

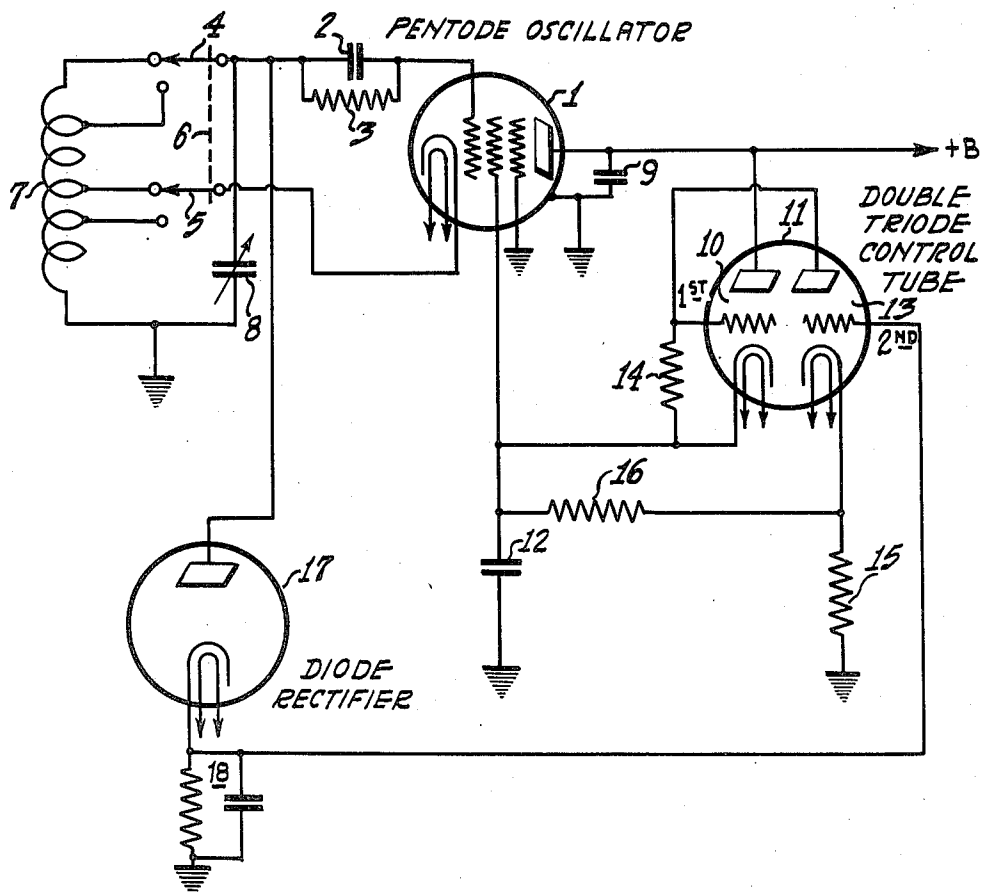
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AUTOMATIC AMPLITUDE CONTROL FOR VARIABLE FREQUENCY OSCILLATORS

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AUTOMATIC AMPLITUDE CONTROL FOR
VARIABLE FREQUENCY OSCILLATORS

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This invention relates generally to thermionic tube oscillation circuits and particularly to an automatic amplitude control circuit especially useful for variable frequency oscillators adapted to operate over a plurality of frequency bands.

Multiple band thermionic tube oscillators employing a common oscillator tube and switching means for connecting thereto different inductive and capacitive elements, depending upon the operating frequency band, have been employed extensively in multiband radio receivers and transmitters. One disadvantage of circuits of this type is that the amplitude of oscillation varies considerably over the several frequency bands and over different portions of each band. Since it is often desirable to maintain the oscillation amplitude at a substantially constant value over the full range of operating frequencies, it has heretofore often been necessary to employ separate individually balanced oscillation circuits.

The instant invention contemplates a simple and efficient circuit for controlling automatically the amplitude of oscillation provided by a multigrid oscillator tube. Briefly, the invention comprises a first triode interposed as a variable resistor in the screen voltage supply circuit connecting the anode and screen electrodes of a pentode oscillator tube. A diode rectifier is connected to a suitable point in the oscillation circuit to derive therefrom a positive control voltage characteristic of the amplitude of oscillations. This control voltage is applied to the control electrode of a second triode which is directly coupled to the control electrode of the first triode which functions as the screen electrode resistor. The circuit effectively comprises a two-stage amplifier for the control voltage which regulates the operating voltage applied to the screen electrode of the pentode oscillator to maintain constant the regeneration, and hence the amplitude of oscillations generated thereby at a substantially constant value notwithstanding changes in the values of the oscillation circuit components.

Among the objects of the invention are to provide an improved thermionic tube oscillation circuit having automatic control of the amplitude of oscillations generated therein. Another object of the invention is to provide an improved automatic amplitude control circuit for a multiband thermionic tube oscillation circuit. An additional object of the invention is to provide an improved automatic amplitude control circuit for a multiband pentode oscillator. A further object of the invention is to provide an improved automatic amplitude control for a multigrid oscillator tube

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wherein the operating voltage applied to the oscillator tube screen electrode is controlled by a thermionic tube circuit responsive to the amplitude of oscillations generated by the oscillator tube.

5 The invention will be further described by reference to the accompanying drawing of which the single figure is a schematic circuit diagram of a preferred embodiment thereof.

