Nov. 20, 1934. G. MARCONI ET AL 1,981,058

THERMIONIC VALVE

Filed Oct. 14, 1926

Fig. 1

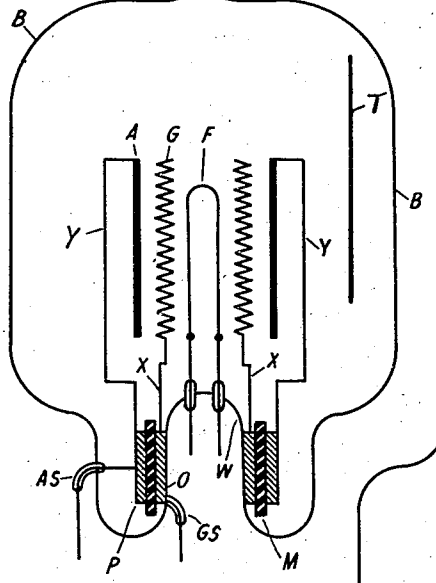
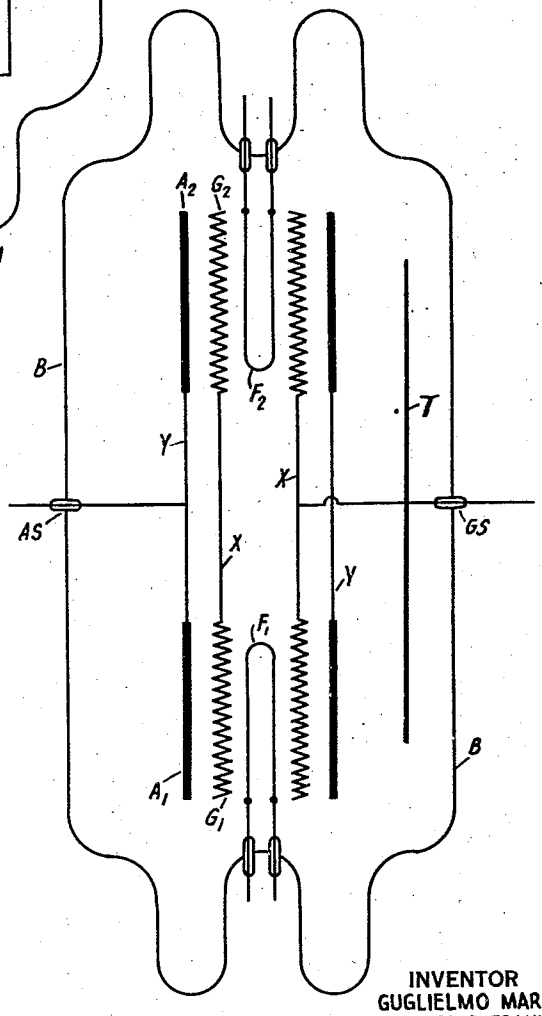


Fig. 2



INVENTOR
GUGLIELMO MARCONI
CHARLES S. FRANKLIN
BY
ATTORNEY

Patented Nov. 20, 1934 1,981,058

UNITED STATES PATENT OFFICE

1,981,058

THERMIONIC VALVE

Guglielmo Marconi, Strand, London, and Charles Samuel Franklin, Buckhurst Hill, England, assignors to Radio Corporation of America, a corporation of Delaware

Application October 14, 1926, Serial No. 141,599½
In Great Britain October 14, 1925

13 Claims. (Cl. 250—27.5)

This invention relates to thermionic valves, and more especially to valves suitable for the production of very short waves of the order of two or three metres long or even less.

In hitherto known arrangements for generating waves by means of thermionic valves, the extent to which the wave length can be reduced is limited by the physical dimensions of leading-in wires and seals necessary, and by the length of such leads.

According to the present invention the whole primary circuit associated with the valve is located within the valve itself, and preferably the arrangement is such that all or some of the inductances and capacities comprising the said primary circuit are formed by the electrodes themselves and the supports therefor.

In one form of construction, the grid and anode of a three electrode valve are arranged concentrically about the filament which is supported from the glass stem of the valve by the usual filament seals. The grid is supported by means of metal strips lying along the surface of an imaginary cylinder, attached to a metal ring surrounding the stem. The anode is supported by means of metal strips lying along the surface of an imaginary cylinder, attached to a second metal ring surrounding and supported by the first metal ring, but insulated therefrom by mica or the like. Connection is made to the grid and anode by means of two small leads sealed in the envelope that for the anode carrying the high tension supply, and that for the grid carrying the grid current.

It will be seen that with this arrangement the oscillatory circuit is comprised by the condensers formed by the grid and anode and by the rings supporting them in series with inductances formed by the metal strips supporting the grid and anode respectively. Thus the primary circuit is wholly inside the valve and therefore the seals do not have to carry any heavy high frequency currents.

In a modification, which is, in effect, two valves in a single envelope, two filaments are provided at opposite ends of a glass bulb. Each filament has associated therewith a grid and an anode supported in any convenient way, the two grids being connected together and also the two anodes, by means of metal strips lying along the surfaces of imaginary cylinders.

Connection is made to the anode and grids by means of two small leads.

This construction has been found to give a very short wave length for a given length of valve, the said wave length being generally about twice the distance between the two anodes, if concentric cylinders be employed for connecting the anodes and grids.

The invention is illustrated in the accompanying drawing, in which Figure 1 is a schematic arrangement of a single valve, according to the invention, and Figure 2 is a schematic arrangement of a double valve according to the invention.

