transformer 9 and in this way an alternating potential difference is applied through the blocking condenser 10 between the two electrodes 2, 3 and modulates the steady potential between them.

Although the invention has been described with particular reference to sound recording, it may be applied to other purposes.

When, for example, the apparatus is used for transmitting oscillations with the aid of light from one station to another, the light from the sending station may be allowed to fall upon a photo-sensitive device at the receiving station.

The apparatus may also be used in connection with the receiving station of a television or photo-telegraphic system, the incoming electrical oscillations being impressed upon the discharge device

and producing corresponding changes in the intensity of the light emitted. In combination with a suitable scanning device, therefore, the apparatus may be used to build up at the sending station the picture or view transmitted.

The invention may also be applied to the generation of light of varying intensity from mechanical oscillations without first converting the mechanical oscillations into electrical oscillations. For example, the magnetic field in the discharge space may be established by or through a member which is capable of vibration. The mechanical vibrations of this member can be made to produce variations in the intensity of the magnetic field around the filament. Clearly, this can be done either by arranging that the mechanical oscillations effect a change in the intensity of the magnetic field or else by causing the mechanical oscillations to change the position of the magnetic field and thus alter the intensity of the field around the cathode although the overall intensity of the field may remain constant. A combination of these two effects can also be used.

It has been found that, after the tube of the type described has commenced to glow, the current for heating the filament may frequently be interrupted without interfering with the behavior of the tube. The filament may in some cases be replaced by a cold electrode, separate ionizing means being provided within the tube to initiate the discharge.

I claim as my invention:

1. A glow discharge device comprising an envelope containing mercury vapor, a helical filamentary cathode disposed in said enevelope, a cylindrical anode surrounding said cathode and having its axis substantially coincident with that of said helical cathode, and a coil arranged around said envelope, said cathode lying substantially along the axis of said coil.

2. A glow discharge device comprising a cylindrical envelope containing mercury vapor, a helical filamentary cathode disposed in said envelope longitudinally thereof, a cylindrical anode surrounding said cathode and also extending longitudinally in said envelope, and a coil arranged around said envelope, the axes of said envelope, said helical cathode, said anode and said coil being substantially coincident.

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