

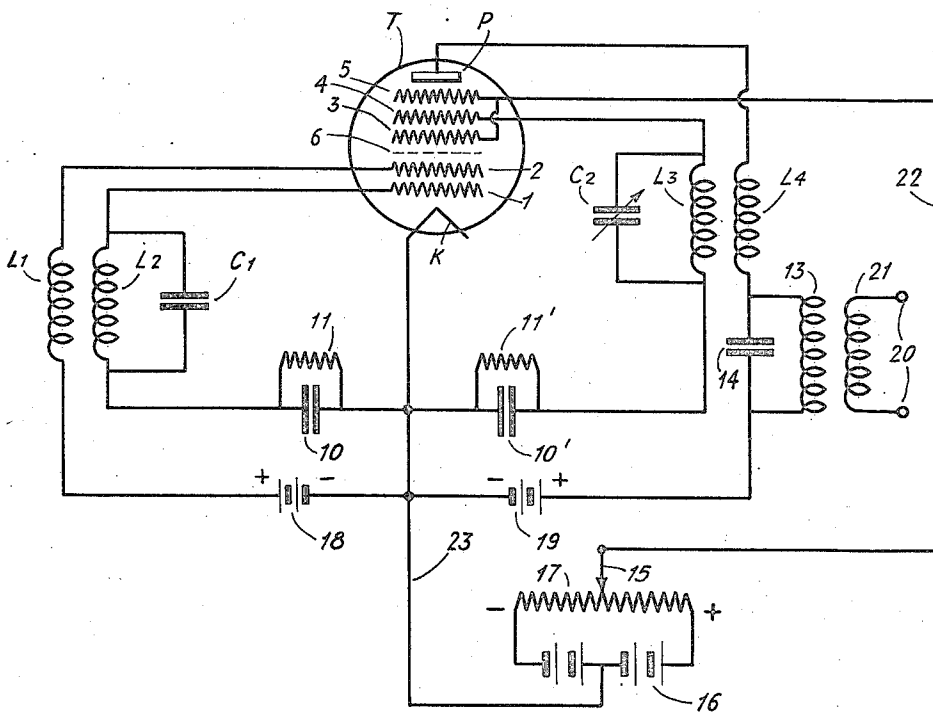
Feb. 18, 1936.

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2,031,100

OSCILLATION GENERATOR

Filed Sept. 10, 1934



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UNITED STATES PATENT OFFICE

2,031,100

OSCILLATION GENERATOR

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Application September 10, 1934, Serial No. 743,328

7 Claims. (Cl. 250—36)

An object of this invention is to provide a vacuum tube arrangement having a plurality of oscillator sections arranged to generate either radio or audio oscillations of different frequencies or one section may generate radio frequency oscillations while the other generates those of audio frequency.

A further object of the invention is to provide a vacuum tube oscillator arrangement in which the amplitude of the generated currents or oscillations may be easily controlled and in such a manner that the oscillation frequency will remain substantially constant or undisturbed.

Other objects of the invention will become evident to those skilled in the art as the description thereof proceeds. For a better understanding of the invention reference is made to the following description taken in connection with the accompanying drawing, in which, the single figure is a schematic circuit diagram of an oscillator arranged according to my invention.

In the design of beat frequency generators, it is the usual practice to employ two separate tube oscillators, one oscillator being set to generate a fixed frequency, while the other is varied in frequency to obtain the desired difference or beat frequency. The resultant beat frequency oscillations are controlled in amplitude by an attenuator network, the design of which has always been a difficult problem because of the wide variation in energy level required for measurement work and other test purposes. It is accordingly an object of my invention to avoid the use of such attenuator devices and also to generate the desired beat frequency by means of a single vacuum tube. A suitable commercial tube for use with the circuit arrangements described is that known as R. C. A. type 2A7.

Referring to the drawing, a vacuum tube T having a heated cathode K, inner oscillator grid 1, grid-anode 2 has a resonant grid circuit comprising coil L₂ shunted by condenser C₁ connected between the grid and cathode, the usual grid leak resistor 11 and condenser 10 also being included in the grid circuit. Between grid-anode 2 and the cathode is connected a circuit including coil L₁ and battery 18 which applies a positive potential to grid 2, the coils L₁ and L₂ being inductively coupled together. These components form an inner oscillator section of the tube, whose oscillation frequency may be controlled by a proper choice of values for coil L₂ or condenser C₁ or both. The outer oscillator section of the tube comprises the plate or anode P and grid 4, the latter being connected to the cathode through

the resonant circuit comprising coil L₃ and variable condenser C₂ and the usual grid leak resistor 11' and condenser 10'. The plate P is shown connected to the cathode through a battery 19, and coils 13 and L₄, L₄ being inductively coupled to L₃ to provide a feedback connection, and if desired, the coil 13 may be shunted by a by-pass condenser 14 which may also aid to tune it to the desired output or beat frequency. The generated oscillations may be taken off the terminals 20 of a secondary coil 21 inductively coupled to coil 13. There is preferably no inductive coupling between coils L₄ and 13.

