

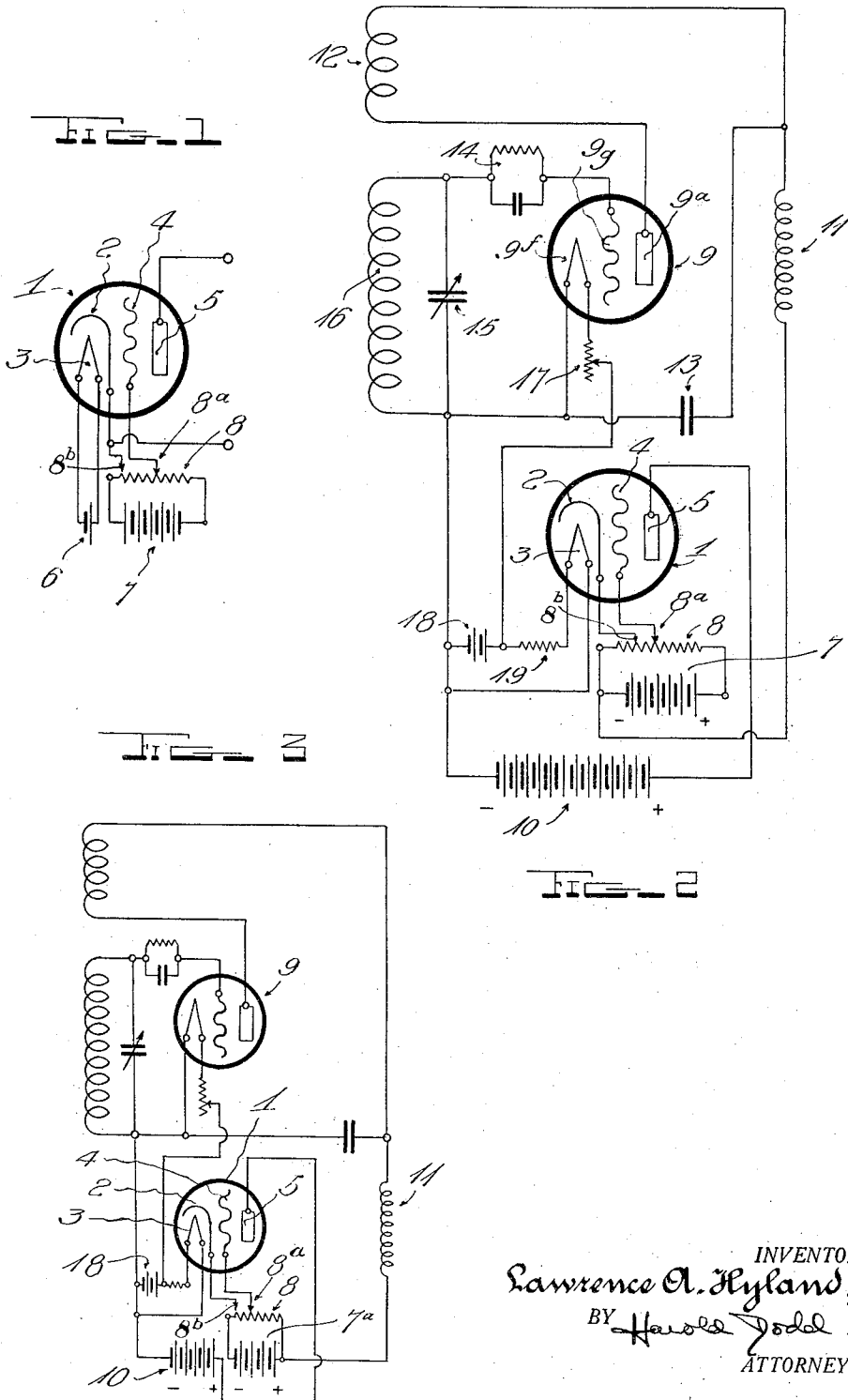
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ELECTRON DISCHARGE DEVICE CIRCUIT ARRANGEMENT

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ELECTRON DISCHARGE DEVICE CIRCUIT ARRANGEMENT

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My invention relates broadly to electron discharge devices and more specifically to electron discharge devices employed for controlling the resistance of circuits.

