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THERMIONIC OSCILLATION GENERATOR

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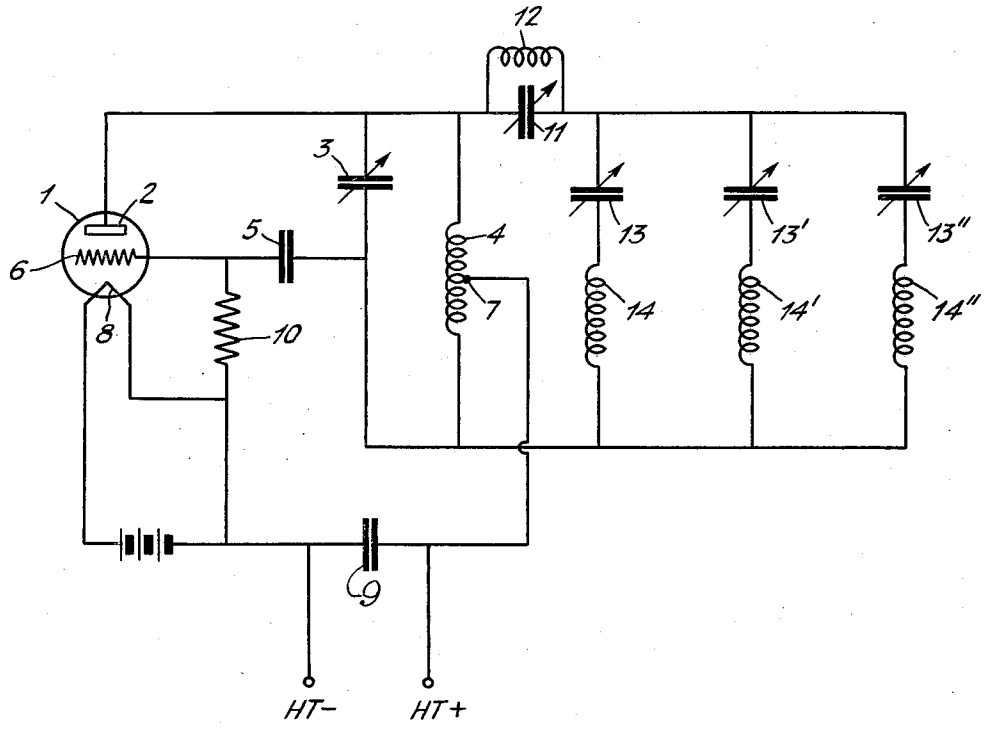

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THERMIONIC OSCILLATION GENERATOR

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5 Claims. (Cl. 250—36)

This invention relates to electron discharge device generators and has for its object to provide an improved electron discharge device oscillation generator which shall be of relatively stable frequency.

It may be shown that, owing to the curvature and asymmetry of the characteristic curves of thermionic valves, the frequency of the oscillations obtained from a thermionic valve oscillation generator wherein a valve is employed in combination with an oscillatory circuit is not entirely a function of the values of magnitude of the said oscillatory circuit, there being also produced currents whose frequencies are multiples of the fundamental or desired frequency. These currents tend to cause the arrangement as a whole to be somewhat unstable as to frequency.

The present invention has for its object to provide a relatively simple and satisfactory electron discharge device oscillation generator arrangement wherein harmonic frequencies are substantially eliminated or their effects to a large extent avoided so that improved stability as regards frequency is obtained.

According to this invention there is provided in association with the oscillatory circuit of an electron discharge device oscillation generator of the kind comprising one or more electron discharge devices in association with an oscillatory circuit arrangement, one or more acceptor circuits tuned to the second and, if desired, higher harmonics of the fundamental frequency, the said acceptor circuit or circuits being in effect shunted across the whole or part of the main oscillatory circuit. In order to prevent any substantial effect upon the fundamental oscillatory circuit due to the presence of the acceptor circuit or circuits, the shunt path in which the said acceptor circuit or circuits is or are included, preferably includes also one or more rejector circuits tuned to the fundamental frequency. Such a rejector circuit not only substantially prevents the fundamental frequency from entering the acceptor circuit, but also provides a so-called "flywheel circuit" effect tending to maintain the desired frequency of oscillation.

