

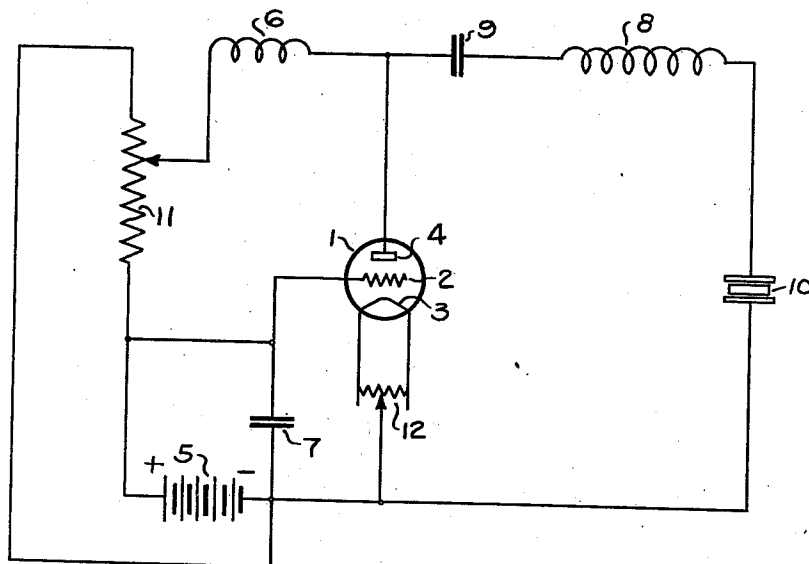
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DYNATRON OSCILLATION SYSTEM

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DYNATRON OSCILLATION SYSTEM

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2 Claims. (Cl. 250—36)

My invention relates broadly to high frequency oscillatory circuits and more particularly to resonant circuits embodying piezo-electric crystals.

One of the objects of my invention is to provide a highly efficient resonant circuit employing a piezo-electric crystal as the frequency determining element and auxiliary filter means for suppressing energy of different frequency.

Another object of my invention is to provide an improved dynatron oscillator circuit having means for maintaining the frequency of oscillation constant.

A further object of my invention is to provide an oscillatory circuit including means selectively responsive to currents of a predetermined frequency and filter means for excluding currents of substantially all other frequencies from the aforesaid means.

Still another object of my invention is to provide a piezo-electric crystal operative at its fundamental frequency and multiples thereof, and filter means in circuit therewith for passing currents only of the fundamental frequency.

A further object of my invention is to provide a highly efficient resonant circuit including means selectively responsive to currents of a predetermined frequency, and auxiliary means offering low impedance to currents at the selected frequency and high impedance to currents at other frequencies.

A still further object of my invention is to provide a series resonant filter in circuit with a piezo-electric crystal for suppressing currents at all frequencies other than the fundamental frequency of vibration of the crystal while offering low impedance to currents at the fundamental frequency.

Still another object of my invention is to provide an electron tube oscillatory circuit embodying the resonant circuit of my invention wherein the operation of the oscillatory circuit is stabilized more efficiently by virtue of the exclusion from the frequency determining element of substantially all but currents of the fundamental frequency thereof.

Other and further objects of my invention reside in the circuits and combinations hereinafter more fully described with reference to the accompanying drawing which is a schematic diagram of the circuit of my invention connected with a dynatron oscillatory circuit.

Piezo-electric crystals and other electro-mechanical vibratory elements have been employed as frequency control means in various circuits for stabilizing electrical oscillations at pre-

termined frequencies. Such devices tend to have modes of vibration other than that desired, producing harmonics and beats that for certain control purposes serve no useful function and reduce the efficiency of the circuit. By the means of my invention the undesired modes of vibration are reduced and the effects thereof substantially eliminated, so that greater efficiency and a higher degree of stability in the circuit results.

The circuit of my invention comprises essentially a series resonant filter connected in circuit with the vibratory element, the filter being constructed to offer low impedance to the fundamental frequency and high impedance to other frequencies. The drawing shows, as one adaptation of my invention, a dynatron oscillator circuit with a piezo-electric crystal connected through a series resonant circuit as the frequency determining means.

Reference character 1 designates an electron tube having a grid 2, a cathode 3, and a plate 4 disposed therein. Power is supplied from a suitable source at 5, the grid 2 being connected to the positive terminal thereof and the cathode 3 to the negative terminal. The plate 4 is connected through a high frequency choke coil 6 to a tap connection on a voltage divider 11 which is connected across the source 5. The potential of plate 4 is less than that of grid 2, and the tube 1 accordingly is operative with a negative resistance between grid and plate; that is, grid 2 at higher positive potential constitutes an accelerating electrode and attracts electrons from cathode 3 which pass to the plate 4 with such velocity as to result in a secondary electron emission from the plate, which electrons are received by the grid. The potential of the grid is lowered as the secondary emission increases; simultaneously, the plate potential increases due to the emission of electrons therefrom; and an inverse current-potential relation in the grid 2 is therefore a result of the negative resistance between grid and plate.

Continuous oscillations are produced by virtue of the negative resistance characteristic in a resonant circuit connected across the negative resistance. In the drawing, condenser 7 bypasses the power source 5 in the grid-cathode circuit and connects with the piezo-electric crystal device 10, inductance 8 and condenser 9 in a series circuit to the plate 4. The relative proportions of inductance 8 and condenser 7 determine the resonant frequency of the combination, which, in accordance with my invention, is the fundamental frequency of the crystal at 10. The

series resonant combination 8, 9, offers high impedance to all frequencies other than the fundamental frequency of the crystal, and the crystal therefore is restricted substantially to its fundamental mode of vibration.

5 In an oscillatory circuit, as in the dynatron circuit shown, the series resonant circuit itself further stabilizes the oscillations produced in that the operation of the circuit is less dependent on the voltages applied to the various elements of
10 the tube 1, that is, the crystal 10 is effectively relieved of off-resonance components which may be developed because of variations in the voltages applied to the tube and is thus more stable in its
15 fundamental vibrations at the resonant frequency.

The arrangement of my invention is adaptable to a variety of circuits, as is the piezo crystal alone, and the illustration of a dynatron oscillator is intended as illustrative only. I desire
20 it understood, therefore, that modifications may be made in the arrangement and the application of the combination of my invention, and that no limitations thereon are intended except as imposed
25 by the scope of the appended claims.

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

1. An oscillation system comprising an electron tube having a cathode, anode and a control electrode, external circuits interconnecting said electrodes, a source of potential for impressing on
5 said control electrode a higher positive potential than is applied to said anode, a frequency determining device, a filter which is series resonant to the fundamental frequency of said frequency
10 determining device, and a series circuit including said frequency determining device and said filter connected between said cathode and said anode.

2. An oscillation system comprising an electron tube having a cathode, anode and a control electrode, external circuits interconnecting said electrodes, a source of potential for impressing on
15 said control electrode a higher positive potential than is applied to said anode, a piezo-electric crystal, a filter which is series resonant to the
20 fundamental frequency of the crystal, and a series circuit including said piezo-electric crystal and said filter between said cathode and said anode.

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