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DEVICE COMPRISING A GAS DISCHARGE TUBE

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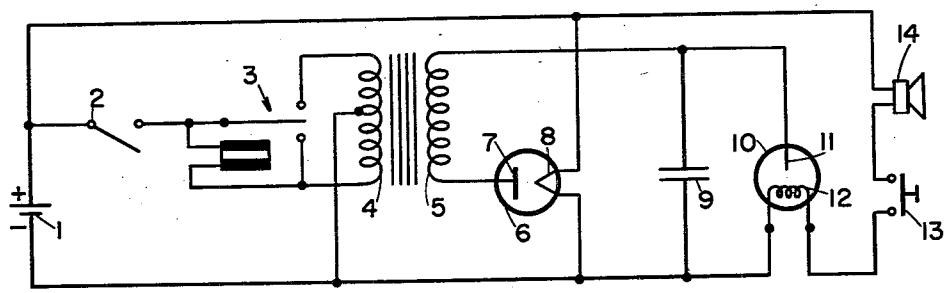


Fig. 1

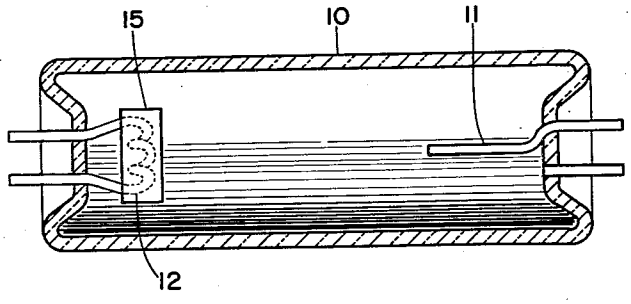


Fig. 2

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DEVICE COMPRISING A GAS DISCHARGE TUBE

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8 Claims. (Cl. 340—75)

The invention relates to a device comprising a gas discharge tube to which is applied a voltage which is not capable of igniting the tube at the prevailing pressure and electrode spacing, this tube being ignited by other means. The invention relates, moreover, to a gas discharge tube for use in such a device.

It is known to reduce the ignition voltage of a gas discharge tube by heating the cathode to a temperature such that electron emission is obtained. As an alternative the ignition voltage may be reduced by exposing the cathode to light radiation of short wavelength or by exposing the discharge path to beta- or gamma rays.

However, it is not always desirable or possible to carry out these methods, since a suitable current source for heating the cathode or a a suitable source of radiation may occupy too much space or be too costly or may fail or give rise to other drawbacks.

The invention has for its object to provide a device comprising a gas discharge tube which is ignited by a method differing from the aforesaid known methods.

According to the invention, in a device comprising a gas discharge tube, to which is applied a voltage which alone is not capable of igniting the tube at the prevailing pressure and electrode spacing, the ignition is obtained by heating the anode to a temperature such that ions are emitted.

An aperiodic discharge requires heating of the anode only for a short time, i. e. until the tube has ignited. Since ion emission requires comparatively high temperatures, comparatively high power being supplied during the heating. In order to further the emission of ions, the anode may be activated by means of alkaline earth metal oxides or other substances emitting ions. However, at the required high temperatures a strong vaporisation of the activating material may readily occur. Consequently both with respect to economy in energy and lifetime, the heating of the anode should not last for a longer time than is required to ignite the tube, unless the discharge is only transient.

With alternating-current discharge lamps for example it is known to preheat the two electrodes of the lamp, the discharge being initiated subsequently by a voltage pulse. However, the temperatures at the electrodes of these lamps are so low that no appreciable ion emission from a heated electrode connected as an anode can occur. The field prevailing between the electrodes is, in itself, not sufficient and, on the other hand, a high temperature will, in itself, be neither sufficient to produce the ignition.

The invention will now be described with reference to the accompanying drawing, in which:

Fig. 1 shows a device for producing luminous flashes having a steep front and

Fig. 2 shows the discharge tube used in this device.

