

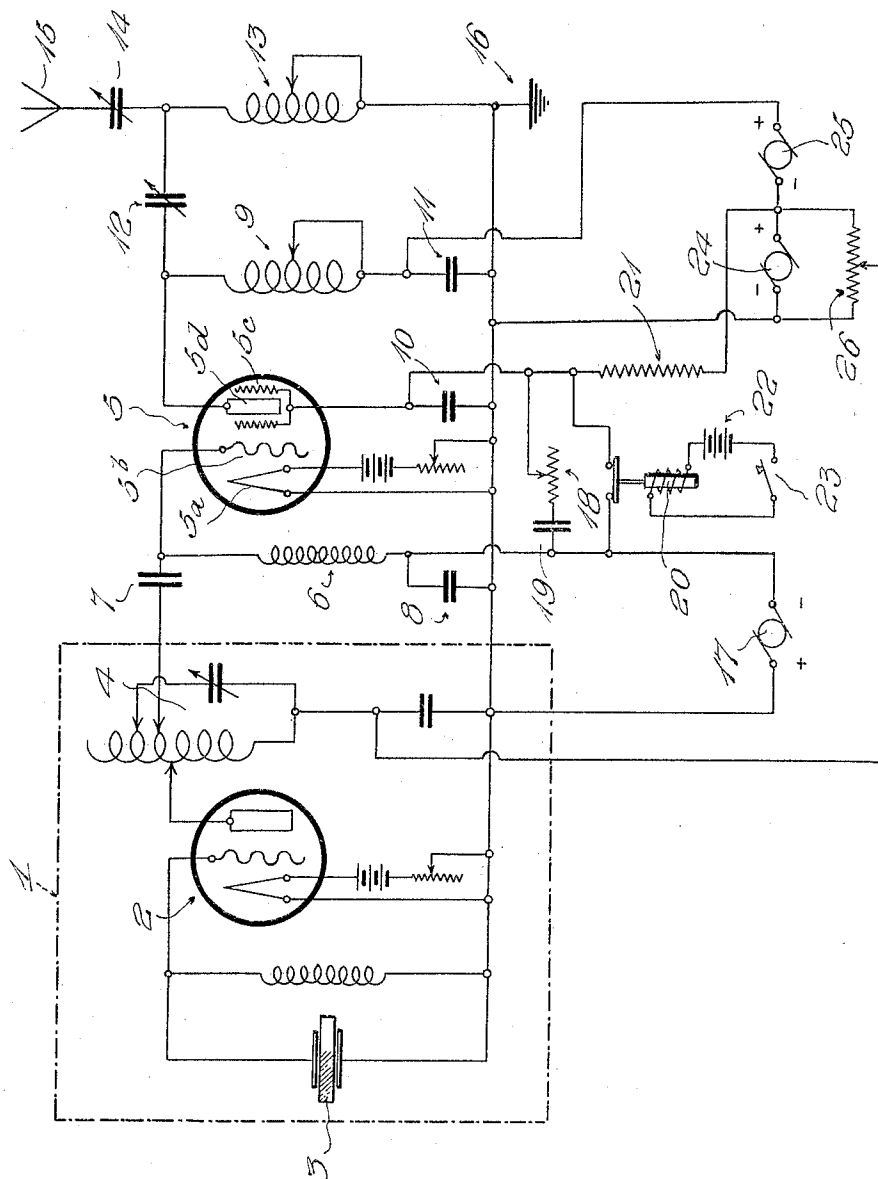
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L. A. GEBHARD

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SIGNALING SYSTEM CONTROL

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INVENTOR.
Louis A. Gebhard,
BY *Harold Dodd*
ATTORNEY

UNITED STATES PATENT OFFICE

LOUIS A. GEBHARD, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO WIRED RADIO, INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

SIGNALING SYSTEM CONTROL

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My invention relates broadly to signaling systems and more particularly to the control of signaling systems.

