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THERMIONIC AMPLIFIER

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Fig. 1

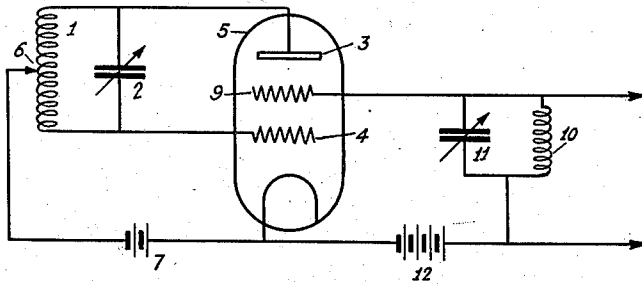
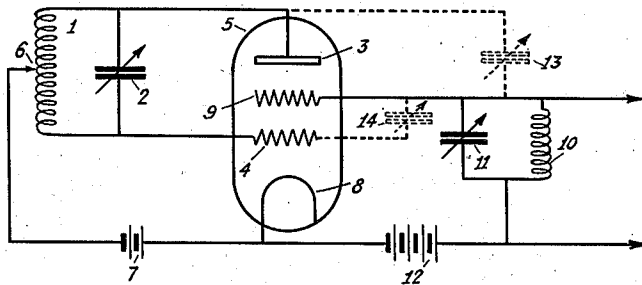


Fig. 2



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THERMIONIC AMPLIFIER

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16 Claims. (Cl. 179-171)

This invention relates to thermionic amplifiers and detectors, and has for its principal object to provide an improved thermionic amplifier or detector suitable for use at high frequencies and in which liability to self-oscillation, due to inter-electrode and the like capacity in the amplifier, shall be reduced to a minimum.

According to this invention a thermionic amplifier or detector comprises a four-electrode thermionic valve, an output circuit associated with one electrode of said valve, and input means arranged in push-pull fashion between two other electrodes of the said valve, the input circuit being completed from a point on said input means to the fourth electrode and the whole arrangement being such that the part or whole of the effect of interelectrode and the like capacity between the output electrode of the valve and one input electrode thereof is wholly or in part compensated by the effect of inter-electrode and the like capacity between the said output electrode and the other input electrode.

Preferably the point on the input means which is connected to the fourth electrode is made variable.

A more complete understanding of the invention will be had from the following specification, and from the specification when read in connection with the drawing in which;

Figure 1 shows one form of the invention in which the internal capacity between the plate and outer grid balances the capacity between the outer and inner grid while

Figure 2 shows a modification of Figure 1.

Referring to Figure 1 of the drawing, which shows one way of carrying out the invention, an input oscillatory circuit, comprising an inductance 1 and shunt variable condenser 2, is connected between the plate 3 and inner grid 4 of a four-electrode valve 5, the said plate and inner grid thus constituting the input electrodes of the valve.

A variable tapping point 6 upon the inductance 1 in the input oscillatory circuit 1-2 is connected (through a grid bias battery 7, if required) to the cathode 8 of the valve.

The outer grid 9 of the valve is connected through an output tuned circuit comprising an inductance 10 and shunt variable condenser 11, and thence through a high tension battery 12 to the cathode. The amplified output of the valve may be tapped off in any well known way from the output electrode, i. e. the outer grid.

It will be seen that with this arrangement the effective plate-outer grid capacity tends to neu-

tralize the effective inner grid-outer grid capacity and by adjustment of the variable tapping point upon the inductance in the input circuit, substantially complete neutralization may be obtained.

For slight departures from complete neutralization the amplifier may be brought to reaction by adjustment of the filament current.

In a modification shown in Figure 2 a small and preferably adjustable external condenser is provided in parallel with the lesser capacity. Such a condenser may be provided as shown in dotted lines in Figure 2 at 13 or at 14, according to whether the plate-outer grid or outer grid-inner grid is the lesser capacity. With the condenser provided at 14 (as in the figure) the point 6 may be adjusted towards the top of the inductance 1, thus obtaining a larger proportion of the oscillating potential on the inner grid, which is, of course, the more effective electrode from the point of view of control.

Although the term push-pull has been employed in describing the present invention, the said term is not to be understood to imply that control is shared equally between the two electrodes between which input means are arranged in what has hereinbefore been termed "push-pull" fashion, although in known push-pull arrangements the "push" is generally equal to the "pull". In arrangements in accordance with the present invention, practically all the control is effected by the grid electrode, to which the input means are connected, although such effect as the anode has as regards control is beneficial.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In an electron discharge device amplifier comprising a four electrode valve, an output circuit connected between the outer grid and cathode of said valve, an input circuit including an input inductance arranged push-pull fashion between the anode and inner grid of said valve, and connecting means between a point on said input inductance and the cathode of said valve.

