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OSCILLATION GENERATOR SYSTEM

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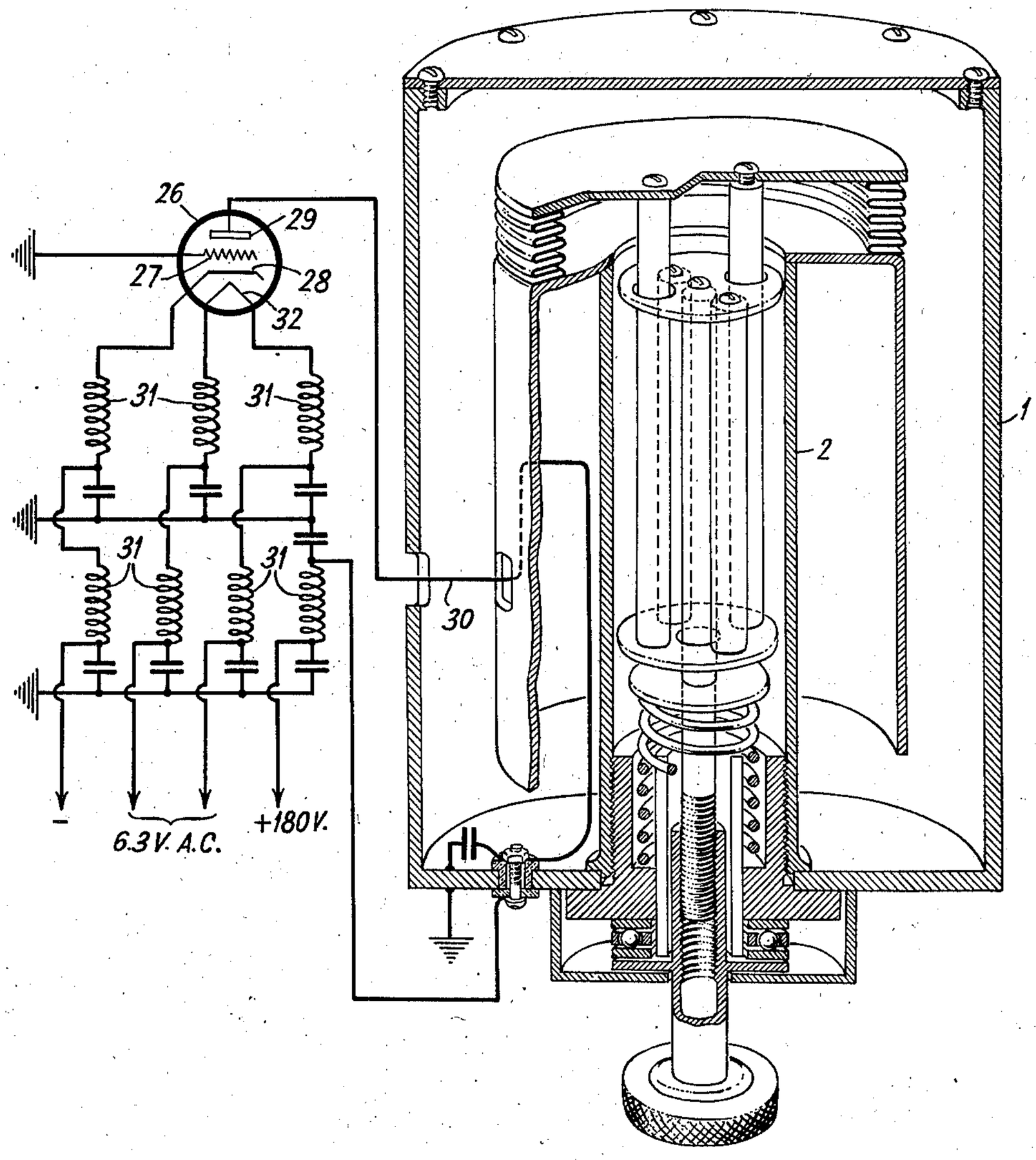

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OSCILLATION GENERATOR SYSTEM

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Original application March 29, 1937, Serial No. 133,614, now Patent No. 2,183,215, dated December 12, 1939. Divided and this application November 3, 1939, Serial No. 302,656

7 Claims. (Cl. 250—36)

The present invention is a division of my copending application Serial No. 133,614, filed March 29, 1937, now United States Patent No. 2,183,215, granted December 12, 1939, and relates to high frequency oscillation generators.

An object of the invention is to provide a novel and desirable type of electron discharge device oscillator circuit for a concentric line resonator, wherein the resonator is coupled between the anode of the device and ground.

Another object is to provide a constant frequency electron discharge device oscillator, wherein the grid of the device is maintained at zero radio frequency potential, and voltage from the anode is fed back to the cathode by means of a capacity potentiometer arrangement.

A more detailed description of the invention follows in conjunction with a drawing whose single figure illustrates my novel oscillator circuit.

