May 25, 1937. R. H. RICHTER 2,081,767

INDICATING DEVICE

Filed Sept. 10, 1935

Fig. 1

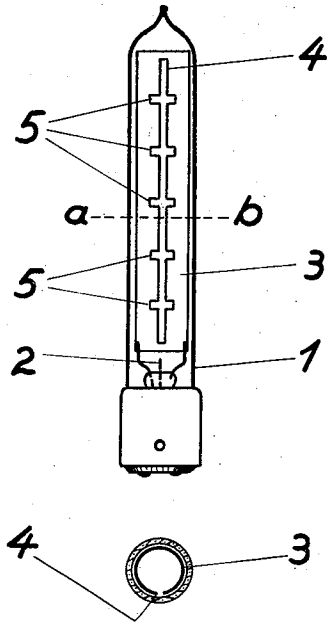


Fig. 2

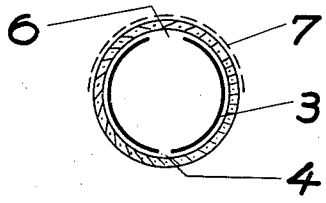
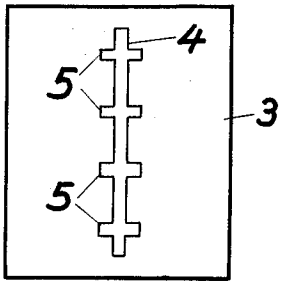


Fig. 3



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by his attorney Samuel Ostrolenk

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UNITED STATES PATENT OFFICE

2,081,767

INDICATING DEVICE

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6 Claims. (Cl. 250—27.5)

My invention relates to voltage indicating devices, more particularly to gaseous discharge indicators and has for its main object to provide an indicator for controlling the tuning of a radio-receiver or the like, such as by measuring the receiving energy applied to an input valve, especially a valve of the variable mu type well known in the art.

With the above main object in view the invention relates to a gas filled discharge tube of the oscillograph type, known also as Gehrke oscillograph. In tubes of this type, the length of the cathode glow serves as a means for directly indicating the value of the voltage applied to the anode-cathode path of the tube, the glow covering a part of the surface of an extended cathode electrode. The anode may be suitably arranged opposite one end of the cathode.

A further object of my invention is to provide a discharge indicator of novel construction free from the defects and disadvantages of devices of this type heretofore known in the art especially from the tendency to generate self-excited oscillations of the ordinary or relaxation type interfering with the operation and stability of the tube.

Moreover, it is the object of my invention to provide a construction of a discharge tube, of the type referred to having a long life and producing a sharp and well defined thermometer-like luminous line or column which may be very easily and conveniently read by the operator.

With the afore-mentioned objects in view, the invention contemplates the use of a vessel or tube of relatively small diameter, containing a rare gas or a mixture of such gases under low pressure (such as a pressure of 5–20 mm. mercury), and enclosing a tubular cathode member, concentrically arranged in the tube or otherwise provided with suitable means in such a manner as to limit the glow to its inner surface, this cathode being furthermore provided with a length-wise extending narrow slit. Preferably a second slit is provided opposite the first slit and those parts of the walls of the tube, which are opposite the said second slit are suitably provided with a non-reflecting surface for the purpose as will be described hereinafter. Moreover, a number of short calibrating slits, arranged substantially at right angles to the main or indicating slit may be provided to serve as luminous marks or calibrating indices for the several values of the voltage indicated by the tube.

My invention will be readily understood from the following description made with reference to the accompanying drawing in which—

Fig. 1 shows diagrammatically a gas filled discharge tube according to the invention.

Fig. 2 is a cross-sectional view of the tube, taken on line 1—1 of Fig. 1.

Fig. 3 shows a metal plate, prior to being formed or bent into the tubular cathode form, as shown in Fig. 2.

Similar reference numerals designate like parts in all the views of the drawing.

