

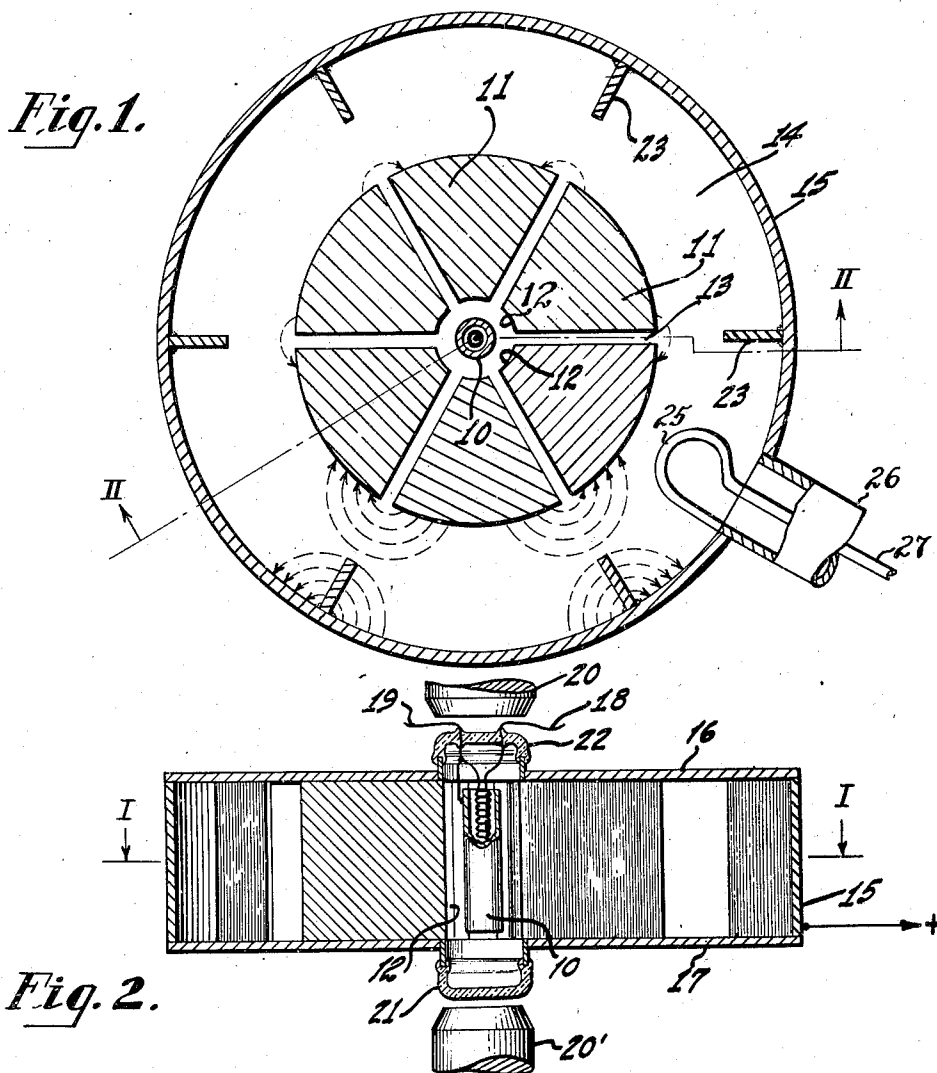
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2,462,510

ELECTRON DISCHARGE DEVICE AND ASSOCIATED CIRCUIT

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ELECTRON DISCHARGE DEVICE AND ASSOCIATED CIRCUIT

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5 Claims. (Cl. 315—6)

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My invention relates to electron discharge devices and associated circuits, and more particularly to magnetrons utilizing cavity resonators.

In one type of such device the anode elements are mounted within drum-shaped cavity resonators, the fields between the cathode and the anode segments being coupled to the space between the anode segments and the resonator, which has a large diameter compared to the diameter of the cylinder whose surface is defined by the anode segments. In such an arrangement the electromagnetic fields are weak in the vicinity of the axis of the resonator; that is in the space between the cathode and the anode segments. Practically this requires extremely high fields near the periphery of the resonator in order to get reasonable fields in the vicinity of the anode segments. The result of this is that losses occur in the walls of the resonator which may be high and field emission may occur from the walls of the resonator.

It is an object of my invention to provide an improved electron discharge device and associated circuit of the magnetron type and utilizing resonators.

It is a particular object of my invention to provide such a device in which losses at the periphery of the resonator due to high fields are reduced and in which field emission from the walls is minimized.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which Figure 1 is a transverse section of an electron discharge device and associated resonator made according to my invention and taken along the line 1—1 of Figure 2, and Figure 2 is a longitudinal section taken along the line 2—2 of Figure 1.