One of the objects of my invention is to provide an arrangement whereby the operation of signaling systems may be readily and efficiently controlled.

Another object of my invention is to provide an arrangement whereby the output of signaling systems may be readily and efficiently controlled.

Still another object of my invention is to provide an arrangement whereby the output of a signaling system may be modulated for the transmission of intelligence.

A further object of my invention is to provide an arrangement whereby the output of a signaling system may be readily modulated by varying the potential of one of a plurality of grid electrodes of an electron discharge device which is adapted to increase the magnitude of the signaling energy.

A still further object of my invention is to provide an arrangement whereby the output of a shield grid electron discharge device is modulated for the transmission of intelligence by varying the magnitude of the potential impressed upon the shield grid electrode.

Other objects and features of my invention will be apparent to those skilled in the art to which this invention relates from the following specification and the accompanying drawing.

According to my invention the output of signaling systems employing one or more shield grid electron discharge devices is controlled readily and efficiently by controlling the magnitude and polarity of the potential impressed upon the shield grid electrode of one of the electron discharge devices which functions to increase the magnitude of the signaling energy. Under normal operating conditions the shield grid electrode is maintained at a positive potential with respect to the cathode. In accordance with my invention I provide an arrangement in which a high impedance unit is connected into the shield grid electrode circuit of an electron discharge device amplifier and the positive terminal of the source of potential which is

connected with the shield grid electrode, and in which another source of potential is connected with a relay system so that a negative potential is impressed upon the shield grid electrode upon the deenergization of the relay system. When the relay system is energized the normal operating positive potential is applied upon the shield grid electrode of the electron discharge amplifying device and signaling energy of increased magnitude is rendered available in the output circuit of the device.

The operation and details of my invention will be more thoroughly understood from the following specification and the drawing in which the sole figure illustrates the preferred embodiment of my invention.

Reference number 1 designates a constant frequency oscillation source including an electron discharge device 2, a frequency determining and stabilizing element 3, which may be of the piezo electric crystal or the magnetostriction type, and an output circuit 4. A shield grid electron discharge device 5, having a cathode 5a, a grid electrode 5b and an anode 5c, is connected to the circuits of the oscillation generator 1 for increasing the amplitude of the oscillations developed by the oscillation generator. A choke coil 6 is connected to the grid electrode 5b of device 5 to prevent high frequency oscillations of large amplitude from being impressed upon the direct current source 17 which is employed as a source of grid biasing potential for the device 5. A condenser 8 is connected between the low voltage end of the choke coil 6 and the cathode circuit of the devices 1 and 5 to provide a low impedance path for high frequency oscillations transmitted through the choke coil 6. The positive terminal of the source 17 is connected to the cathode circuit of the devices 1 and 5. A coupling condenser 7 is provided for the input circuit of device 5 for coupling the output circuit 4 to the grid electrode 5b. A continuously variable output inductance 9, which has a turn engaging device connected to one end thereof for short circuiting the turns not in use, is connected to the anode 5c of the device 5. A source of anode current for the devices 2 and 5, com-

prising the generators 24 and 25, is connected between the cathode and anode circuits of these devices.

This source of anode current may consist of a battery of any of the well known types or of a rectified alternating current source in place of the generators 24 and 25, illustrated in the drawing. Likewise the source 17 may also consist of any of the well known sources of direct current. Where a battery is employed as a source of anode current for the devices 2 and 5 a portion of it may be used to furnish the grid bias potential for the device 5 in place of the source 17. A potentiometer 26 is connected across the source 24 to provide means for reducing the potential applied to the anode of the device 2. A high resistance unit 21 is connected between the shield grid electrode 5c and the positive terminal of the source 24. This resistance may be of the order of 100,000 ohms. A relay 20 is connected between the shield grid electrode 5c and the negative terminal of the source 17. When the key 23 is released the circuit of the relay 20 and the source 22 of relay energizing current is interrupted and the circuit between the shield grid electrode 5c and the negative terminal of the source 17 is closed whereby the negative potential of the source 17 is impressed upon the shield grid electrode 5c and the electron discharge device 5 ceases to function as an amplifier. When the key 23 is depressed the relay 20 opens the circuit between the source 17 and the shield grid electrode 5c. The shield grid electrode is then maintained at a positive potential with respect to the cathode 5a and the electron discharge device 5 functions as an amplifier. The output of the electron discharge device amplifier 5 is thus controlled by the key 23 through the action of the relay 20.