5 One of the objects of my invention is to provide an electron discharge device circuit arrangement whereby the resistance of circuits connected with the electron discharge device may be controlled.

10 Another object of my invention is to provide an electron discharge device circuit arrangement wherein the resistance of circuits connected with the electron discharge device may be varied continuously throughout
15 wide ranges.

Still another object of my invention is to provide an electron discharge device circuit arrangement in which a space discharge device is employed to control the conditions
20 of operation.

A further object of my invention is to provide an electron discharge device circuit arrangement for generating electrical oscillations in which an electron discharge device is employed to control the magnitude of the oscillations.

Still a further object of my invention is to provide an electron discharge device circuit arrangement for receiving signaling energy, in which the regenerative condition may be readily controlled.

30 A still further object of my invention is to provide an electron discharge device signal receiving circuit arrangement wherein a space discharge device which is energized from the sources of current supply employed to energize the circuits of the signal receiving circuit is used to control conditions of operation of the receiving circuit.

40 Another and further object of my invention is to provide a circuit arrangement employing electron discharge devices having cathode electrodes energized from a common source of current supply in which one of the electron discharge devices is employed to control the magnitude of the current flowing through the anode circuits of the other electron discharge devices.

Still another and further object of my invention is to provide a space discharge de-

vice arrangement for controlling the resistance of electrical circuits connected therewith, in which an electron emitting electrode is substantially electrically isolated from the circuits of the electrode which acts to maintain the electron emitting electrode in operative condition.

Other objects and features of my invention will be apparent from the following specification and accompanying drawing.

60 According to my invention an electron discharge device having a cathode, which is heated through the action of an electrode electrically isolated therefrom, a grid electrode and an anode is employed in a circuit arrangement as a continuously variable resistance device. A source of potential is connected with the cathode. A potentiometer is connected between the grid electrode and the source of potential whereby the grid electrode
65 may be maintained at any one of an infinite number of different potentials with respect to the cathode and the resistance of the electron current path between cathode and the anode may be varied.

70 My invention is employed to considerable advantage in controlling the regenerative condition of receiving circuits, employing the well known feed back principle, in which the part of the energy of the output circuit is transferred to the input circuit so as to augment the electrical oscillations of the input circuit. It is, however, to be understood that my invention is readily adapted for use in controlling various amplifying circuits in which the tendency of the circuit to generate self excited oscillation is due only to the inherent inter-electrode capacities. The arrangement of my invention is likewise readily adapted for use as a sound intensity control or output control in radio signal receiving sets as will be seen from the following description.

75 In the drawing, Figure 1 illustrates the circuit arrangement of the electron discharge device variable resistor; Fig. 2 illustrates an embodiment of this invention; and Fig. 3 illustrates a modified form of this invention.

Referring to Fig. 1 of the drawing in detail, reference numeral 1 designates an elec-

tron discharge device which may be any type in which the electron emitting cathode 2 is heated to its normal operating temperature by an auxiliary heating electrode 3 which is electrically isolated from the cathode 2. A grid electrode 4 and an anode 5 are also disposed within the device 1. A source 6 of current supply is connected to the heating electrode 3. Source 7 of relatively high potential is connected to the potentiometer 8. A variable contact 8a of the potentiometer is connected to the grid electrode 4 whereby the negative potential at which the grid electrode is maintained with respect to the cathode may be varied. The tap 8b on potentiometer 8 connects to the cathode 2 and enables a selected potential to be impressed on the cathode from source 7.

In Fig. 2 an arrangement wherein the apparatus of Fig. 1 is employed to control the output circuit resistance of the electron discharge device 9 is illustrated. A source 10 of anode current supply for the device 9 is connected to the anode 5 of the device 1. A choke coil 11 is provided in the output circuit of device 9 between the inductance 12 which is connected to the anode 9a and the cathode 2 of device 1. A high frequency bypass condenser 13 is connected between the inductance 12 and the cathode of device 9.

