

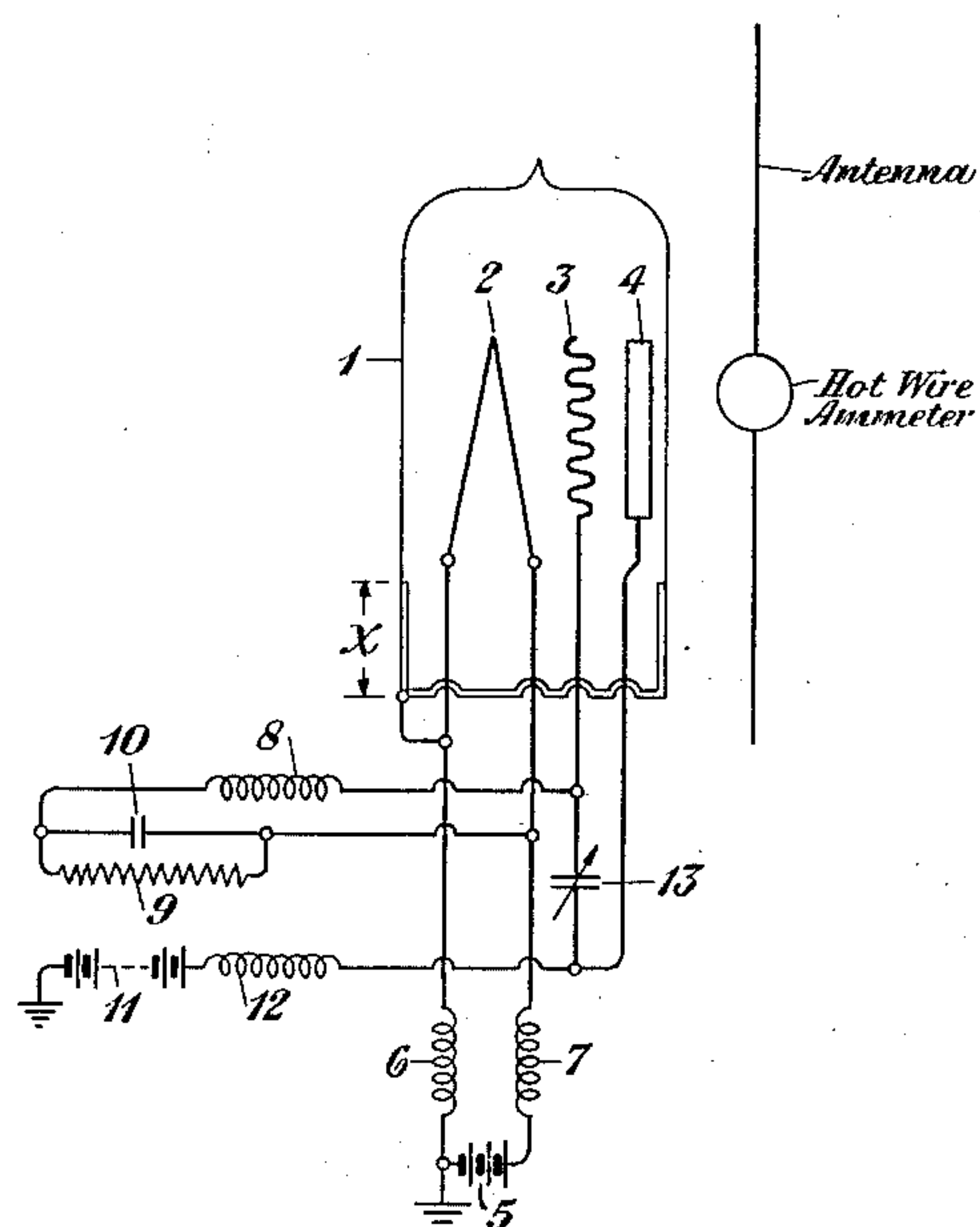
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ULTRAHIGH FREQUENCY GENERATOR

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ULTRAHIGH-FREQUENCY GENERATOR.

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This invention relates to high frequency generators and particularly to a generator of the vacuum tube type designed for the production of ultra-high frequencies.

Generators of the vacuum tube type have been used in many fields of electrical work. Such generators are characterized by a coupling between the output and the input circuits of the vacuum tube by which sufficient energy is fed back from the output circuit to the input circuit to maintain the production of oscillations. The vacuum tube generators of the prior art have been satisfactory where the frequency requirements have not been very high; that is to say, not above 5,000 kilocycles. With the improvements being rapidly made in radio signaling, particularly along the lines of directional control, it is desirable to produce oscillations of relatively short wave length, for example, of the order of magnitude of 5 meters or less.