Referring to Fig. 1, reference numeral 1 designates a battery which feeds through an interrupter or switch 2 a vibrator 3, which in turn drives a hi-voltage transformer comprising a primary winding 4 and a secondary winding 5. A rectifying tube 6, having an anode 7 and a

cathode 8, charges a capacitor 9 of about 50,000 pf. to a voltage of 2000 v. The flashlight discharge tube 10 comprises a rod-shaped cathode 11 and a helix 12, used as an anode. A switch 13 connects the anode helix 12 through a sound signalling device 14 to the positive terminal of the battery, while the other end of the helix is connected to the other terminal of the battery.

In Fig. 2 the elements corresponding to those of Fig. 1 are designated by the same reference numerals. The cathode rod 11 is made of nickel and the anode helix 12 is made of tungsten which is coated with barium-strontium-calcium oxide obtained by the decomposition of carbonates. The anode helix is surrounded by a rectangular screening envelope 15. The distance between the anode and the cathode is 15 mms. and the gas filling consists of xenon at a pressure of 50 cms. Hg.

The device shown in Fig. 1 operates as follows. As stated above, the capacitor 9 is charged to a voltage of 2000 v. by means of the rectifier 6 and the secondary winding 5. The break-down voltage of the tube 10 with cold electrodes is, however, 3000 v. If switch 13 is closed, the device 14 produces a claxon signal and the anode 12 is heated to a temperature of 2000 to 2500° C. At this temperature a strong emission of ions occurs and under the action of the field in the tube 10 the ions move towards the cathode and free electrons from the gas atoms and from the cathode and thus initiate the discharge. The capacitor 9 discharges via the tube 10, during which discharge a transient flash of light with very steep slope occurs. If the switch 13 is kept closed, again a discharge will occur after the capacitor 9 is re-charged. If the flash of light is detected in a photo-electric device comprising a suitable amplifier which responds to the steep slope of the luminous flash, this flash produces a signal therein. The device is intended for use in overtaking signalling devices, for example on motor vans. Owing to the method of producing the voltage for the discharge via the tube, i. e., the presence and circuit connections of the rectifier 6, it is not possible to heat the cathode of the discharge tube from the battery directly, and the arrangement of a separate source of voltage for this purpose would require difficult and costly insulation.

Although the invention is described with reference to a very special device, it will be obvious that many further applications are possible.

What is claimed is:

1. A circuit arrangement comprising a gas discharge tube, said tube having cathode and anode electrodes and an ionizable filling, a source of potential, said tube being ignitable alone by the application of a potential above a given value, means for applying across said cathode and anode electrodes a potential below said given value and at which said anode is positive and said cathode is negative, and means for heating the positive anode to a temperature at which ions are produced therefrom to ignite the tube.

2. A circuit arrangement as set forth in claim 1 wherein the heating means for the anode are separately controllable.

3. A circuit arrangement as set forth in claim 1 wherein the discharge tube comprises a cold cathode and a thermionic anode activated with ion-emitting materials.

4. A circuit arrangement comprising a capacitor and means including a rectifier having cathode and anode electrodes for charging said capacitor to a high D.-C. potential, one terminal of said capacitor being at a negative potential and the other being positive, the positive terminal being connected to the cathode of said rectifier, a gas-filled discharge tube having a cold cathode and a thermionic anode connected in parallel with said capacitor, said thermonic anode being connected to said

positive terminal of said capacitor and said cold cathode being connected to said negative terminal of said capacitor, said D.-C. potential being insufficient alone to ignite said discharge tube, and means for passing current through said thermionic anode to heat the latter to a temperature at which ions are emitted thereby, whereby the tube is ignited and the capacitor discharged therethrough.

5. An arrangement as set forth in claim 4 wherein a sound-producing device is coupled to the current-passing means for the anode.

6. A device comprising a gas discharge tube having an ionizable filling and a cathode and an anode, and a circuit for igniting said tube comprising means applying a high D.-C. potential insufficient to ignite said tube across said cathode and anode and at which the anode is positive relative to the cathode, and means for heating the anode to a temperature at which ions are emitted thereby to ignite the tube.

7. A device as set forth in claim 6 wherein the cathode is constituted by a nickel rod, and the anode is constituted by a tungsten helix coated with alkaline earth oxide material.

8. A device as claimed in claim 7 wherein the filling is constituted by xenon at a pressure of about one atmosphere, and the anode and cathode are spaced apart about a few centimeters.

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