

Dec. 30, 1947.

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2,433,813

ELECTRIC DISCHARGE TUBE

Filed Aug. 23, 1945

Fig. 2

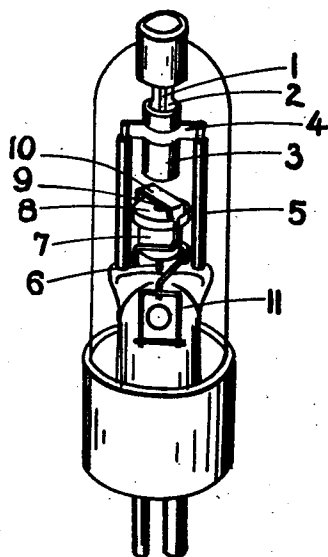


Fig. 1

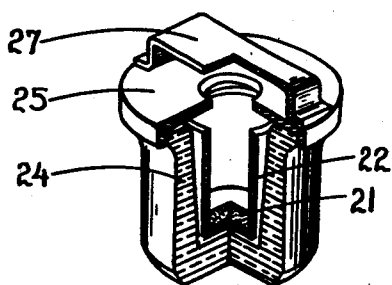
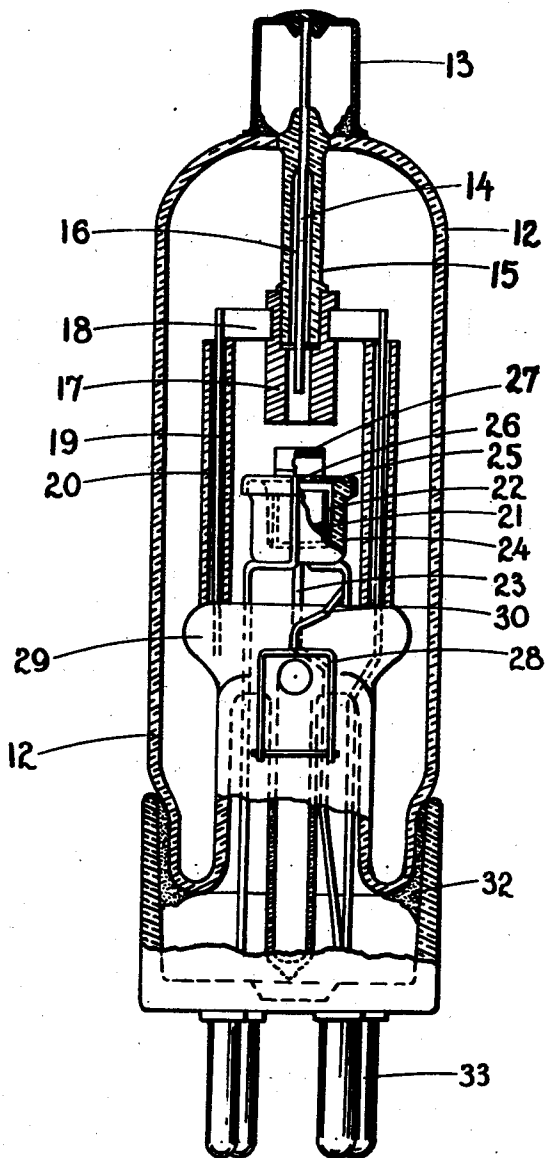


Fig. 3



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2,433,813

ELECTRIC DISCHARGE TUBE

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Application August 23, 1945, Serial No. 612,217

6 Claims. (Cl. 250—27.5)

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This invention relates to gaseous discharge tubes and particularly to those of the type in which the source of electrons is a cathode spot. It may be designed, if desired, so that the short distance between the electrodes makes the tube useful as a rectifier. It may also be used for producing extremely short pulses, and for other purposes.

An object of this invention is to provide a cold-cathode, gaseous discharge tube which has relatively easy, cathode-spot formation without the necessity of heating power for the filaments.

Another object of this invention is to provide an electron discharge tube in which the discharge is controlled, without the expenditure of appreciable energy, by the control grids, for producing extremely short pulses and high peak currents.

A feature of this invention is the use of a carbon grid at the anode to help control the electrode to give a sharp cut-off after the discharge stops.

Another feature of this invention is the use of a glass tube heated and sealed to the carbon electrode to support it.

Another feature of this invention is the use of caesium chloride and aluminum in a highly compressed form as a "pill."

Another feature of this invention is the use of an annular metal grid over the cathode cup to prevent sputtering of the cathode-emitting material and to act as keep-alive, where necessary, and to start the discharge.

A further feature of this invention is the use of a strap or baffle over said nickel grid to keep sputtered material from forming on the anode grid.

Other objects and features of this invention will be explained hereinafter and will be particularly pointed out in the appended claims.

Figure 1 is a perspective view of the cold-cathode gaseous-discharge tube.