2. In an electron discharge device amplifier comprising a four electrode valve, an output circuit connected between the outer grid and cathode of said valve, an input circuit including an input inductance arranged push-pull fashion between the anode and inner grid of said valve, and variable connecting means between a point on said input inductance and the cathode of said valve.

3. In an electron discharge device amplifier comprising a four electrode valve, an output circuit connected between the outer grid and cathode of said valve, an input circuit including an input inductance arranged push-pull fashion between the anode and inner grid of said valve, connecting means between a point on said input inductance and the cathode of said valve, and a variable condenser connected between the outer grid and an adjacent electrode of said valve.

4. An electron discharge device amplifier including a thermionic valve having anode, cathode, control grid and an auxiliary electrode, an output circuit connected between said auxiliary electrode and said cathode, an input circuit including an inductance connected directly between the inner grid and anode of said valve and a variable tap connecting a point on said inductance to said cathode, the position of said tap being such that the alternating potential applied through the inherent capacity of said tube from the auxiliary electrode to the control grid is compensated by the alternating potential applied through the inherent capacity of said tube from the auxiliary electrode to said anode.

5. In combination, an electron discharge tube provided with a cathode, an anode and two intermediate electrodes, a resonant circuit connected between one of said electrodes and the cathode, and a second resonant circuit connected between the remaining intermediate electrode and the anode, the potentials of said anode and last mentioned electrode being maintained in opposite phase relation.

6. In combination, an electron discharge tube provided with a cathode, anode, control grid and auxiliary electrode, means for applying a potential to said electrode which is positive with respect to said cathode, a resonant circuit coupled to said electrode and cathode, and a radio frequency oscillation circuit coupled between said anode and grid, the potentials on said anode and grid being in opposite phase relation.

7. A high frequency circuit comprising an electron discharge tube provided with an anode, cathode, grid and an auxiliary electrode disposed between the grid and anode, a source of energy for supplying a potential to said electrode which is positive with respect to said cathode, a resonant circuit between the latter and said cathode, and a source of high frequency oscillations coupled to said grid and anode.

8. A high frequency circuit comprising an electron discharge tube provided with an anode, cathode, grid and an auxiliary electrode disposed between the grid and anode, means for applying a potential to said electrode which is positive with respect to said cathode, a resonant circuit connected to the latter, a source of high frequency oscillations coupled to said grid and anode, and a connection between said cathode and a point on said resonant circuit.

9. A radio frequency receiver comprising an electron discharge tube provided with an anode, cathode, grid and auxiliary electrode, means for maintaining the latter positively biased with respect to the anode and cathode, a tunable output resonant circuit connected in the auxiliary electrode circuit, and an independent radio frequency oscillation circuit connected to the anode.

10. In an electron tube circuit, a thermionic

tube including a cathode, a grid and an anode, an input circuit comprising a source of potential disposed between said anode and cathode, an output circuit including a second source of potential and disposed between said grid and cathode, said source of potential in said input circuit being connected to subject said anode to a negative charge and said source of potential in said output circuit being adapted to subject said grid to a positive charge.

11. In combination, in a receiver of high frequency signal waves, an electron discharge tube provided with a cathode, a cold electrode and two additional cold electrodes, an output circuit connected between said first cold electrode and the cathode, and a resonant signal input circuit connected between the two additional cold electrodes, the signal potentials of said two additional cold electrodes being maintained in opposite phase relation, and a connection between the cathode and a point on said resonant input circuit.

12. In an electron tube circuit, an electron tube including a cathode, a grid and an anode, a circuit comprising a source of potential disposed between said anode and said cathode, an output circuit including a second source of potential and disposed between said grid and cathode, said source of potential in said first circuit being connected to subject said anode to a negative charge and said source of potential in said output circuit being adapted to subject said grid to a positive charge.

13. In an electron tube system, an electron tube having at least one cathode, one grid, and one anode, a source of alternating current connected to said anode and said cathode, a source of direct current grid potential, and an output circuit connected through said source of grid potential to said grid and said cathode for applying to said grid a potential positive with reference to said cathode.

14. In an electron tube system, an electron tube having at least one cathode, one grid, and one anode, a source of alternating current connected to said anode and said cathode, means connected in series between said source and said anode and cathode for maintaining said anode at a determined potential with reference to said cathode, a source of direct current grid potential, and an output circuit connected through said source of grid potential to said grid and said cathode for applying to said grid a potential positive with reference to said cathode.

15. In combination, an electron discharge tube comprising a cathode, anode, inner and outer grids, a tunable resonant input circuit coupled between said anode and inner grid, and a tunable resonant output circuit coupled between said outer grid and cathode, and a connection from said cathode to said input circuit.

16. In combination, an electron discharge tube comprising a cathode, anode, inner and outer grids, a tunable resonant input circuit coupled between said anode and inner grid, and a tunable resonant output circuit coupled between said outer grid and cathode, and means for maintaining said anode and inner grid negative with respect to said cathode.

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