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W. W. EITEL ET AL
ELECTRICAL DISCHARGE DEVICE
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2,355,717

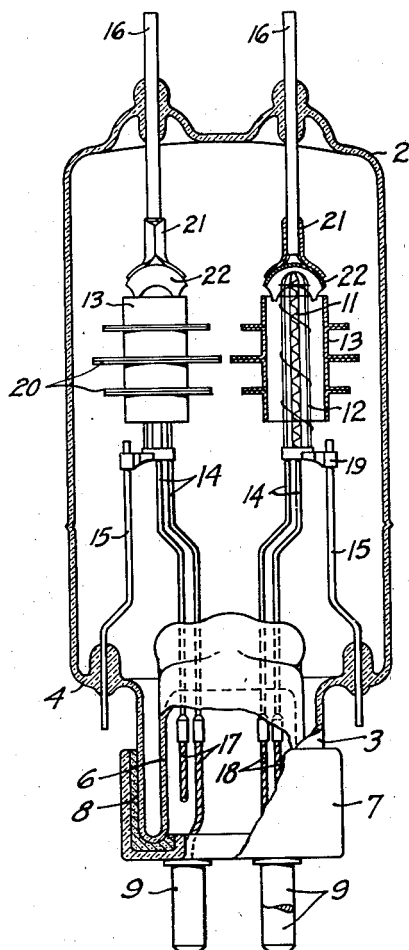


Fig. 1

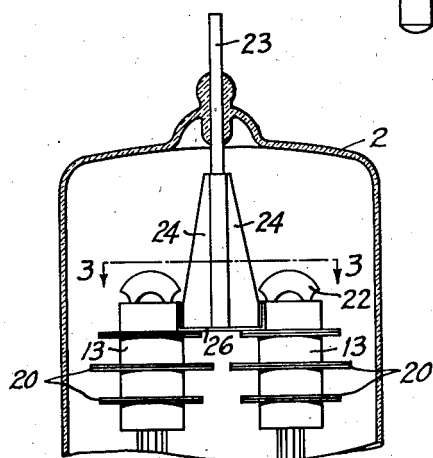


Fig. 2

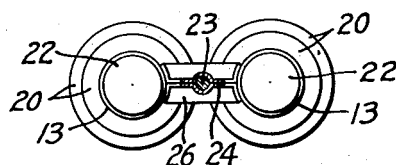


Fig. 3

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ELECTRICAL DISCHARGE DEVICE

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Original application February 14, 1941, Serial No. 378,900. Divided and this application October 10, 1941, Serial No. 414,505

2 Claims. (Cl. 250—27.5)

This is a division of our copending application, Serial No. 378,900, filed February 14, 1941.

Our invention relates to electron discharge devices, and more particularly to an improved anode structure for thermionic tubes.

It is among the objects of our invention to provide an anode having improved heat radiating fins.

Another object is to provide heat radiating surfaces varying in size in accordance with the degree of heat to be dissipated at different parts of the anode.

A further object to provide an anode structure having greater mechanical strength.

A still further object is to provide an anode made in sections and adapted for simplified fabrication.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of our invention. It is to be understood that we do not limit ourselves to this disclosure of species of our invention, as we may adopt variant embodiments thereof, within the scope of the claims.

Referring to the drawing:

Figure 1 is a side view, partly in section and partly in elevation, showing a two-unit tube embodying the improvements of our invention; and

Figure 2 is a fragmentary view showing a modified construction in which the anodes are unitarily supported; and

Figure 3 is a horizontal sectional view taken in a plane indicated by line 3—3 of Figure 2.

In terms of broad inclusion, our electrical discharge device comprises an electrode, and heat radiating fins disposed transversely of and spaced along the electrode. The electrode is preferably formed of cylindrical sections secured together end-to-end; and the annular fins preferably vary in size in accordance with the heat to be dissipated.

In greater detail, and referring to Figure 1 of the drawing, a two-unit tube embodying the improvements of our invention comprises an envelope of vitreous material such as glass having an upper end or dome portion 2, an intermediate portion including a reduced neck 3 and a shoulder 4, and a lower end portion including a re-entrant stem 6. The base of the tube comprises a porcelain collar 7 secured to the neck by cement 8 and carrying four terminals or prongs 9 three of which are shown in Figure 1.