A condenser 10 is connected between the shield grid electrode 5c and the cathode 5a. Another condenser 11 is connected between the inductance 9 and the cathode 5a. These condensers are employed to provide low impedance paths for high frequency oscillations. A condenser 19 and a variable resistor 18 may be connected in series across the contacts of relay 20 to act as an absorption circuit and render sparking at the contacts of the relay negligible. The antenna circuit comprising the antenna 15, the series tuning condenser 14, the variable inductance 13 and the ground connection 16 is coupled to the output circuit of the device 5 through the variable capacity 12.

Practically no radio frequency voltage exists between shielding grid 5c and cathode 5a because by-pass condenser 10 connected between the shielding grid and cathode will by-pass practically all of any such radio frequency voltage and the radio frequency potential of the shielding grid will be that

of the cathode. For this reason tube 5 can be blocked by a direct current potential applied to shielding grid 5c of very considerably less value than would be required if the keying negative biasing voltage were applied to the control grid 5b on which a radio frequency voltage with reference to the cathode necessarily exists. By the use of my system, the blocking keying potential applied to the shield grid may be as small, or smaller, than the normal control grid negative bias. The figure shows the use of the same source 17 for the normal control grid bias, and also for the negative keying blocking potential impressed on the shielding grid. In the keying systems heretofore employed in which negative blocking potential is impressed upon the control grid of a three-electrode tube, which grid must be maintained at a considerable radio frequency potential to maintain oscillations, the negative potential required to block the grid is far higher than any normal grid biasing potential, and this fact greatly increases the practical difficulties of keying in operation. My method of keying the shielding grid is therefore a substantial improvement over methods heretofore employed.

Where it is desired a greater number of electron discharge devices than is illustrated in the drawing may be employed to increase the amplitude of the high frequency oscillations. The outputs of other arrangements in which a series of frequency multiplying electron discharge devices are employed may also be controlled in accordance with this invention. Various other modifications of this invention may be made without departing from the scope and spirit thereof and it is therefore understood that I do not desire to limit my invention to the exact details as set forth in the foregoing specification except in so far as these details may be 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 a keying system for a radio telegraph transmitter, an electron tube having cathode, anode, control grid and shielding grid, said shielding grid being adjacent said anode, a source of anode potential connected to said anode, oscillating circuits connecting the electrodes of said tube, a source of direct current negative biasing potential connected to said shielding grid of value sufficient to apply to said shielding grid a negative potential which will prevent the delivery of oscillations in the output circuit of said tube, a high current limiting resistance, a source of positive operating biasing potential connected through said current limiting resistance between said shielding grid and said cathode, and means inserted in the circuit connecting said source of negative biasing

potential to said shielding grid for interrupting the application of said negative biasing potential to said shielding grid in accordance with a communication code, whereby the transmission of energy from the output circuit of said tube is controlled in accordance with said communication code.

2. In a keying system for a radio telegraph transmitter, an electron tube having cathode, anode, control grid and shielding grid, said shielding grid being adjacent said anode, a source of anode potential connected to said anode, oscillating circuits connecting the electrodes of said tube, a source of direct current negative biasing potential connected to said shielding grid of value sufficient to apply to said shielding grid a negative potential which will prevent the delivery of oscillations in the output circuit of said tube, a high current limiting resistance, a source of positive biasing potential for normal operation connected through said current limiting resistance between said shielding grid and said cathode, a radio frequency by-pass condenser connected between said shielding grid and said cathode for avoiding the maintenance of radio frequency potentials on said shielding grid, and means inserted in the circuit connecting said source of biasing potential to said shielding grid for interrupting the application of said negative biasing potential to said shielding grid in accordance with a communication code, whereby the transmission of energy from the output circuit of said tube is controlled in accordance with said communication code, and the voltage interrupted during keying has a minimum value.