One arrangement in accordance with this invention is illustrated in the accompanying drawing which shows a thermionic valve 1, herein illustrated a triode, having its plate 2 connected to one end of a tuned circuit 3, 4, consisting of a variable condenser 3 in shunt with an inductance 4. The other end of the circuit 3, 4, is connected through a grid condenser 5 to the grid 6. A suitable tapping 7 upon the inductance 4 is connected to the positive terminal HT+ of an anode battery whose negative terminal HT— is connected to the cathode 8, the anode battery being shunted as in the usual way, by a by-pass condenser 9. A resistance 10 is connected between grid and cathode of the valve. The tuned circuit 3, 4, constitutes the main oscillatory tuned circuit and is, of course, tuned to the fundamental or desired frequency. The anode end of the main tuned circuit 3, 4, is connected through a rejector circuit 11, 12, and thence through one or more acceptor circuits 13, 14, 13', 14'; 13'' 14''; (if more than one acceptor circuit is utilized they are in parallel with one another as shown) to the other end of the said main tuned circuit 3, 4. The rejector circuit 11, 12, is tuned to the fundamental frequency and the acceptor circuit, if there be one only, is tuned to the second harmonic; if there be two acceptor circuits the second thereof is tuned to the third harmonic; if there be three the third is tuned to the fourth harmonic, and so on. Thus in the illustrated case the circuit 13, 14, is tuned to second harmonic ($\frac{\lambda}{2}$, where λ is the fundamental wave length); the circuit 13', 14' is tuned to the third harmonic; and the circuit 13'' 14'' to the fourth harmonic. It will thus be seen that with this arrangement the fundamental frequency is kept away from the acceptor circuit or circuits by the rejector circuit while the shunt path including the acceptor circuit or circuits constitutes substantially a short circuit for any harmonic frequency for which an acceptor circuit is provided. Obviously, the particular grid circuit described, consisting of a grid condenser and resistance, may be replaced by any other convenient form of grid connection.

In the arrangement above described the shunt path consisting of the rejector circuit in series with the acceptor circuit or circuits is shunted across the whole of the main oscillatory circuit. This is not necessary and the shunt path may, if desired, be connected across only a portion of the inductance in the main oscillatory circuit.

The circuits provided in carrying out this invention should, for practical reasons, contain as large condensers and as small inductances as possible consistent with the maintenance of a reasonable value of high frequency efficiency.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The combination with an electron discharge device oscillation generator having anode and grid electrodes and a circuit tuned to the fundamental frequency coupled between said anode and grid, of a second tuned circuit connected in parallel with at least a portion of said first circuit, said second circuit being series resonant and tuned to a harmonic of said fundamental.

2. The combination with an electron discharge device oscillation generator having in its output a circuit tuned to the fundamental frequency, of a second tuned circuit connected in parallel with at least a portion of said first circuit, said second circuit being tuned to a harmonic of said fundamental, and a rejector circuit tuned to reject said fundamental frequency connected in series between said two tuned circuits.

3. The combination with an electron discharge device oscillation generator having anode and grid electrodes and a circuit tuned to the fundamental frequency coupled between said anode and grid, of a plurality of tuned circuits each series resonant and tuned to different harmonics of said fundamental frequency and conductively connected in shunt across said first circuit.

4. The combination with an electron discharge device oscillation generator having anode and grid electrodes and a circuit tuned to the fundamental frequency coupled between said anode and grid, of a plurality of tuned circuits each series resonant and tuned to different harmonics of said fundamental frequency and conductively connected in shunt across said first circuit, said plurality of tuned circuits each comprising a condenser connected in series with inductance, and a rejector circuit tuned to the fundamental frequency connected in series between said first circuit and said plurality of tuned circuits.

5. An electron discharge device oscillation generator comprising an anode, cathode, and control electrode, a circuit tuned to the fundamental frequency comprising a variable condenser and an inductance in parallel relation thereto connected across said anode and control electrode, a source of unidirectional potential whose positive terminal is connected to a point intermediate the ends of said inductance and whose negative terminal is connected to the cathode, a plurality of tuned circuits each tuned to a different harmonic of said fundamental frequency and connected in shunt across a part, at least, of said first circuit, said plurality of tuned circuits each comprising a condenser connected in series with inductance, means for biasing said control electrode negatively with respect to said cathode, a blocking condenser between said control electrode and said parallel tuned circuit, and means for preventing oscillations of the fundamental frequency from entering said plurality of tuned circuits.

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