

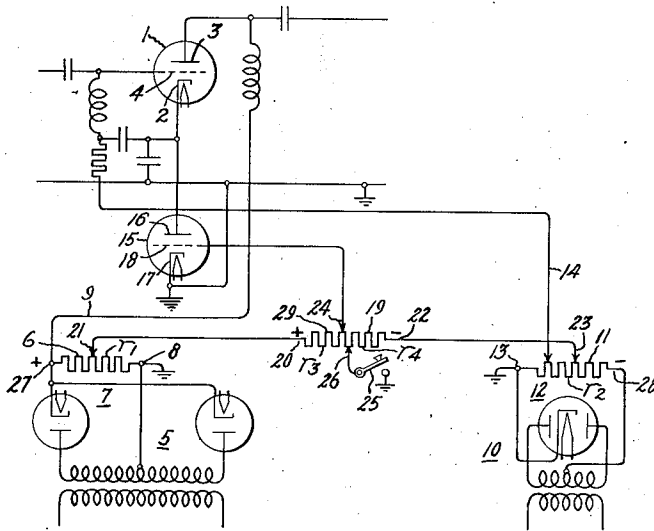
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TRANSMITTER KEYING SYSTEM

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TRANSMITTER KEYING SYSTEM

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My invention relates to keying systems for radio transmitters or the like, and particularly to keying systems for transmitters wherein a space discharge device or tube is employed as a keying tube connected in series with the output circuit of a second space discharge device such as an amplifier.

It is an object of the present invention to provide an improved keying system requiring only a small number of parts to be added to existing transmitter structures.

It is a further object to utilize, in providing a keying system for a transmitter, potential sources already present in the transmitter, such as rectifiers for supplying amplifier anode potential and grid bias potential, as a potential source for the operation of the keying system.

It is a particular object to provide improved means for obtaining in any desired circuit, such as a circuit including a keying tube, a potential which may be readily changed with respect to a potential reference point or to ground, for example from a negative to a positive potential.

The novel features which are considered to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawing the single figure whereof illustrates diagrammatically a transmitter system embodying my invention.

In the single figure of the drawing the numeral 1 designates a space discharge device having a cathode 2, an anode 3, and control electrode 4, and which in the present embodiment of the invention is an intermediate power amplifier of a radio transmitter. Any suitable means (not shown) may be employed to neutralize feedback of energy between the anode and control electrode circuits. The input and output circuits of the amplifier are connected respectively to means (not shown) for producing desired signals to be modulated by a keying means and for radiating the modulated signals. As these signal producing and radiating means form no part of the present invention they will not be described further herein.

Potential for the anode-cathode circuit of discharge device 1 is provided by a rectifier apparatus 5 having a potentiometer resistor 6 connected across its output circuit 7 the low potential, or negative, end 8 of which is at ground.

The anode 3 of device 1 is connected to a point of resistor 6 of suitable potential through a lead 9. Bias potential for the control electrode-cathode circuit of device 1 is similarly provided by a rectifier apparatus 10 having a potentiometer resistor 11 connected across its output circuit 12 the end 13 of which having the higher, or positive, potential is at ground. The control electrode 4 of device 1 is connected to a point of resistor 11 of desired potential through a lead 14.

To provide in series with the anode-cathode circuit of discharge device 1 an impedance which may be varied by a keying means to be described hereinafter, a space discharge device 15, or keying tube, having an anode, 16, a cathode 17 and a control electrode 18 is connected between the device 1 and ground. For this purpose cathode 2 of device 1 is connected to anode 16 of device 15 and cathode 17 of device 15 is at ground.

To control the potential impressed on control electrode 18 of discharge device 15 and thereby to control the impedance introduced into the anode-cathode circuit of discharge device 1 by the discharge device 15, in accordance with the present invention a third potentiometer resistor 19 is provided, one terminal 20 of which is connected, preferably adjustably as by a sliding contact 21 or other suitable means, to a point of any desired potential of resistor 6, and the other terminal 22 of which is, similarly, preferably adjustably connected as by a sliding contact 23 to a point of any desired potential of resistor 11. The control electrode-cathode circuit of discharge device 15 is connected to the resistor 19, the control electrode 18 being adapted to be connected to any desired point of resistor 19, preferably adjustably, by a means such as a sliding contact 24. To vary the bias potential impressed on electrode 18 in accordance with a keying code a keying device 25 is interposed between ground and resistor 19, the device 25 being adapted to be preferably connected adjustably to the latter resistor by means, for example, of a sliding contact 26.