Referring to Figure 1, the valve comprises an evacuated bulb B, containing a filament F, a grid G, and an anode A, supported upon a glass stem W. Around this stem are mounted two metal rings, O and P, with an insulating ring M between them. Connection is made to these two rings by wires which pass thru seals GS and AS respectively. The grid is supported from the ring O by means of a number of metal strips X, and the anode is supported from the ring P by means of a number of metal strips Y. The capacity between the rings O and P should be large compared with the capacity between the anode A and grid G.

It will be seen that the anode-grid capacity, in series with the capacity between the rings O and P, and the inductances of the strip connections X and Y, constitute an oscillatory circuit which may easily be constructed to have an extremely high natural frequency. The seals AS and GS, through which connections are made to the anode and grid respectively, carry merely the anode feed current and grid currents respectively, and do not have to carry the high frequency current. They can therefore be made comparatively small.

The modification shown in Figure 2 is a double valve having two sets of filaments, grids, and anodes, F_1, G_1 and A_1 and F_2, G_2 and A_2, mounted in a single bulb B.

The anodes A_1 and A_2 are connected together by metal strips Y, the grids G_1 and G_2 being similarly connected by metal strips X. From the centre points of these strips, connections are brought to the outside of the valve through seals AS and GS respectively.

The anodes and grids may be supported in any convenient manner from the stem of the valve, as is done in Fig. 1 or otherwise.

It will be seen that in this arrangement there is a natural oscillatory circuit comprising the capacity between the anode A_1 and the grid G_1, in series with the capacities A_2, G_2, and the inductances of the strips X and Y.

It has been found that for very short waves, the aerial T itself may advantageously be in-

cluded in the envelope of the valve, but generally coupling by way of the filament lead or by electrostatic effect through the glass is sufficient.

Having described our invention what we claim is:

1. A thermionic oscillation generator comprising an envelope enclosing a complete oscillatory circuit, said circuit consisting of a grid electrode, an anode electrode in spaced relation with respect thereto, a capacitive element between said grid and anode, and an inductance element, all of said elements being supported from one end only of said envelope, the value of the capacity of said capacitive element being large compared with the capacity between the anode and grid due to the space between them.

2. An oscillation generator, comprising an envelope which includes a reentrant stem, a filament supported by leads sealed in said stem, a cylindrical ring of conducting material supported in said envelope, a second cylindrical ring of conducting material concentric to said first named ring but insulated therefrom in said envelope, a control electrode supported by said first named ring, and an anode supported by said last named ring, said elements and supports forming a complete oscillation circuit within said tube.

3. A discharge tube for producing high frequency oscillations, comprising a cathode, a grid surrounding the cathode, an anode surrounding the grid, and two metal rings insulated from each other to form a condenser, the grid being supported from one of the metal rings by means of metal strips, the anode being supported from the other metal ring by means of metal strips, the whole being enclosed within a single evacuated envelope.

4. A discharge tube for producing high frequency oscillations, comprising a cathode, a grid arranged around the cathode, an anode surrounding the grid, two metal rings insulated from each other to form a condenser, the grid being supported from one of the metal rings by means of metal strips, the anode being supported from the other metal ring by means of metal strips, and an antenna parallel to said anode and coupled thereto, the whole being enclosed within a single evacuated envelope.

5. An oscillation generator comprising two space current units within a single envelope and conductors, also within the envelope, connecting corresponding electrodes of the two space current units and forming a complete oscillatory circuit therewith.

6. An evacuated envelope containing two triode structures spaced apart and also containing conductors having substantially rectilinear parts, connecting together corresponding elements of the triode structures and forming therewith a complete oscillatory circuit.

7. An oscillatory system comprising two sets of space current device electrodes within an envelope, a plurality of conductors with their centre lines disposed on a circle, and connecting one pair of corresponding electrodes, and a plurality of conductors with their mid-points disposed on a circle concentric with the aforementioned circle and connecting another pair of corresponding electrodes.

8. A high frequency oscillator comprising a vessel containing a radio oscillating circuit, and a substantially straight linear radiating element mounted within said vessel.

9. An electron discharge device comprising an evacuated container enclosing an electron emitting cathode an anode and a grid, and means completing a high frequency oscillatory circuit and a high frequency antenna within said envelope parallel to said electrodes.

10. A thermionic oscillation generator comprising an envelope enclosing a complete oscillatory circuit, said circuit consisting of a grid electrode, an anode electrode in spaced relation with respect thereto, a capacitive element between said grid and anode, and an inductance element, all of said elements being supported from one end only of said envelope, the value of the capacity of said capacitive element being large compared with the capacity between the anode and grid due to the space between them, and a straight linear aerial in the form of a wire also located within said envelope and spaced from said electrodes and electrostatically coupled thereto.

11. An oscillation generator comprising two space current units within a single envelope, each of said units comprising a cathode, anode and control electrode, and conductors also within the envelope connecting corresponding grid and anode electrodes of the two space current units together to form a complete oscillatory circuit therewith, the individual cathodes of said respective units being supported at opposite ends of said envelope.

12. An oscillation generator comprising two space current units within a single envelope, each of said units comprising a cathode, anode and control electrode, and conductors also within the envelope connecting corresponding grid and anode electrodes of the two space current units together to form a complete oscillatory circuit therewith, the individual cathodes of said respective units being supported at opposite ends of said envelope, and a straight linear aerial in the form of a wire electrostatically coupled to said anodes.

13. A thermionic valve, comprising an envelope which includes a reentrant stem, a filament supported by leads sealed in said stem, a cylindrical ring of conducting material supported in said envelope, a second cylindrical ring of conducting material concentric to said first named ring but insulated therefrom in said envelope, a control electrode supported by said first named ring, an anode supported by said last named ring, said elements and supports forming a complete oscillation circuit within said tube, and means for leading potential to both of said rings all being supported from one end of said envelope.

GUGLIELMO MARCONI.
CHARLES SAMUEL FRANKLIN.