Figure 2 is a longitudinal sectional view of said cold-cathode, gaseous-discharge tube enlarged.

Figure 3 is a perspective view of the cathode cup in partial section.

In Figure 1, the anode wire 1 of tantalum is welded to material suitable for sealing the glass and is sealed into the base of a hollow glass tube 2 which supports the carbon grid 3.

The carbon grid 3 is further supported by a metal strip 4 with metal wires sealed in and supported by the glass sleeves 5. At the cathode, the lead-in wire 6 passes through the insulating ceramic cup 7 to the cathode cup and "pill." The ceramic cup 7 is covered by a nickel grid 8 to prevent the sputtering of the cathode-emitting material and thus to act as a keep-alive or to

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start the discharge. The nickel grid has a hole 9 in it to allow the action of the spot discharge. The cathode is further protected from sputtering by a baffle 10 of metal. The unit is insulated by and mounted upon the glass base 11 and sealed in a glass envelope filled with helium at a pressure of 7 to 20 millimeters.

In Figure 2, the glass tube 12 is capped by a metal anode cap 13 to which is attached a tantalum wire 14 supported by and insulated by a glass tube 15, welded to it as in normal tube construction. The wire 14 is separated from the glass tube 15, except at the base, by an air space 16 to prevent cracking from heat. The carbon grid 17 at the anode gives a sharp cut-off after the discharge stops and is supported not only by the glass tube 15 but also by the metal strip 18 upheld by the metal wires 19 supported in the glass sleeves 20. At the cathode, the caesium chloride and aluminum compressed into a "pill" 21 provide a cathode spot. This "pill" 21 of cathode-emitting material rests in and is contacted by a nickel cup 22 to which is attached the lead-in wire 23. A ceramic cup 24 surrounding and insulating the cathode is covered with an annular grid 25 to prevent sputtering of the cathode-emitting material and to act as a keep-alive, where necessary. The hole 26 in the metal grid is covered by a strap 27 which further prevents sputtered material from reaching the carbon grid 17. The getter 28 on each side of the glass mounting 29 is attached by a wire 30 to the stem. The entire glass envelope 12 is filled with helium at 7 to 20 millimeters pressure, or any inert gas; helium gas at low pressure may be used to increase the "hold-off" factor and to make the response of the device quicker. The glass envelope is fastened with cement 32 to a base from which project the pins 33.

In sealing the glass and the carbon together at the anode, the carbon is heated to the softening point of glass and the glass tube then pushed into the carbon electrode. A mandrel is pushed up into the glass tube during this sealing process to keep the tube open. This process may be useful in other places where keeping the glass tube open is not important, and in those cases a mandrel will not be required.

In Figure 3, the cathode "pill" 21 is shown resting in the metal cup 22, said metal cup insulated by the ceramic cup 24. Over all of this is the annular metal grid 24 surmounted by the metal baffle 27.

This tube may be used in the usual strobtron circuit and in many other types of circuit. I have

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found my tube particularly useful when used as a rectifier, the grids being in that case connected back to the anode through suitable resistance. The carbon grid in that case may be connected to an intermediate point on the resistance in the metallic grid circuit.

What I claim is:

1. In an electric discharge tube, a graphite electrode and a glass support sealed thereto, and a lead-in wire sealed through the glass support and extending into, but spaced from, said graphite electrode to act as an anode.

2. In an electric discharge tube, a graphite electrode and a glass support sealed thereto and a lead-in wire sealed through the glass support and extending into, but spaced from, said graphite electrode, said lead-in wire acting as an anode and being composed of tantalum.

3. In an electric discharge tube, a cathode of material capable of forming a cathode spot, an insulating cup for the part of said cathode away from the discharge, an annular metal cover for the part of said cathode facing the discharge, and a metal shield spaced from but in register with the center of said annulus.

4. In an electric discharge tube, a cathode of material capable of forming a cathode spot, an insulating cup for the part of said cathode away from the discharge, an annular metal cover for the part of said cathode facing the discharge, said annular ring acting as a control grid for the discharge, and a metal shield spaced from, but in register with, the center of said annulus.

5. In an electric discharge tube, a cathode of material capable of forming a cathode spot, said material comprised of caesium chloride and aluminum highly compressed, an insulating cup for the part of said cathode away from the discharge, an annular metal cover for the part of said cath-

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ode facing the discharge, said annular ring acting as a control grid for the discharge, and a metal shield spaced from but in register with the center of said annulus.

6. In an electric discharge tube, a graphite electrode and a glass support sealed thereto and a lead-in wire anode composed of tantalum, sealed through the glass support and extending into, but spaced from, said graphite electrode and a cathode of material capable of forming a cathode spot, said material comprised of caesium chloride and aluminum highly compressed into a "pill," an insulating cup for the part of said cathode away from the discharge, an annular metal cover for the part of said cathode facing the discharge, and a metal shield spaced from but in register with the center of said annulus.

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