

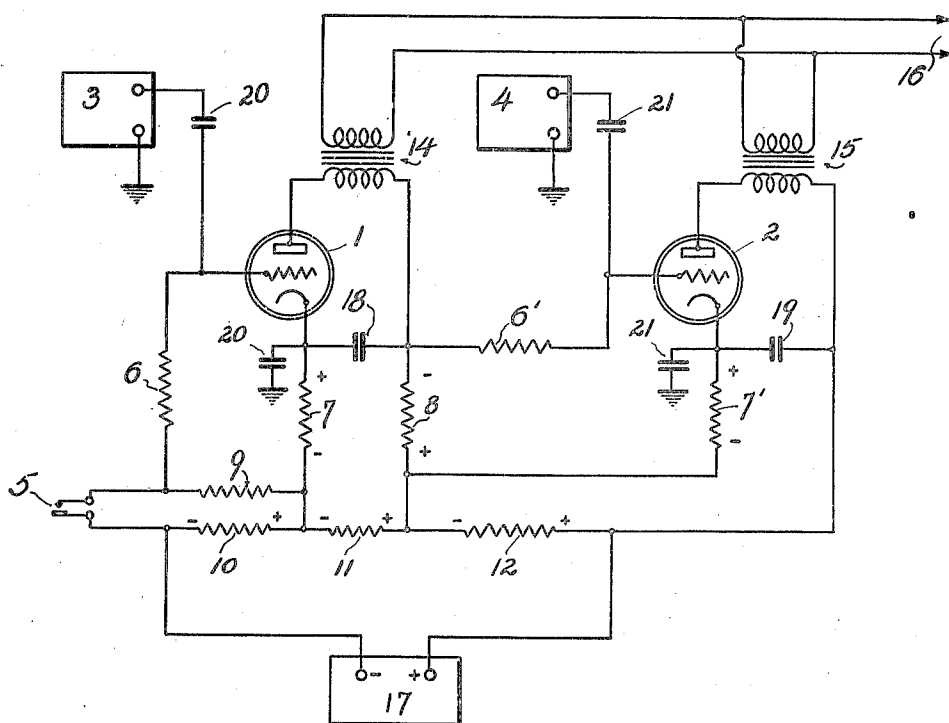
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TRANSMISSION SYSTEM

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TRANSMISSION SYSTEM

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5 Claims. (Cl. 178-66)

My invention relates broadly to high frequency signaling and more particularly to modulating systems for keying a high frequency transmitter.

The system of my present invention is an improvement upon the circuits disclosed in my patent numbered 2,033,948, granted March 17, 1936, and has likewise for its principal object the elimination of time delay in the keying of a high frequency transmitter caused by the operation of mechanical relays in the keying circuits. The system of my invention is applicable to two-tone modulation systems wherein one or another low frequency oscillation or tone is caused to modulate a high frequency carrier wave in accordance with a signal code. The system of my invention is also applicable to the transmission of facsimile images wherein the high frequency carrier wave is modulated in accordance with the character of the image by the blocking and unblocking of amplifier circuits for regulating the transfer of high frequency power to the antenna.

One of the objects of my invention, therefore, is to provide a circuit arrangement which does not employ mechanical relay devices for keying a high frequency transmitter.

Another object of my invention is to provide a system for controlling the operation of a pair of electron tubes by simultaneously controlling the grid bias supplied to each, one only of said tubes being operative at any time.

Still another object of my invention is to provide a circuit arrangement whereby the anode current flowing in one of a pair of electron tubes produces a potential to render the second tube inoperative; and wherein the first tube is normally operative by virtue of an optimum grid bias but rendered inoperative by a cut-off potential applied to the grid upon the operation of switching means.

A still further object of my invention is to provide a circuit arrangement for controlling the operation of a pair of electron tubes having unsymmetrical grid and unsymmetrical anode circuits, the anode circuit of one of said tubes being interconnected with the grid circuit of the other of said tubes.

Other and further objects of my invention reside in the circuit arrangement hereinafter more fully described with reference to the accompanying drawing, which shows my invention applied to a two-tone transmission system, for purposes of illustration.

Referring to the drawing in more detail, reference characters 1 and 2 indicate electron tube amplifiers having anode, cathode and grid elec-

trodes as the essential elements thereof. Two sources of current of different frequencies are shown broadly at 3 and 4. A key switch for controlling the operation of the system is shown schematically at 5. The switch 5 may be one of a series of switches adapted to be operated in accordance with the symbols of the Baudot code when the system of my invention is applied to printing telegraph systems; or the switch 5 may be actuated by a photoelectric or other arrangement in systems such as for facsimile transmission.

Two frequencies of different periods are supplied continuously by generators 3 and 4 and applied to tubes 1 and 2. When switch 5 is open, tube 1 is operative as an amplifier and tube 2 is inoperative; and conversely, when switch 5 is closed, tube 1 becomes inoperative and tube 2 is operative as an amplifier.

More specifically, when switch 5 is open, the grid-cathode circuit of tube 1 includes filter resistor 6, leak resistor 9, and bias resistor 7. Voltage for the anode is supplied by the potential drop across resistor 11, one of the voltage dividing resistors 10, 11, 12, connected across the voltage supply 17. Resistor 7 supplies proper negative bias for normal operation of tube 1, and the energy from frequency generator 3, which is applied to the grid of tube 1 is amplified and passed through output transformer 14 to output terminals at 16.