Referring to the drawing, the oscillation circuit 10 comprises a pentode oscillator tube 1 having its control electrode connected through a conventional parallelwise connected grid capacitor 2 and grid resistor 3 to the movable element of a first wave-change switch 4. Similarly, the cathode of the pentode oscillator tube 1 is connected to the movable element of a second wave-change switch 5. The movable elements of the first and second wave-change switches 4, 5, respectively, may be ganged as indicated by the dash line 6. The fixed 15 contacts of the wave-change switches 4 and 5 are connected to tapped points on an inductor 7, one end of which is connected to ground. A variable tuning capacitor 8 is connected between the movable element of the first wave-change switch 4 20 and the grounded end of the inductor 7. The suppressor electrode of the pentode oscillator tube 1 is grounded. The pentode anode electrode is connected to a source of positive potential, and also is connected through a capacitor 9 to ground.

30 The anode of the pentode oscillator 1 is connected to the anode of a first triode 10 of a double triode tube 11. The cathode of the first triode 10 is connected to the screen electrode of the pentode oscillator tube 1, and also is connected through a fixed capacitor 12 to ground. The anode of the second triode 13 of the double triode 11 is connected to the control electrode of the first triode 10, and also is connected through a grid coupling resistor 14 to the cathode of the first triode 10. 40 The cathode of the second triode 13 is connected through a cathode resistor 15 to ground, and also through a bleeder resistor 16 to the screen electrode of the pentode oscillator tube 1.

The movable element of the first wave-change switch 4 is connected to the anode of a diode rectifier tube 17. The cathode of the diode rectifier tube 17 is connected to the control electrode of the second triode 13 of the double triode tube 11, and is also connected through a conventional cathode resistance-capacitance network 18 to ground. 50

In operation, a screen voltage to the screen electrode of the pentode oscillator tube 1 is supplied through the variable resistance comprising 55 the anode-cathode circuit of the first triode 10 of

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the double triode 11. Anode voltage for the second triode 13 of the double triode tube 11 is obtained through the grid resistor 14 which is connected between the grid and cathode electrodes of the first triode 10. The cathode of the second triode 13 is suitably biased by means of voltage derived from the screen circuit through the bleeder resistor 15.

Oscillations generated in the oscillator circuit, and applied to the diode rectifier 17, provide a positive control voltage which is applied to the control electrode of the second triode 13 of the double triode tube 11. The control voltage thus applied to the second triode 13 is amplified therein, and applied to the control electrode of the first triode 10 to vary the cathode-anode resistance of the first triode. Variations in the cathode-anode resistance of the first triode 10 provide variable screen voltage on the pentode oscillator 1, which automatically controls the amplitude of oscillations generated thereby. The triode portions 10, 13 respectively, of the double triode control tube 11 effectively comprise a two-stage amplifier responsive to the control voltage derived from the diode rectifier 17 for varying the screen voltage on the pentode oscillator in response to the amplitude of oscillations generated thereby.

It will be seen that an increase in the amplitude of oscillations generated by the pentode oscillator will provide increased positive bias on the control electrode of the second triode 13 of the double triode control tube 11, causing the second triode to draw more plate current and thereby biasing the first triode 10 toward anode current cutoff. The effect of increasing the bias of the first triode 10 toward anode current cutoff condition effectively raises the anode-cathode resistance of the tube and lowers the screen voltage applied to the pentode oscillator 1, which in turn, decreases the amplitude of oscillations generated in the oscillator tube circuit.

Furthermore, lowering of the voltage applied to the screen electrode of the pentode oscillator tube 1 lowers the fixed bias applied to the second triode cathode electrode, thereby increasing the apparent gain of the amplifier system.

Thus the invention described comprises a novel and efficient means for controlling automatically the amplitude of oscillations of a multigrid thermionic tube multiband oscillator circuit whereby control voltages derived from the oscillation circuit provide effective control of the screen voltage of the oscillator tube.

I claim as my invention:

1. An automatic amplitude control circuit for a variable frequency oscillator employing a thermionic discharge tube having at least a cathode, an anode, a screen electrode and a control grid

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comprising means including a second thermionic discharge tube providing a variable impedance path from said anode to said screen electrode, rectifier means coupled to said oscillator tube control grid and responsive to the amplitude of oscillations generated by said oscillator for deriving control voltages, and means for applying said control voltages to vary the impedance of said variable impedance path to control regeneration in said oscillator by varying the voltage on said screen electrode.

2. An automatic amplitude control circuit for a variable frequency oscillator employing a thermionic discharge tube having at least a cathode, an anode, a screen electrode and a control grid comprising means including a second thermionic discharge tube providing a variable impedance path from said anode to said screen electrode, rectifier means coupled to said oscillator tube control grid and responsive to the amplitude of oscillations generated by said oscillator for deriving control voltages, thermionic tube means for amplifying said control voltages and means for applying said amplified control voltages to said second thermionic tube to vary the impedance of said variable impedance path to control regeneration in said oscillator by varying the voltage on said screen electrode.

3. An automatic amplitude control circuit for a variable frequency oscillator employing a thermionic discharge tube having at least a cathode, an anode, a screen electrode and a control electrode comprising a source of operating voltage for said anode, means including a second thermionic discharge tube having at least at cathode, an anode and a control electrode providing a variable impedance path for said anode voltage to said screen electrode, diode rectifier means coupled to said oscillator tube control electrode and responsive to the amplitude of oscillations generated by said oscillator for deriving control voltages, means including a third thermionic tube for amplifying said control voltages, and a connection from said third tube to the control electrode of said second tube for applying said amplified control voltages to vary the impedance of said variable impedance path to vary the voltage applied to said screen electrode of said oscillator tube.

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