The anode potential supply source, comprising rectifier 5 shunted by potentiometer resistor 6, and the bias potential supply source, comprising rectifier 10 shunted by potentiometer resistor 11, together constitute for the resistor 19 a single source of potential, the two sections of the single source being connected respectively to the opposite terminals 20 and 22 of resistor 19. The potential range thus provided for resistor 19 extends from a point of greatest positive po-

tential, which is terminal 27 of the first section, to an intermediate, or section, connection point indicated by numerals 8 or 13, which are respectively the points of lowest and highest potential of the first and second sections, and from this intermediate point to a point of greatest negative potential which is terminal 28 of the second section. In the present embodiment the intermediate point is at ground.

Suitable filter means (not shown) for the output circuits of rectifiers 5 and 10 are preferably provided which may comprise, for example, usual choke coils in series in the output circuits and capacitors in shunt with the potentiometers.

Since terminal 20 of resistor 19 is connected to the resistor 6 which is at positive potential and terminal 22 is connected to the resistor 11 which is at negative potential, therefore at some point between the positive terminal 20 and the negative terminal 22 of resistor 19 the potential is the same as the potential of the intermediate or ground point, indicated by 8 or 13. The position of this "floating ground" point on resistor 19 is determined in accordance with the adjustment of the points of connection of terminals 20 and 22, of resistor 19, along the potentiometer resistors 6 and 11. The arrangement of the single potential source and resistor 19 is thus such that for any given setting of the adjustment means 21 and 23 four resistances comprised in the resistors 6, 11 and 19 are in a Wheatstone bridge circuit. The four resistance arms of the bridge are respectively r_1 between positive potential point 21 of resistor 6 and ground, r_2 between ground and negative potential point 23 of resistor 11, r_3 between positive potential point 21 and the floating ground point of resistor 19 indicated for the illustrated particular adjustment by the numeral 29, and r_4 between the assumed floating ground point 29 and negative potential point 23 of resistor 11.

Any point of resistor 19 between the positive end 20 thereof and the "floating ground" point, or point of equal potential with that of the connection point between the two sections of the single source, is at a potential positive with respect to the connection point (8 or 13) of the sections and any point of resistor 19 between the negative end 22 thereof and the floating ground point is at a potential negative with respect to the section connection point. If, however, a conductive connection is made between the section connection point (8 or 13) and a point of resistor 19 other than the "floating ground" point, the potential of all points of resistor 19 with respect to the section connection point is changed. If, for example, a circuit be connected, between resistor 19 and the section connection point, at such point of the latter resistor that the potential impressed on the circuit is initially negative, and a conductive path then be provided between the section connection point (8 or 13) and a point of resistor 19 closer to the negative terminal 22 than the circuit connection point, the potential impressed on the circuit becomes positive with respect to the section connection point.

In operation of the transmitter system herein described embodying my invention, anode potential and bias potential are impressed on the anode 3 and control electrode 4 respectively of discharge device or amplifier tube 1 from the rectifiers 5 and 10, and the input circuit of the discharge device 1 is energized by signal potential. The control electrode circuit of the keying tube

15 is connected to the resistor 19 in such manner, as illustrated at point 24, that when key 25 is in its illustrated open position the potential of the control electrode 18 of the tube 15 is negative with respect to the grounded, intermediate, or connection, point (8 or 13) and to the grounded cathode 17 of this tube. Therefore, during the open condition of key 25 the keying tube 15 interposes a high impedance in series with the anode-cathode circuit of amplifier tube 1 sufficient to block the latter tube and to prevent the transmission of the signal to the antenna. Further, the key 25 is connected, as illustrated, to such point 26 of resistor 19 with respect to the connection point 24 of control electrode 18 that when the key is in closed position, thereby connecting the key connection point 26 of resistor 19 to the grounded intermediate or section connection point (8 or 13), the negative bias potential impressed on electrode 18 is removed and the bias potential becomes positive with respect to cathode 17 of keying tube 15. Therefore, under the closed condition of key 25 the keying tube becomes conducting, thereby interposing only a low or negligible impedance in series with the anode-cathode circuit of amplifier tube 1, which accordingly transmits the signal to the antenna, or following amplifier tube, as the case may be.

Keying of the transmitter is, therefore, accomplished by alternately opening and closing the ground connection 26 of resistor 19 by means of the key 25.