Now, while tube 1 is operating normally, current flows through the anode circuit thereof, which includes resistor 8. The voltage drop across the resistor 8, being in the potential shown, is applied to the grid of tube 2 in such amplitude as to cause tube 2 to be biased negatively to cut-off, and be inoperative so that energy from frequency generator 4, which is applied to the grid of tube 2, is blocked. The grid-cathode circuit of tube 2 also includes filter resistor 6' and bias resistor 7'. Anode voltage for tube 2 is supplied from the source 17 by the potential drop across resistor 12.

When switch 5 is closed, the grid-cathode circuit of tube 1 includes resistor 10 connected in parallel with leak resistor 9; and as resistor 10 is one of the voltage dividing resistors connected across the voltage supply 17, high negative bias is applied to the grid of tube 1, causing the tube to become inoperative as an amplifier, and blocking the passage of energy from frequency generator 3 to the output 16.

While tube 1 is inoperative, its anode current, and also the voltage drop across the resistor 8, is

zero. Therefore, the grid of tube 2 is relieved of the cut-off potential and supplied with normal operating bias provided by the drop across bias resistor 7'. Tube 2 now is in an operative condition and energy from frequency generator 4 is amplified by tube 2 and passed to the output terminals 16 through output transformer 15.

Capacitors 18 and 19 are by-pass condensers for current of the signal frequencies of the generators 3 and 4 respectively. The "ground" symbols indicate a common connection. Capacitors 20 couple the generator 3 to the grid and cathode of tube 1; and capacitors 21 couple the generator 4 to the grid and cathode of the tube 2.

The system of my invention has uses and adaptations other than the particular arrangement shown in the drawing. The alternate operation of the tubes, simultaneously effected, results in a constant power output which relieves the signals of much distortion. The dependency of one tube on the operation of the other in the manner I have disclosed may be used to advantage in electron tube systems for the maintenance of operation of the system when a normally operative tube fails for any reason, such as a broken connection in its immediate circuits, burned-out filament, etc. Under such conditions, a second tube connected in accordance with my invention becomes instantaneously operative to replace the faulty device.

I have shown my invention in a simple embodiment whereby it may be clearly understood. Modifications may be made in the arrangements disclosed in applying the system of my invention in particular circuits, and I intend no limitations upon my invention except as defined in the appended claims.

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

1. A control system for modulating a high frequency transmitter comprising a pair of audio frequency amplifying electron tubes having anode, cathode, and grid electrodes, and input and output circuits; separate audio frequency generators operative at different frequencies connected to said input circuits, said output circuits being connected to a high frequency transmission system; grid biasing circuits connected with said electron tubes, keying means individual to one of said grid biasing circuits for controlling the operation of the associated electron tube, and means connected with the output circuit of said electron tube for simultaneously controlling the operation of the other of said electron tubes.

2. In a control system for keying a high frequency transmitter, a pair of electron tube devices having anode, cathode, and grid electrodes; means for supplying potentials to said electrodes comprising a source of potential, a series circuit including a plurality of resistors connected with said source, connections from one of said resistors to the anode and cathode of one of said electron tube devices, connections from an adjacent one of said resistors to the anode and cathode of the other of said electron tube devices, impedance elements in the said connections to said cathodes for supplying operative grid biases for the respective grid electrodes; an impedance element in the

connection to the anode in one of said devices adjacent the connection to the cathode in the other of said devices, the anode in the first said device being connected with the grid in the other of said devices, current of said anode flowing in said impedance element producing a potential drop for supplying cut-off potential to said grid when the first said device is operative; and means for connecting the grid in the first said device to another of the resistors in said series circuit for impressing cut-off potential on said grid, said grid normally being connected with the respective cathode through the impedance element connected therewith.

3. In a control system for keying a high frequency transmitter, a pair of electron tube devices having anode, cathode, and grid electrodes; means for supplying potentials to said electrodes comprising a source of potential, a series circuit including a plurality of resistors connected with said source, connections from one of said resistors to the anode and cathode of one of said electron tube devices, connections from another of said resistors to the anode and cathode of the other of said electron tube devices, impedance elements in the said connections to said cathodes for supplying operative grid biases for the respective grid electrodes; and means for rendering said electron tube devices alternatively operative, including means energized from one of said devices for controlling the operation of the other of said devices, and switching means for controlling the operation of the first said device comprising a leak resistor connected between the grid in said device and the impedance element connected to the cathode of said device and means for connecting another of the resistors in said series circuit in parallel with said leak resistor for applying cut-off potential to said grid.

4. In a control system for keying a high frequency transmitter; an electron tube amplifying device having anode, cathode, and grid electrodes, a source of potential, a series circuit including a plurality of resistors connected with said source, connections from one of said resistors to the anode and cathode in said amplifying device, an impedance element in the connection to said cathode for supplying operative bias potential for said grid electrode, a leak resistor connected between said grid and said impedance element, and switching means adapted to connect another of the resistors in said series connection in parallel with said leak resistor for applying cut-off potential to the grid electrode.

5. In a control system for keying a high frequency transmitter, an electron tube amplifying device having anode, cathode, and grid electrodes, a source of potential, a series circuit including a plurality of resistors connected with said source, means including at least one of said resistors for supplying the electrodes in said amplifying device with operative potentials from said source, said means including a grid biasing circuit; and switching means for connecting said grid electrode with another of said resistors for applying cut-off potential to said grid electrode.

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