Grid leak and grid condenser 14 are connected to the grid electrode 9g and the oscillatory circuit comprising capacity 15 and inductance 16. Where the device 9 is employed as a high or low frequency amplifier the grid leak resistance and the grid condenser 14 are generally eliminated. A source 18 of current supply for heating the cathode 9f and the heating electrode 3 is connected into the circuits of devices 1 and 9 through the current limiting resistance units 17 and 19. The operation of the continuously variable resistance arrangement including the electron discharge device 1 is as follows:

The anode 5 is connected with the positive terminal of the source 10 and the heater electrode 3 is connected with the negative terminal of the source 10 whereby an electrostatic field is set up between the electrode 3 and the anode 5. Electrons are caused to stream from the electron emitting surface of electrode 2. Through the action of the electrostatic field the electron stream passes to the anode 5 and gives rise to a current flow in the cathode anode circuit of device 9. By introducing either a positive or negative potential on the grid electrode 4 with respect to the electrode 2 the quantity of electrons, that are emitted by the electrode 2, that finally reaches the anode 5, is varied. The resistance of the electron discharge device 1 is thus varied. In practice it is usually desirable to maintain the grid electrode 4 at a negative potential with respect to the electrode 2.

However in certain circuit arrangements

such as illustrated in Fig. 3 of the drawing, in which the source of current supply 7a is employed in conjunction with the source of supply 10 as a source of anode current for the device 9, it is desirable to maintain the grid electrode at slight positive potentials with respect to the cathode 2.

The source 18 which is employed for the purpose of heating the cathode electrodes of devices 1 and 9 may be of any of a variety of well known direct current or alternating current sources.

While I have described my invention in certain of its embodiments it is to be understood that various modifications thereof may be made without departing from the scope and spirit of this invention, and therefore I do not desire to limit this invention to the exact details as set forth in the foregoing specification except in so far as they are defined by the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In an electron tube system, an electron tube having anode, grid and cathode, a second electron tube having anode, grid, cathode and heater electrode, said heater electrode being in thermal relation with the cathode of said second tube but electrically insulated therefrom, the anode of said first mentioned tube being connected to the cathode of said second mentioned tube, an input circuit connecting the grid of said first mentioned tube to its cathode, a source of anode potential having its negative terminal connected to the cathode of said first mentioned tube and having its positive terminal connected to the anode of said second mentioned tube, an independent source of grid biasing potential, and a voltage divider connected for variably applying a portion of said biasing potential between the cathode and grid of said second tube.

2. In an electron tube system, an electron tube having anode, grid and cathode, a second electron tube having anode, cathode and heater electrode, said heater electrode being in thermal relation with the cathode of said second tube but electrically insulated therefrom, the anode of said first mentioned tube being connected to the cathode of said second mentioned tube, an input circuit connecting the grid of said first mentioned tube to its cathode, a source of anode potential having its negative terminal connected to the cathode of said first mentioned tube and having its positive terminal connected to the anode of said second mentioned tube, and a common source of potential for energizing the cathode of said first mentioned tube and the heater electrode of said second mentioned tube.

3. In an electron tube system, an electron tube having anode, grid and cathode, a sec-

ond electron tube having anode, grid, cathode and heater electrode, said heater electrode being in thermal relation with the cathode of said second tube but electrically insulated therefrom, the anode of said first
5 mentioned tube being connected to the cathode of said second mentioned tube, an input circuit connecting the grid of said first mentioned tube to its cathode, a source of anode
10 potential having its negative terminal connected to the cathode of said first mentioned tube and having its positive terminal connected to the anode of said second mentioned tube, an independent source of grid biasing
15 potential, a voltage divider connected for variably applying a portion of said biasing potential between the cathode and grid of said second tube, and a common source of potential for energizing the cathode of said first
20 mentioned tube and the heater electrode of said second mentioned tube.

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