My invention has been described herein in a particular embodiment for purposes of illustration. It is to be understood, however, that the invention is susceptible of various changes and modifications and that by the appended claims I intend to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. In combination, a space discharge device having a cathode and a control electrode, a potential source, a resistance connected across two points of different potential of said source, means to connect said cathode to a point of said source having a potential intermediate the potentials of said two points, means to connect said control electrode to a predetermined point of said resistance, and means subsequently to connect said point of intermediate potential to a point of said resistance which is initially of different potential from that of said point of intermediate potential thereby to vary the potential of said predetermined point with reference to the potential of said point of intermediate potential.

2. In combination, a space discharge device having a cathode and a control electrode, a source of potential, a resistance connected across two points of different potential of said source, means to connect said cathode to a point of said source having a potential intermediate the potentials of said two points, means to connect said control electrode to a point of said resistance which is initially of lower potential than that of said point of intermediate potential and means subsequently to connect said point of intermediate potential to a point of said resistance which is initially of lower potential than that of said point of connection of said control electrode to said resistance thereby to render the potential of said last-named point of said resistance positive with reference to the potential of said point of intermediate potential.

3. In combination, a space discharge device

having a cathode and a control electrode, a source of potential, a resistance connected across points of said source which are respectively of higher and lower potential than an intermediate point of said source, means to connect said cathode to said intermediate point means to connect said control electrode to a point of said resistance which is initially at a lower potential than that of said intermediate point whereby a potential negative with respect to said intermediate point is impressed on said control electrode, and means subsequently to connect said intermediate point to a point of said resistance which is at least as close to the point of lowest potential of said resistance as said point of connection of said control electrode to said resistance whereby said negative potential is removed from said control electrode.

4. In combination, a space discharge device having a cathode and a control electrode, a potential source having two sections, means to connect said cathode to the high potential end of one of said sections and to the low potential end of the other section, a resistance connected between a point of predetermined potential of one of said sections and a point of predetermined potential of the other of said sections, means to connect said control electrode to a predetermined point of said resistance whereby a predetermined initial potential is impressed on said control electrode, and means subsequently to connect said cathode to a point of said resistance which is initially of different potential from that of said cathode whereby the potential impressed on said control electrode is changed.

5. In combination, a space discharge device, a source of anode potential and a source of bias potential for said device, a second space discharge device having its anode-cathode circuit connected in series with the anode-cathode circuit of said first-named discharge device and said anode potential source, said second discharge device having a control electrode, means to connect the cathode of said second discharge device to the low potential end of said anode potential source and to the high potential end of said bias potential source, a resistance, means to connect the opposite terminals of said resistance respectively to said anode potential source and said bias potential source at points thereof respectively of higher and lower potential than that of the point of connection of said cathode of said second discharge device to said sources, means to connect said control electrode to a predetermined point of said resistance whereby an initial bias voltage is impressed on said control electrode, and means to connect a predetermined point of said resistance to said point of connection of said cathode of said second discharge device to said

sources whereby a bias voltage different from said initial bias voltage is impressed on said control electrode.

6. In combination, a space discharge device, a source of anode potential and a source of bias potential for said device, two resistances connected respectively across said potential sources, a second space discharge device having its anode-cathode circuit connected in series with the anode-cathode circuit of said first-named discharge device and said anode potential source, said second discharge device having a control electrode, a keying device, means to connect the cathode of said second discharge device to the low potential end of the anode potential resistance and to the high potential end of the bias potential resistance, a third resistance connected at the respective ends thereof to predetermined points of said first and second-named resistances, means to connect said control electrode to a predetermined point of said last-named resistance whereby a predetermined initial bias voltage is impressed on said control electrode, and means including said keying device subsequently to connect a predetermined point of said last-named resistance to said low potential end of said anode potential resistance, said high potential end of said bias potential resistance, and said cathode of said second discharge device whereby a bias voltage different from said initial bias voltage is impressed on said control electrode.

7. In combination, a space discharge device, sources respectively of anode potential and bias potential for said device, two resistances connected respectively across said sources, a second space discharge device connected in series with the anode-cathode circuit of said first-named discharge device and said anode potential source and having a cathode and a control electrode, means to ground said cathode, means to ground the low-potential end of the resistance connected across said anode potential source, means to ground the high-potential end of the resistance connected across said bias potential source, a third resistance connected at the respective ends thereof to predetermined points of said first-named two resistances, means to connect said control electrode of the second space discharge device to a point of said third resistance which is initially at negative potential whereby a negative bias is initially impressed on said control electrode, and means subsequently to ground a point of said third resistance which is at least as close as said last-named point to the low potential end of said third resistance whereby said negative bias potential is removed from said control electrode.

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