The two units are preferably disposed symmetrically about the axis of the tube; and each

comprises a set of electrodes including a cathode or filament 11, a grid or control electrode 12, and an anode or plate 13. Cathodes 11 are supported from stem 6 by conductors 14; grids 12 from shoulder 4 of the intermediate tube portion by conductors 15; and anodes 13 from dome portion 2 by conductors 16. These supporting wires are all sealed in the tube portions indicated and provide external connections for the various electrodes. The mounting of the grid supports at shoulder 4 instead of in the base of the tube materially reduces the interelectrode capacities at the base.

Cathodes 11 may be of any suitable form, such as the coiled filaments illustrated; one filament being connected to one pair of terminals 9 by leads 17 and the other filament being connected to the other pair of terminals by leads 18. Grids 12 are also of optional construction, the type shown comprising a series of vertical wires with an outer reinforcing helix all held by a base ring secured to support 15 by an arm 19.

Our improved anode 13 is hollow and preferably cylindrical in shape, and has a series of say three radiating fins 20 disposed circumferentially about the electrode and extending transversely of the electrode axis. The axis referred to is the longitudinal axis about which the cathode and grid are also disposed. The anode is preferably made from drum-like sections having integrally formed, outwardly extending, annular flanges to provide fins of double thickness when the sections are secured together as by welding. If desired, the cylindrical sections may be formed with a flange at one end only to provide fins of single thickness. These sections may be made from flat sheets with the cylindrical portions formed by a drawing die. The final structure, with annular flanges spaced along the axis is easier to fabricate and is stronger mechanically than anodes having longitudinal flanges.

Since an anode is subjected to greatest heating at its central portions, we make the central fin wider than the others. In other words, the fins are arranged and proportioned to provide heat radiating surfaces varying in size in accordance with the degree of heat to be dissipated. The use of annular fins makes this arrangement possible. Annular fins have the further advantage of embracing the full diameter of the electrode, thereby giving the most effective heat radiation, particularly along the mid-diameter where the maximum heating occurs. This arrangement of cooling fins is much superior to the longitudinal fins commonly used, and we have mate-

rially increased the output of our tubes merely by making this change.

The anodes of the tube type shown in Figure 1 are separately supported by the conductors 16, each anode being fastened to its support by a strap 21 secured to a cap 22 of the electrode. These supports being separate from and independent of the heat radiating fins 20 tend to thermally isolate the anode; which is desirable for the purpose of keeping the glass seal at the support from undue heating. Separate external connections can thus be made to each electrode of each unit, so that one unit may be operated independently of the other. When the units are operated singly the life of the tube is doubled, it being only necessary to turn the tube around in the socket to bring another unit into operation when one of the filaments burns out. Another important feature is that the inactive unit may be employed for neutralizing capacity. The two units thereby mutually cooperate in the functioning of the tube, even though only one unit is in actual operation and even though the other unit may be burnt out. If desired, of course, the electrodes having similar function may be connected in parallel to simultaneously operate units.

For simultaneous operation however the anodes are preferably connected in parallel to a common central support 23 as shown in Figures 2 and 3. In this case a bracket is provided with lateral fins 24 embracing the support and with

base flanges 26 secured to the upper fins of the anodes. Fins 24 extend upwardly along the support and decrease in width therealong. These fins aid in radio frequency conduction, and also function to dissipate heat.

While we have chosen to illustrate the improved anode structure in a multiple-unit tube, it is understood that the improvements may be incorporated in an ordinary single-unit tube.

10 We claim:

1. In an electrical discharge device, an electrode comprising a plurality of tubular sections contiguously disposed end-to-end with the rim of one section integrally united to that of an adjacent section, and an outwardly extending heat radiating fin carried by a section and disposed about the electrode in a plane transverse to the electrode axis at the junction of the tubular sections.

20 2. In an electrical discharge device, an electrode comprising a plurality of tubular sections contiguously disposed end-to-end with the rim of one section integrally united to that of an adjacent section, and outwardly extending heat radiating fins formed on the adjacent ends of contiguous sections and disposed about the electrode in a plane transverse to the electrode axis at the junction of the tubular sections, the adjacent fins contacting to provide in effect a single fin of double thickness.

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