Feb. 15, 1938. N. E. LINDENBLAD 2,108,539

ELECTRON DISCHARGE DEVICE

Filed Dec. 2, 1936

Fig. 1

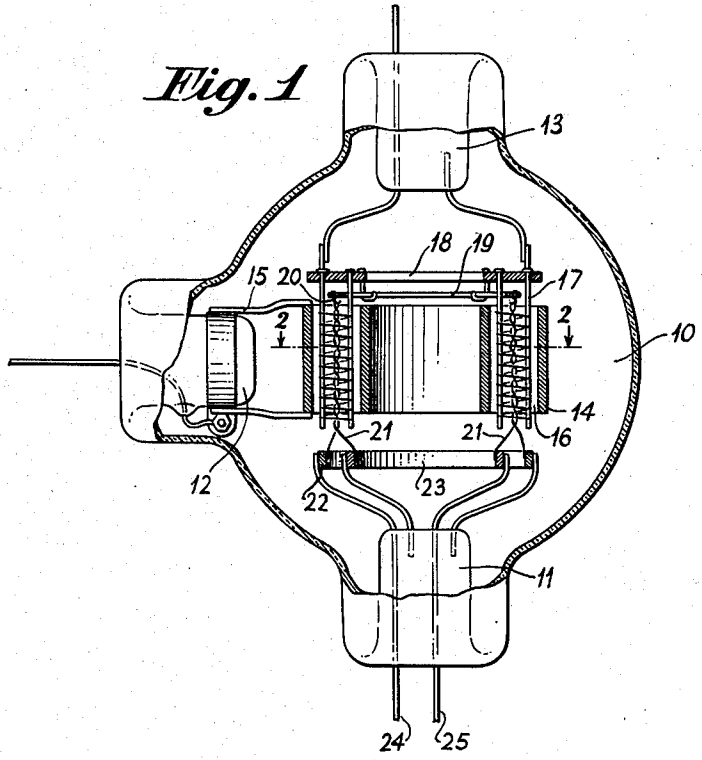


Fig. 2

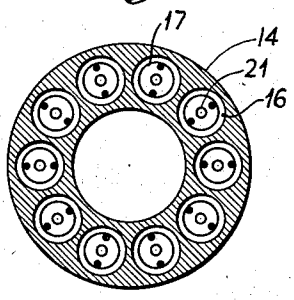
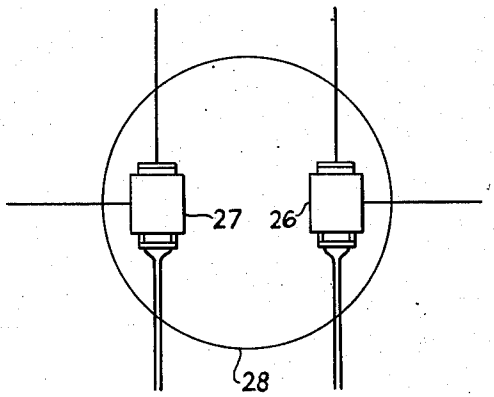


Fig. 3



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ELECTRON DISCHARGE DEVICE

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2 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices for use at very high frequencies, particularly such tubes having a comparatively high power output.

In conventional methods of producing continuous oscillations at ultrahigh frequencies by the Barkhausen method, by the use of a magnetron or by frequency multiplication, there is a definite relationship between dimensions of the tube elements and the electromagnetic forces within the tube at each frequency. This condition is especially critical when the Barkhausen method is used. Furthermore this relationship is such that for conventional dimensions of tubes, the power output is very small, since the higher the desired frequency the smaller is the required dimensions of the elements with a resulting smaller output.

It is the principal object of my invention to provide an improved form of an electron discharge device intended for use at very high frequencies and having a comparatively high power output.

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 partial vertical section of an electron discharge device made in accordance with my invention, Figure 2 is a transverse section of the electrode assembly taken along the line 2—2 of Figure 1, and Figure 3 is a schematic diagram of a multiple unit tube incorporating my invention.

Referring to the drawing, particularly Figures 1 and 2, I provide an evacuated envelope 10 having re-entrant portions 11, 12, and 13 disposed 90° from each other around the wall of the tube for supporting the cathode, anode and grid electrodes of an electron discharge device.

In accordance with my invention the anode member 14 which may be an annular member having a comparatively thick wall and providng a rectangularly shaped longitudinal section is supported from the stem 12 by means of the support member 15 clamped to the stem 12. This annular member may be of copper or similar material, which readily absorbs and radiates heat, and which may be carbon coated or provided with cooling fins to increase the heat dissipation. This annular member is provided with a plurality of longitudinal bores 16 forming chambers in which the other electrodes are received, and thus in effect provides a plurality of anodes connected in parallel. Each of these bores receives the additional electrodes for providing separate electron discharge devices, the elements of which are connected in parallel.

The grids 17 are supported from an annular metal ring member 18 in turn supported from the press 13 into which the grid support wires are fused. This grid is coaxial and concentric with the chamber formed by the bore 16. Supported from the ring 18 is an insulating ring 19 provided with hooks 20 to which the upper ends of the cathodes 21, which could be indirectly heated, are attached. The lower ends of the cathode are secured to a pair of concentric conducting rings 22 and 23 so that all of the cathode filaments are connected in parallel, the rings being provided with separate leads 24 and 25 which can be attached to opposite terminals of a source of cathode filament heating voltage. The cathodes are mounted at the axis of the grid 17 and chamber 16.

The arrangement just described satisfies the conditions necessary for providing a high frequency tube having a high power output. All of the elements and the spacing between elements can be made very small so that the frequency at which the tube will oscillate may be high. The anodes are all connected in parallel and because of the mass of the anode elements considerable heat can be absorbed and dissipated. The resulting electrode mount is compact and reduces to a minimum the connections necessary for connecting the various groups of electrode assemblies in parallel, and hence the circuit constants permitting higher frequencies.

To promote reliable and certain efficiency, it is desirable to build such tubes as push-pull tubes. Such an arrangement is shown in Figure 3 where the clusters of elements 26 and 27, each corresponding to the electrode assembly shown in Figures 1 and 2, are provided within a single envelope 28.

While I have indicated the preferred embodiments 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 an en-

velope containing an annular conducting member having a comparatively thick wall and supported from one side of the envelope and having a plurality of longitudinally extending cylindrical chambers spaced around the wall of said annular conducting member, a grid positioned within each chamber and coaxially thereof, a conducting ring electrically connected to and supporting said grids, said ring being supported from another portion of the envelope wall, and a plurality of cafhodes positioned and supported centrally of each chamber.

2. An electron discharge device having an envelope containing an annular conducting member having a comparatively thick wall and supported from one side of the envelope and having a plurality of longitudinally extending cylindrical chambers spaced around the wall of said annular member, a grid positioned within each chamber and coaxially thereof, a conducting ring electrically connected to and supporting said grids, said ring being supported from another portion of the envelope wall, an insulating member carried by the grid supporting ring, and a cathode positioned centrally of each chamber and having one end supported from the wall of the envelope opposite to said grid support and its other end from said insulating member.

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