This invention resides in a vacuum tube generator capable of producing ultra-high frequency oscillations. By the term "ultra-high frequency" is meant a frequency higher than 5,000,000 cycles per second.

The invention will be apparent from the following description when read in connection with the attached drawing showing schematically a form of embodiment of the invention.

In the drawing, the vacuum tube 1 is of the well known three-electrode type comprising a filament 2, a grid 3 and a plate 4. For the purpose of carrying out this invention the tube employed in the generating circuit should have low internal loss at the frequencies of oscillation. The filament 2 is connected with the source of filament-heating current 5, one pole of which is grounded. The connection between the source 5 and the filament includes the choke coils 6 and 7 which should be so proportioned as to have extremely high impedance at the oscillating frequency. The grid 3 is connected with one of the filament leads, the connection including a high frequency choke coil 8, a resistance 9 and a condenser 10, the said resistance serving as the grid leak. The plate 4 is connected with the positive pole of the source 11 of plate potential, the negative pole of which is grounded. The connection between the plate 4 and the source 11 includes a high frequency choke coil 12. Connected between the grid 3 and the plate 4

is a variable condenser 13 which determines the frequency of oscillation of the circuit. The base of the vacuum tube, namely, the part designated x supporting the glass container, which base coacts with a receptacle to hold the tube in correct position, should, in effect, be connected to ground in order to avoid the dissipation of the high frequency energy through its capacity to ground. The possibility of such dissipation will be apparent when it is considered that the base, consisting of a relatively large mass of metal, is in close juxtaposition to the space in which the high frequency oscillations are being set up and has, also, fairly large capacity to ground. A preferred method of grounding the base consists in connecting it with the filament-heating circuit between said filament and a choke coil, for example, 6, so that the choke coil acts in the same manner with respect to the base as to the filament circuit. The leads to the cathode and the grid should have as low inductance and capacity as practicable in the construction of vacuum tubes.

The radiating element of a vacuum tube generator of the type described consists of a rod of copper or similar metal of such diameter as to cause the rod to remain in a fixed position without appreciable vibration. Such a rod should be ungrounded and its length should be one-half the length of the generated wave. The rod should be placed in close juxtaposition to the source of oscillations and should have a thermoammeter inserted midway between the ends of the rod. As thus placed the rod will absorb most of the power output of the vacuum tube generator when the resonant circuit of the tube is attuned to the natural period of the rod.

The manner in which the circuit functions to produce the ultra-high frequency oscillations is as follows: The grounded source of plate potential 11, which for example, may be of the order of magnitude of 1,000 volts, will cause a flow of current from the plate 4 to the filament 2 and to ground through the source 5. This source of plate potential 11 will also apply a charge to the condenser 13 which will produce a negative charge upon the grid 3, which will vary the stream of electrons from the filament 2 to the plate 4. This negative charge upon the grid will, however, be reduced by the grid

leak 9. It will be apparent therefore that there will be a charge and discharge of the condenser 13, and the rate of charge and discharge will depend upon the magnitude
5 of the condenser and of the constants of the tube. The connecting circuits do not appreciably affect the rate of oscillation because the choke coils 6, 7, 8 and 12 have been
10 so chosen as to prevent the passage of high frequency currents through the circuits in which the coils are placed. The oscillations produced within the tube will be transferred to the antenna and radiated therefrom. The
15 connection of the base x of the tube to the grounded lead of the filament heating circuit, which lead includes the high frequency choke coil 6, prevents the dissipation of energy through the base.

20 As an indication of the magnitudes of the various parts, it may be stated that in a generator producing a wave of 5 meters the condenser 13 was variable up to the maximum capacity of 150 mmf.; the condenser 10 had
25 a capacity of .001 mf.; the resistance 9 was of 5,000 ohms; the tube was of 51 watts capacity; the source 5 was of 10 volts and the

source 11 was 1,000 volts. With such an arrangement it was found that the power output efficiency was comparable with that of a vacuum tube generator producing much
30 lower frequencies.

While this invention has been disclosed as embodied in a particular form it is to be understood that it is capable of embodiment
35 in other forms without departing from the spirit and scope of the appended claim.

What is claimed is:

A generator of ultra-high frequency oscillations, comprising a vacuum tube having a plate, a grid and a filament, an evacuated
40 vessel enclosing such electrodes and having a metallic base supporting said vessel, a condenser coupling between said plate and grid, a grounded source of plate potential, a grounded source of filament-heating cur-
45 rent, and a connection between the said metallic base and the grounded side of the source of filament-heating current.

In testimony whereof, I have signed my name to this specification this 23rd day of
50 December, 1924.

RUSSELL S. OHL.