3. In a keying system for a radio telegraph transmitter, an electron tube having cathode, anode, control grid and shielding grid, said shielding grid being adjacent said anode, a source of anode potential connected to said anode, a source of negative control grid biasing potential connected to said control grid of value suitable for normal operation of said tube, oscillating circuits connecting the electrodes of said tube, a source of direct current negative shielding grid biasing potential connected to said shielding grid of value sufficient to apply to said shielding grid a negative potential which will prevent the delivery of oscillations in the output circuit of said tube, a radio frequency by-pass condenser connected between said shielding grid and said cathode for avoiding the maintenance of radio frequency potentials on said shielding grid, the voltage of said source of shielding grid biasing potential not exceeding the voltage of said source of control grid biasing potential, and means inserted in the circuit connecting said source of shielding grid biasing potential to said shielding grid for interrupting the application of said negative biasing potential to said shielding grid

in accordance with a communication code, whereby the transmission of energy from the output circuit of said tube is controlled in accordance with said communication code.

4. In a keying system for a radio telegraph transmitter, a master oscillator electron tube, input and output circuits therefor, a power amplifier electron tube having cathode, anode, control grid and shielding grid electrodes, the output circuit of said master oscillator tube being connected to the control grid of said power amplifier tube, a source of anode potential connected to the anode of said power amplifier tube, oscillating circuits connecting the electrodes of said power amplifier tube, a source of direct current negative biasing potential connected to said shielding grid of value sufficient to apply to said shielding grid a negative potential which will prevent the delivery of oscillations in the output circuit of said power amplifier tube, a high current limiting resistance, a source of positive operating biasing potential connected through said current limiting resistance between said shielding grid and said cathode, and means inserted in the circuit connecting said source of biasing potential to said shielding grid for interrupting the application of said negative biasing potential to said shielding grid in accordance with a communication code, whereby the transmission of energy from the output circuit of said power amplifier tube is controlled in accordance with said communication code.

5. In a keying system for a radio telegraph transmitter, a master oscillator electron tube, input and output circuits therefor, a power amplifier electron tube having cathode, anode, control grid and shielding grid electrodes, the output circuit of said master oscillator tube being connected to the control grid of said power amplifier tube, a source of anode potential connected to the anode of said power amplifier tube, oscillating circuits connecting the electrodes of said power amplifier tube, a source of direct current negative biasing potential connected to said shielding grid of value sufficient to apply to said shielding grid a negative potential which will prevent the delivery of said oscillations in the output circuit of said power amplifier tube, a high current limiting resistance, a source of positive operating biasing potential connected through said current limiting resistance between said shielding grid and said cathode, a radio frequency by-pass condenser connected between said shielding grid and said cathode for avoiding the maintenance of radio frequency potentials on said shielding grid of said power amplifier tube, and means inserted in the circuit connecting said source of biasing potential to said shielding grid for interrupting the application of said negative biasing potential to said shield-

ing grid in accordance with a communication code, whereby the transmission of energy from the output circuit of said power amplifier tube is controlled in accordance with said communication code and the voltage interrupted during keying has a minimum value.

6. In a radio telegraph transmitter employing a four-electrode shielding grid tube, the method of keying which consists in normally applying to said shielding grid when a signal is transmitted, a biasing potential positive with reference to said cathode and of value suitable for maintaining oscillations and during spacing intervals between signals applying to said shielding grid a negative biasing potential with reference to the cathode of value exceeding said normal positive biasing potential and sufficient to cause the blocking of the operation of said four-electrode tube.

LOUIS A. GEBHARD.

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