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F. RAWLS

2,735,954

GAS DISCHARGE TUBE

Filed Aug. 3, 1951

FIG. 1

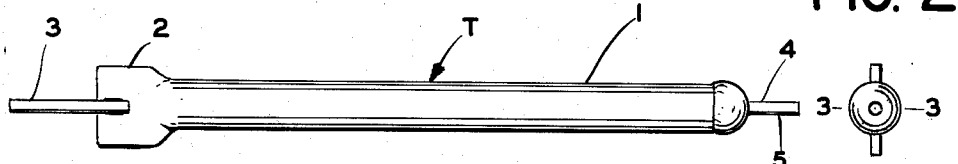


FIG. 2

FIG. 3

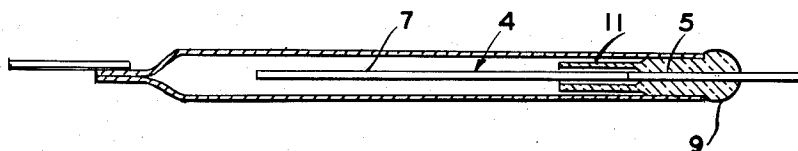
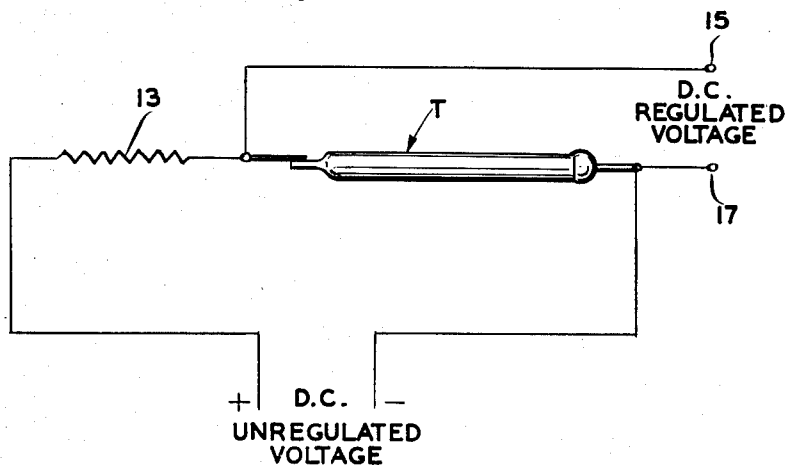


FIG. 4



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1 Claim. (Cl. 313—216)

The invention relates to voltage regulator and voltage reference devices and, more particularly, to a gas discharge tube therefor which maintains a substantially constant voltage drop through a relatively wide current range.

One object of the present invention is to provide a gas discharge tube which may be used as a voltage regulator in a conventional circuit and which is relatively easy to construct in that the tube comprises a cylindrical gas-tight envelope of conducting material which forms one electrode and a rod-like element extending into the envelope coaxially thereof and which forms the other electrode.

Another object is to provide a gas discharge tube of relatively small size which needs no socket or other mounting structure and which is self-supporting and may be connected in a circuit similarly to other standard circuit elements, such as resistors and condensers.

Another object is to provide a gas discharge tube of the kind described which is readily adapted to any suitable range of operation by changing the physical dimensions of the tube, the gas pressure, or the materials of which the electrodes are made.

A further object is to provide a tube of the kind described, which because of its small size and weight, is extremely rugged and will withstand shock.

Another object is to provide a tube of the kind described which may be constructed entirely on automatic machines.

The invention contemplates a gas discharge tube having a cylindrical gas-tight envelope of conducting material and a rod-like element extending into the envelope coaxially thereof and sealed in one end of the envelope by suitable insulating means. The envelope functions as one electrode, and the rod-like element functions as a second electrode.

The foregoing and other objects and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawing wherein one embodiment of the invention is illustrated. It is to be expressly understood, however, that the drawing is for the purposes of illustration and description only, and is not to be construed as defining the limits of the invention.

In the drawing,

Fig. 1 is an enlarged elevation view of a gas discharge tube constructed according to the invention.

Fig. 2 is an end view of the tube.

Fig. 3 is a horizontal section taken approximately on the line 3—3 of Figure 2, and

Fig. 4 shows a conventional wiring diagram in which the discharge tube is connected as a voltage regulator.

Referring now to the drawing for a more detailed description of the novel discharge tube of the present invention, the tube T is shown as comprising a cylindrical envelope 1 of conducting material, such as nickel-iron

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alloy, which functions as the anode. One end of the envelope is sealed by a pinch weld 2 and a terminal 3 is welded thereto.

A cathode 4 comprises a rod-like element extending into the envelope coaxially thereof and which may have a stem portion 5 of nickel-iron alloy and a terminal portion 7 of platinum. The stem portion of the cathode is sealed in the other end of the envelope by any suitable means, and in the present embodiment, the seal 9 is made of lead-glass and closes the end of the envelope. The seal has a cylindrical portion 11 encircling cathode 4 and extending coaxially inwardly of the envelope. Portion 11 serves as a shield for the part of the stem portion 5 protruding from seal 9 into the envelope and provides a longer leakage path for current flow between stem portion 5 and the envelope.

Envelope 1 is rendered gas tight as described above and may contain a suitable ionizing gas, such as a mixture of approximately 98% neon and 2% argon at a pressure of 60 mm. of mercury. Radioactive material, such as radium bromide, is introduced into the tube by any suitable means before sealing the tube and stabilizes the starting voltage.

The tube is shown greatly enlarged in the drawing. In one embodiment the envelope is .075 inch in diameter and 1.25 inches long and is especially adapted for connection in a circuit where the size of the tube is a factor.

The tube T may be used in a conventional circuit of the kind shown in Fig. 4 and is connected to an unregulated direct current source in series with a resistor 13. The regulated D. C. voltage is taken across the tube at terminals 15, 17. If desired, the tube may be connected in the circuit so that the envelope functions as the cathode and element 4 functions as the anode.

The tube is easy to construct in that the electrodes are concentric and readily positioned during assembly. The tube may be adapted for any suitable range of operation by changing the physical dimensions of the elements, the gas pressure, or the materials of which the electrodes are made.

Although but one embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto. Various changes can be made in the design and arrangement of the parts without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art.

I claim:

A voltage regulator tube for regulating the voltage from an unregulated D. C. source, comprising a cylindrical envelope of conducting material forming one electrode, and a rod-like element extending into said envelope coaxially thereof and forming a second electrode, a seal of insulating material closing one end of said envelope and maintaining said electrodes assembled, said seal having a cylindrical portion extending into said envelope between said electrodes to shield adjacent portions of said electrodes from one another and an ionizing gas contained in said cylindrical envelope.

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