Referring more particularly to the drawing, there is shown a tuned circuit in the form of a concentric line resonator 1, 2, associated with which is an evacuated electron discharge device 26 having a grid 27 connected to ground, a cathode 28 maintained above ground potential and its anode 29 coupled inductively to the line resonator through lead 30. The line resonator is thus located in the anode circuit of the electron discharge device between the ground and anode and functions to control the frequency of the oscillator. In other words, the line resonator is so coupled to the electron discharge device 26 that its impedance appears between the anode 29 and ground. The cathode 28 and the heater 32 are both fed through choke coils 31, 31 (preferably of the quarter-wavelength type).

The radio frequency voltage on the anode is fed back to the cathode by means of a capacity potentiometer consisting of the anode-cathode interelectrode capacity and the grid-cathode interelectrode capacity. Both of these capacities are very small, the former being of the order of .5 mmf and the latter of the order of 1 or 2 mmf. Since both elements of the capacity potentiometer are the same type of reactance, namely capacitive, the voltage fed back to the cathode is of the same phase as the anode voltage, a condition necessary for the production of oscillations. The radio frequency voltage on the cathode is in the same phase with the anode voltage and may be expressed by the following equation:

$$E_f = E_p \frac{Xc_{gf}}{Xc_{pf} + Xc_{gf}}$$

where E_f is the voltage on the cathode, E_p the voltage on the anode, Xc_{gf} the capacitive reactance between grid and cathode, and Xc_{pf} the capacitive reactance between anode and cathode.

One advantage of the oscillator circuit of the present invention lies in the fact that there is eliminated the external anode circuit which is customarily necessary in cases where the concentric line is coupled between the grid and cathode of an electron discharge device.

In one embodiment of the invention, used in practice, the electron discharge device was an RCA–955 Radiotron tube of the extremely small type known by the trade-name "Acorn," and such device was mounted on the outer conductor 1 of the concentric resonator. The oscillator circuit and resonator functioned to produce oscillations of about 177 megacycles, although it will be appreciated that the circuit and resonator can be designed to function on any other desired frequency.

It is also to be understood that the term "ground" used in the specification and appended claims is intended to mean any surface or point of zero or relatively fixed radio frequency potential.

What is claimed is:

1. In combination, an oscillator comprising an electron discharge device having only one oscillatory circuit coupled thereto for determining the frequency of oscillations, said device having an anode, a grid, and a cathode, a connection from said grid to ground, means for maintaining said cathode above ground potential, a connection between said anode and ground, said connection being coupled to said oscillatory circuit.

2. A frequency stabilized oscillator comprising an electron discharge device having an anode, a grid and a cathode, a connection from said grid to ground, means for maintaining said cathode above ground potential, a concentric line resonator having an inner and an outer conductor, and means for inductively coupling said resonator to said electron discharge device comprising an untuned linear connection between said anode and ground, a part of said connection being located between said inner and outer conductors and positioned parallel to a portion of the length of said inner conductor.

3. A frequency stabilized oscillator comprising an electron discharge device having an anode, a grid, and a cathode, a connection from said grid to ground, means for maintaining said cathode above ground potential, an untuned anode circuit constituted by a linear connection between said anode and ground, and an oscillatory circuit coupled to said linear connection.

4. A frequency stabilized oscillator comprising an electron discharge device having an anode, a grid, and a cathode, a connection from said grid to ground, means for maintaining said cathode above ground potential, an untuned anode circuit constituted by a linear connection between said anode and ground, and an oscillatory circuit inductively coupled to said linear connection, the radio frequency voltage on said cathode being in the same phase as the voltage on said anode.

5. An oscillation generator comprising an evacuated electron discharge device having a cathode, a pair of cold electrodes and inherent capacity between said cold electrodes and also between each of said cold electrodes and said cathode, means for determining the frequency of oscillation of said generator consisting of a single resonant circuit coupled between said pair of cold electrodes, one of said cold electrodes constituting a grid, a connection of low impedance to energy of the operating frequency from said grid to a point of fixed alternating current potential, whereby the voltage fed back to said cathode through said interelectrode capacity is in phase with the voltage on said anode.

6. A frequency stabilized oscillator comprising an electron discharge device having an anode, a grid, and a cathode, a connection from said grid to ground, means for maintaining said cathode above ground potential, an untuned anode circuit constituted by a connection between said anode and ground, and a low loss oscillatory circuit in the form of a hollow metallic enclosure coupled to said connection.

7. An oscillation generator comprising a pair of terminals one of which is at a fixed alternating current potential, an electron discharge device having a grid connected to said terminal of fixed potential and an anode connected to the other terminal, said device constituting a capacity potentiometer by virtue of the interelectrode capacities, whereby the anode-cathode capacity is in series with the grid-cathode capacity and both together are across said pair of terminals, a single tuned oscillatory circuit effectively coupled across said terminals, untuned means connected between said cathode and said terminal of fixed potential, and means for producing a direct current flow between said cathode and anode.

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