In order to readily control the amplitude of the generated oscillations, I provide additional grids 3 and 5 which may be conductively connected together within the tube as shown or exteriorly of the tube if desired. These grids are in turn connected as shown by a lead 22 to a sliding contact 15 adjustable along a high resistance or potentiometer 17 which is connected across a steady voltage source, such as a battery 16, the middle terminal of which is connected by lead 23 to cathode K.

The tube operates as though the electrons for the outer section came from a virtual cathode designated by the dotted line 6, the modulation of the currents generated in this section being effected by the modulated electron stream generated by the oscillations of different frequency produced by the inner section.

It will be understood that all the grids shown are located in the path of the electron stream between cathode K and plate P and that the potential and polarity of screen grids 3 and 5 with reference to cathode K may be easily controlled at will by means of adjustable contact 15. This variation of potential and polarity makes possible complete control of the output amplitude of this beat frequency without changing the beat frequency generated.

It will be understood that the inner section of the tube may generate either radio or audio frequency oscillations by proper choice of values of coil L₂ and condenser C₁ and that the outer section may likewise generate either radio or audio frequency oscillations by proper choice of values of coil L₃ and condenser C₂ and also that this frequency may easily be controlled by adjustment of C₂. Also, when both sections of the tube are arranged to generate oscillations of different radio frequencies, the beat frequency produced may be a radio or audio frequency as desired by proper adjustment of condenser C₂.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. A vacuum tube having an inner oscillator section and an outer section, means for causing said two oscillator sections to generate currents of different frequencies, and an output circuit traversed by currents of the beat frequency and means including an electrode in said tube between said sections for controlling the amplitude of the beat frequency oscillations generated without change of frequency thereof.
2. A vacuum tube having a cathode, an oscillator grid, an oscillator grid-anode, a second oscillator grid and a plate, a circuit resonant to oscillation frequency f_1 connecting the first oscillator grid and cathode, a circuit connecting said oscillator grid-anode and cathode including a feedback connection to said resonant circuit, a circuit resonant to oscillation frequency f_2 connecting the second oscillator grid and cathode, a circuit connecting said plate and cathode including a feedback connection to the circuit resonant to frequency f_2 , a grid located between the grid-anode and the plate and means for applying a steady potential of adjustable value to said last-named grid.
3. The combination defined in the preceding claim in which the circuit connecting the plate and cathode includes a coil and condenser connected in parallel and forming a circuit resonant to the beat frequency $f_1 - f_2$.
4. An oscillation generator having a cathode, an oscillator grid, an oscillator grid-anode, a second oscillator grid, a plate, and a control grid located between the grid-anode and the plate, a circuit resonant to oscillation frequency f_1 connecting the first oscillator grid and cathode, a circuit connecting said oscillator grid-anode and cathode including a feedback connection to said resonant circuit, a circuit resonant to oscillation frequency f_2 connecting the second oscillator grid and cathode, a circuit connecting said plate and cathode including a feedback connection to the circuit resonant to frequency f_2 , and means for adjusting the voltage of said control grid to a steady potential which is positive or negative with respect to the cathode potential.
5. An oscillation generator comprising a cath-

ode, an oscillator grid, an oscillator grid-anode, a second oscillator grid, a plate, and a control grid positioned between the grid-anode and the plate, a circuit resonant to oscillation frequency f_1 connecting the first oscillator grid and cathode, a circuit connecting said oscillator grid-anode and cathode including a feedback connection to said resonant circuit, a circuit resonant to oscillation frequency f_2 connecting the second oscillator grid and cathode, a circuit connecting said plate and cathode including a feedback connection to the circuit resonant to frequency f_2 , a steady source of potential having an intermediate tap, a connection between said tap and said tube cathode, a resistor connected across the terminals of said source, a contact adjustable along said resistor, and a connection between said contact and said control grid.

6. An oscillation generator tube comprising a cathode, an oscillator grid, an oscillator grid-anode, a first control grid, a second oscillator grid, a second control grid and a plate arranged within the tube in the order named, a circuit resonant to oscillation frequency f_1 connecting the first oscillator grid and cathode, a circuit connecting said oscillator grid-anode and cathode including a feedback connection to said resonant circuit, a circuit resonant to oscillation frequency f_2 connecting the second oscillator grid and cathode, a circuit connecting said plate and cathode including a feedback connection to the circuit resonant to frequency f_2 , and means for simultaneously adjusting the steady voltages of said first and second named control grids with reference to the potential of said cathode.

7. In combination, a vacuum tube having an anode, a cathode, and four grids between said anode and cathode, an oscillatory circuit resonant to one frequency coupled to the two grids nearest said cathode, another oscillatory circuit resonant to another frequency coupled to said anode and a third grid, and means including said fourth grid located between said first two grids and said third grid for controlling the amplitude of the beat frequency oscillations produced in said tube.

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