Oct. 27, 1942. W. PUHLMANN 2,300,315

OSCILLATION GENERATOR CIRCUITS

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Fig. 1

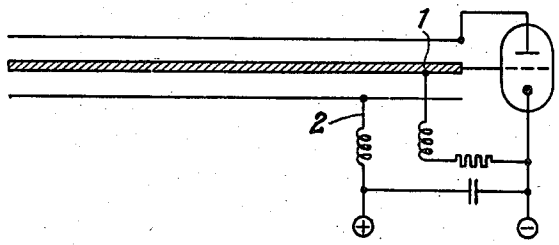


Fig. 2

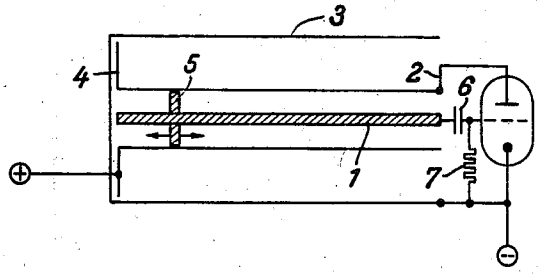
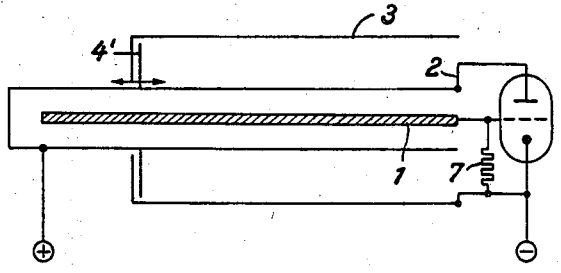


Fig. 3



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OSCILLATION GENERATOR CIRCUIT

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4 Claims. (Cl. 250—36)

This invention relates to oscillation generator circuits for obtaining oscillations of ultra-high-frequencies, and consists in certain features of novelty which will be fully understood from the following description and be pointed out in the appended claims; reference being had to the accompanying drawing in which:

Fig. 1 represents an oscillatory circuit of the prior art; Fig. 2 shows a generator circuit according to the present invention; while Fig. 3 is a modification of the arrangement shown in Fig. 2.

The impractibility of using concentric type tuning means in the ultra-high frequency range, leads to the application of tuning circuits having distributed inductances and capacitances, such as the parallel conductors of a Lecher system which may be considered as a variant of a concentric conductor system having a hollow center conductor and a tubular outer conducting sheath. A circular or coaxial conductor system properly connected to a voltage source is so far superior to the usual parallel conductor arrangement or Lecher system that the outer conducting sheath may be earthed so as to form a system non-symmetrical with respect to ground in which the radiation damping is considerably reduced. However, in cases when it is desirable to employ a concentric conductor system as the oscillatory circuit in a three-point connection with a thermionic valve oscillation generator, this simple connection does not result in a system which is non-symmetrical to earth and, hence, the benefit of low radiation damping is again cancelled out.

This condition is illustrated in Fig. 1 in which the control grid voltage and the anode supply voltage is each applied to a voltage node of the separate conductors, as indicated by reference numerals 1 and 2, respectively. Since not only the center conductor but also the outer conducting sheath of the coaxial conductor system carries a certain potential with respect to ground and to the cathode of the thermionic valve oscillator, respectively, this arrangement forms a system which is symmetrical to ground. The radiation of the circuit is therefore highly damped and the circuit as such suffers from critical tuning conditions as the result of inevitable capacities with ambient conductive masses.

It is the object of this invention to eliminate the deleterious effect mentioned above, and this is accomplished according to the invention by using a sort of trap circuit in the shape of a cup member one quarter wave-length long. It is a known fact that this circuit element when employed as tuning means acts as a trap or rejector circuit and converts a concentric transmission line asymmetric with respect to ground into a two conductor system symmetrical to earth.

The application of such a cup member leads to the development of oscillation generator circuits, the principle of which is shown in the Figs. 2 and 3. The feature common to these two embodiments is that the bottom of this cup member is connected with the outer conducting sheath of the concentric conductor system, while its open end points toward the thermionic valve oscillator with which it is electrically connected.