Referring to Figure 1, an electron discharge device and associated resonator made according to my invention includes an indirectly heated cathode 10 having the cathode and heater leads 18—19. Surrounding the cathode are a plurality of anode elements 11 which are sector-shaped, and which although shown as solid elements could be made of sheet metal and hollow in the interior. The inner ends 12 of the sector shaped elements 11 provide the anode segments surrounding the cathode 10 and define the cathode chamber. The anode elements are positioned in spaced relation so as to provide radially directed slots 13 communicating with the interior

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14 of the cavity resonator formed by the outer cylinder 15 and the outer walls of the segmentally shaped anode elements 11.

To provide the proper mode of operation I utilize baffle members 23 which result in producing the field pattern shown by the dotted lines. The ends of the cylindrical member 15 are closed by plate members 16 and 17 to provide a drum-shaped structure, the cathode chamber being sealed by means of the insulating cup-shaped members 21 and 22 which may be made of glass.

The usual magnetic field is produced by means of electro-magnetic poles 20—20'.

Thus it will be seen that I make the inner and outer diameters of the coaxial cylinder resonator more equal than in the case where segmental elements are not provided and where the resonator field and the field between the cathode and the anode segments are directly coupled. The slots 13 act as waveguides and the sections of the waveguides are so proportioned that standing waves do not occur in them, this being accomplished by correctly proportioning the slots. The length of the slots is preferably chosen to be effectively one-half wave-length so that if standing waves do occur the resonance in the waveguide sections will not be a substantial factor in determining the frequency of oscillation.

A voltage is induced between adjacent anode segments 12 in a manner now well known. These radio frequency voltages cause electro-magnetic waves to travel down the slot, which acts as a waveguide, causing high frequency voltages and currents at the ends of the slots to generate the high frequency electromagnetic fields shown by the dotted lines and thus energize the cavity resonator.

While I have indicated the preferred embodiment of my invention of which I am now aware and have also indicated only one specific application for which my invention may be employed, it will be apparent that my invention is by no means limited to the exact forms illustrated or the use indicated, but that many variations may be made in the particular structure used and the purpose for which it is employed without departing from the scope of my invention as set forth in the appended claims.

What I claim as new is:

1. An electron discharge device having a hollow drum-shaped conducting member, a plurality of anode elements of sector-shaped transverse section mounted within said member in spaced relation thereto, whereby the inner wall of said

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drum-shaped member and the outer surfaces of said sector-shaped anode elements provide a cavity resonator, said anode elements being spaced from each other along radial planes to provide radially-directed slots, the inner ends of said anode elements providing anode segments defining a cathode chamber, a cathode mounted in said chamber, the radial length of said slots being effectively a half-wavelength of the operating frequency of said device.

2. An electron discharge device having a hollow drum-shaped conducting member, a plurality of anode elements of sector-shaped transverse section mounted within said member in spaced relation thereto, whereby the inner wall of said drum-shaped member and the outer surfaces of said sector-shaped anode elements provide a cavity resonator, said sector-shaped anode elements being spaced from each other along radial planes to provide radially-directed slots, the inner ends of said anode elements providing anode segments defining a cathode chamber, a cathode mounted in said cathode chamber, and radially-directed conducting baffle elements positioned in registry with said slots and extending inwardly from the inner wall of said resonator.

3. An electron discharge device having a cavity resonator comprising a hollow conducting member, a series of anode elements mounted within said member in spaced relation thereto, said anode elements being spaced from each other to provide slots, said anode elements at one end of said slots providing a series of parallel anode segments defining a cathode space, a cathode mounted adjacent said anode elements for sup-

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plying electrons in said cathode space, and a plurality of conducting baffle elements positioned in said resonator in registry with the other ends of said slots and extending from said hollow conducting member.

4. An electron discharge device according to claim 3, having means including said hollow conducting member for providing an evacuated envelope for said device.

5. An electron discharge device having a cavity resonator comprising a cylindrical conducting member, an annular series of anode elements concentrically mounted within said member in spaced relation thereto, said anode elements being spaced from each other along radial planes to provide radially-extending slots, the inner ends of said anode elements providing anode segments defining a cathode chamber, a cathode mounted in said chamber, and radially-directed conducting baffle elements positioned in registry with said slots and extending inwardly from the inner wall of said member.

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Disclaimer

2,462,510.—*Nathaniel I. Korman*, Camden, N. J. ELECTRON DISCHARGE DEVICE AND ASSOCIATED CIRCUIT. Patent dated Feb. 22, 1949. Disclaimer filed Dec. 22, 1949, by the assignee, *Radio Corporation of America*.

Hereby enters this disclaimer to claim 1 of said patent.

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