Referring to Fig. 1, a gas-filled tube 1 of glass or other suitable insulating material provided in the example shown with swan-base mounted to its re-entrant seal in a known manner encloses a short anode member 2 such as a short wire as shown and a tubular cathode member 3 arranged concentrically in the interior of the tube at a close distance to the walls of the tube in such a manner, that the glow is prevented from extending to the outer surface of the cathode. As is understood any other suitable means may be provided for preventing the glow from extending to the outer cathode surface, as by covering it with an insulating coating or the like. I have furthermore shown the cathode 3 to be provided with a narrow slit 4 parallel to its axis and intersected by a number of additional short calibrating slits shown at 5.

In operation the electrodes of the tube are connected in a well known manner to the terminals of the circuit carrying the voltage variations to be indicated or controlled, whereupon the rarefied gas in the vessel 1 becomes ionized and the inner surface of the tubular cathode member 3 partly covered with a glowing layer, said layer having a length which is a function of the voltage impressed to the anode-cathode path of the tube starting from one end of the cathode opposite to the anode 2. The slit 4 permits to observe the interior of the tubular cathode and to the observer appears like a sharply defined luminous thermometer-like column as intersected by luminous calibrating lines or indices 5 as described above.

I have found by experiments, that a sharply defined luminous line or column is obtained, if reflections from the opposite side of the cathode member are prevented. For this purpose I have shown a second slit 6 of the cathode as seen in Fig. 2, arranged opposite to the indicating slit 4 and serving to prevent reflections from the background of the first or indicating slit 4. Moreover, I prefer to cover those parts of the walls of the tube, which are opposite to the second slit 6, with a light absorbing film 7 or coat which may consist of a black paint or other suitable material.

By these means a luminous indicating column is produced upon a black background (6, 7).

A cathode member of the type described is easily manufactured by a punching process from sheet metal as shown in Fig. 3. The thus obtained sheet or punching is then formed or bent into the required curved form as shown in Fig. 2.

While I have illustrated and described specific embodiment of my invention, it will be evident that a number of equivalent constructions and modifications are possible coming within the broader scope and spirit of the invention and accordingly I do not desire to be limited to the precise construction illustrated and described.

I claim:

1. A discharge device comprising a cylindrical vessel filled with a gaseous atmosphere, a concentric tubular cathode therein, an anode disposed in operative relation to said cathode, said cathode having a longitudinal slit means for preventing a glow discharge on the outside surface of said cathode, further means for preventing light reflections from the portion of the cathode wall opposite said slit, and a plurality of spaced shorter slits arranged transverse said first slit.

2. A discharge device comprising a tubular vessel filled with a rarefied gas, a tubular shaped cathode therein concentrically arranged in close proximity to the walls of said vessel and having a pair of diametrically opposed longitudinal slits, and an anode disposed in operative relation to said cathode.

3. A discharge device comprising a tubular vessel filled with a rarefied gas, a tubular cathode therein mounted in close proximity to the walls of said vessel and having a longitudinal slit, an anode disposed in operative relation to said cathode, said cathode having a further slit diametrically opposite to said first slit, and a light absorbing coating applied to the wall portion of said vessel opposite said last slit.

4. A discharge device comprising a tubular vessel filled with a rarefied gas, a cathode and an anode therein, said cathode consisting of a metal tube having a longitudinal slit, means for preventing a glow discharge on the outside surface of said cathode, and further means for preventing light reflections from the portion of the cathode wall opposite said slit.

5. A discharge device comprising an oblong vessel, a gaseous atmosphere therein, a hollow cathode having an oblong longitudinal cross-section mounted within said vessel, an anode disposed in operative relation to said cathode, means for preventing the production of a negative glowing layer on the outside surface of said cathode, said cathode having a longitudinal slit, and means for preventing light reflections from the portion of the cathode wall opposite said slit.

6. A discharge device comprising an oblong vessel, a gaseous atmosphere therein, a hollow cathode having an oblong longitudinal cross-section mounted within said vessel, an anode disposed in operative relation to said cathode, means for preventing the production of a glowing layer on the outside surface of said cathode, said cathode having a pair of diametrically opposed longitudinal slits.

RUDOLF HANS RICHTER.