As shown in Fig. 2, the concentric conductor system having its ends 1 and 2 connected to the grid and to the anode, respectively, of the thermionic oscillation generator is in phase opposition to the earth. It is thus possible to connect the plate potential source to this end of the outer conducting sheath. As judged from the exterior the possibility of symmetry to earth is cancelled out, since the concentric conductor system is surrounded by the cup member 3 which acts as a shielding means and the bottom of which is capacitively connected with the outer conducting sheath as indicated at 4 of Fig. 2. By virtue of its trapping or arresting properties, this cup member renders the end of the outer conducting sheath remote from thermionic oscillation generator asymmetric with respect to ground. It is thus possible to connect the plate supply voltage source to this end of the outer conducting sheath of the coaxial system or line. The open end of the cup member 3 is directly connected to the cathode of the thermionic oscillator.

In the concentric conductor system there is provided between the center conductor and the outer conducting sheath a short-circuiting disc member 5 which may be axially displaced in order to vary the tuning of this oscillatory circuit. It is thus possible to obtain an optimum efficiency by properly adjusting the amount of feedback which depends upon the complex impedance between the cathode of the oscillator and the point at which the plate supply voltage source is connected to the outer conducting sheath. The remaining circuit elements indicated in Fig. 2 have their conventional significancies, that is, reference numeral 6 designates a grid coupling condenser, and 7 a high ohmic grid resistor.

A modification over the arrangement exemplified in Fig. 2 is shown in Fig. 3 according to

which the cup member 3 is arranged axially slidable with respect to the concentric conductor system. Also in this case there is a capacitive connection 4' between the outer conducting sheath and the bottom of cup member 3. This permits the open end of this cup member to be directly connected with the cathode of the valve oscillator, and the plate potential may be directly applied to the outer conducting sheath. The optimum feed-back condition which by the application of a three-point connection is normally attained in ultra-high frequency operation by the adjustment of a cathode circuit may in the arrangement according to the invention as exemplified in Fig. 3 be secured by axially displacing the cup member 3 along the outer conducting sheath until the desired value has been reached, which may be accomplished without materially changing the tuning of the system. In this case the grid voltage may be supplied directly to the center conductor through a high ohmic resistor 7.

An oscillation generator system in which the adjustment of the degree of feedback is rendered substantially free from reactions and which permits tuning independently of the amount of feedback may be attained by a suitable combination of the two embodiments shown in Figs. 2 and 3 for instance, by making the cup member 3 according to Fig. 2 axially slidable along the outer conducting sheath of concentric conductor system.

It is of course necessary in dimensioning the coaxial conductor system that its surge impedance be matched to the impedance of the anode system by neglecting the influence of the inevitable lead-in conductors.

The use of an oscillatory circuit according to this invention is by no means limited to generator circuits comprising a grid controlled thermionic valve, since this circuit may likewise be brought in cooperation with other oscillation generator valves, such as a Habann tube, for example.

What is claimed is:

1. An arrangement for generating ultra-high frequency oscillations comprising a thermionic valve oscillator having at least a cathode, a control grid and an anode, an oscillatory circuit in the shape of a concentric conductor system having a center conductor connected to said grid and an outer conducting sheath contacting said anode, and a shielding cup member one quarter wave-lenth long in a position concentric about said outer conducting sheath and having its open end electrically connected for high frequencies to said cathode and its bottom operatively connected for high frequencies with said outer conducting sheath.

2. An arrangement for generating ultra-high frequency oscillations comprising a thermionic valve oscillation generator having at least a cathode, a control grid and an anode, an oscillatory circuit in the shape of a coaxial conductor system having a center conductor associated with said grid and an outer conducting sheath contacting said anode, a shielding cup member one quarter wave-length long in a position concentric about said outer conducting sheath and having its open end electrically connected for high frequencies to said cathode and its bottom capacitively connected for high frequencies with said outer conducting sheath, and means to vary the position of said capacitive connection relative to points along the length of said outer conducting sheath as defined by the occurrence of standing waves therein for satisfying optional feedback conditions.

3. An arrangement as defined in claim 1, wherein a short-circuiting disc is slidably arranged on said center conductor and contacting said outer conducting sheath.

4. An arrangement as defined in claim 2, wherein said cup member is axially displaceable along said outer conducting sheath.

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