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ELECTRON TUBE GENERATOR

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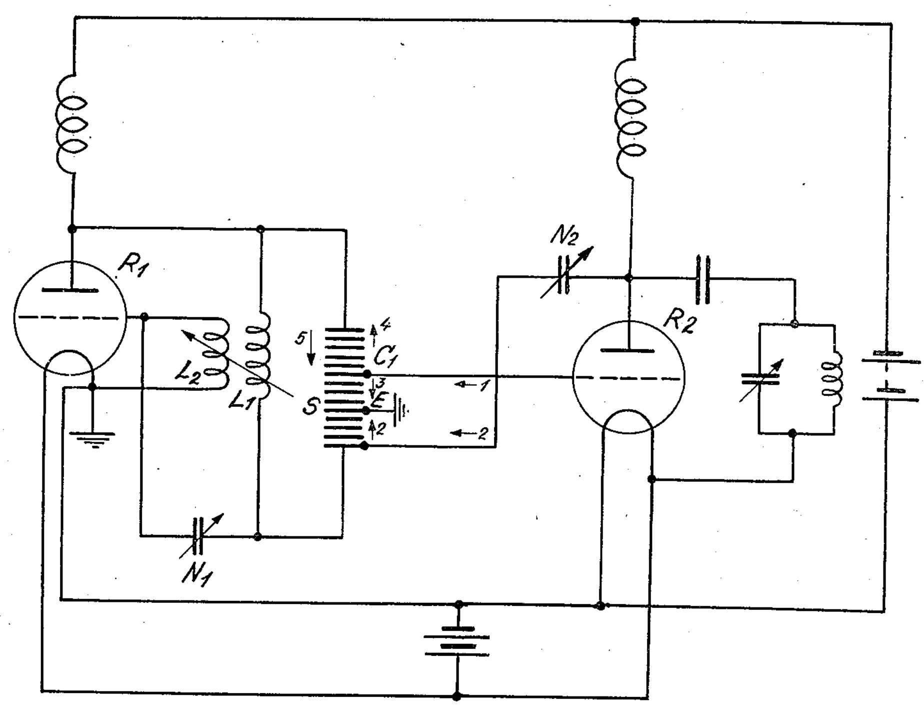

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ELECTRON TUBE GENERATOR

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1 Claim. (Cl. 250—36)

The invention has for its object to create an electron tube generator wherein load variations shall be avoided under any circumstances. This problem must be considered especially if the operation is required to be most constant in frequency even if mechanically-oscillating controlling means such as quartzes are not employed. This requirement is now growing more and more important, since quartz only admits of operating on a predetermined wavelength whilst there is a necessity for working on any desired wavelengths.

The invention is adapted for use with simple transmitting arrangements, i. e. arrangements merely having one self-excited stage, as well as with transmitters having several stages, but it is possible also to employ it with receivers. The inventive idea is explained hereafter as employed in a two-stage transmitter controlled from a separate oscillator, the drawing being a diagrammatic illustration of this embodiment of the invention.

The controlling transmitter is designated R_1, the main transmitter designated R_2. Transmitter R_1 operates on the principle of self-excitation in a well-known manner. Disposed between the anode and grid of the transmitter R_1 is an oscillatory circuit containing the split or tapped condenser C_1 and the self-induction coil L_1. In the arrangements hitherto in use the grid is connected to a suitable tapping of the condenser C_1. There is thus a capacitive potentiometer-connection for effecting the back-coupling. Condenser C_1 is earthed at a suitable point E. Moreover, transmitter R_2 is connected to the condenser C_1 and is through a variable condenser N_2 of the transmitter R_2 neutralized or balanced out from the anode in a well-known manner.

This customary arrangement has the following disadvantages, which are simplest to explain in connection with the usual adjusting of the transmitter. For setting the neutralization condenser N_2 the anode potential is disconnected from R_2 whilst N_2 is varied until the oscillatory circuit connected to R_2 shall be free of current. In this way the stage is neutralized. When now the anode potential is connected again, the inconvenient phenomenon results that at the same time the frequency of the transmitter R_1 is changed, although this transmitter has not been subjected intentionally to any influence. The act of connecting the anode voltage is identical with the keying effected in practice. Closer reflections on this state show that the variation in frequency is attributable to dephased currents in transmitter R_1 which are due to the detuning of transmitter R_2 and at the same time act to change the phase of the back-coupling voltage and thereby the frequency.

According to the invention therefore it is proposed to effect the back-coupling of the transmitter R_1 by purely inductive means and to so arrange this transmitter that the controlling voltage supplied to its grid is in unkeyed and keyed condition merely a voltage 180° out of phase over the anode alternating potential. Transmitter R_1 is neutralized itself. It is known per se to neutralize stages located behind the controlling transmitter, but it is not known to neuralize a controlling transmitter, this transmitter not being able to oscillate owing to such neutralization. Its oscillations are merely attributable to the inductive back-coupling.

For effecting the inventive idea, the back-coupling of the transmitter R_1 is not capacitive but inductive, namely through coil L_2. In addition there is provided a variable condenser N_1 connected after the manner of a neutralizing condenser (one may perhaps consider such arrangement to be a compensation device) and having for its object to compensate for dephased currents.

From the customary structure, wherein the grid is connected to a tap on the main coupling condenser whilst L_2 and N_1 are missing, the following results:

If transmitter R_2 is not keyed and not well neutralized, then the frequency of the transmitter R_1 can of course not be influenced by transmitter R_2. If, however, transmitter R_2 is keyed, i. e. detuned, then capacitive currents **1**, **2** flow over the grid conductor and cathode conductor. These currents split up differently. Current **1** splits into a component **3**, that flows to earth, and a component **4**, whereas current **2** because of the less resistance mainly passes to earth. In condenser C_1 a current **5** flows at a definite moment, this current arriving from transmitter R_1. It has been assumed that all these currents are cophasal. Already on this assumption it will be seen that owing to the presence of currents **1** and **2** the back-coupling potential in the grid of the transmitter R_1 is changed, for in condenser C_1 the currents are added in part, for example **3** and **5**, and in part subtracted, for instance **4** and **5**, or **2** and **5**. This involves that the back-coupling potential derived at the point S, i. e. the potential by which the frequency of the transmitter R_1 is determined decisively, depends upon the currents **1**, **2**, that is, upon the state of operation of the transmitter R_2. In addition, however, phase rotations will occur, because connected in parallel with condenser C_1 is the self-induction coil L_1, and current 4 flows not only over the internal tube capacity of the transmitter R_1 but in part also through the self-induction coil L_1 which for this current is connected in parallel with the internal tube capacity.

The described disadvantages are avoided by the invention according to which, as stated, the back-coupling is not effected capacitively but by purely inductive means, that is, with the aid of coil L_2, for example. Owing to the transmitter R_1 being neutralized, that is, located in a bridge arrangement, the capacitive currents cannot bring about an action on it, provided that their coaction takes place symmetrically, that is, the capacitive currents 1 and 2 for instance should not act to produce a drop of potential in the bridge diagonal, i. e. in the coil L_1. It will be easily seen that this can be performed readily, because the neutralization acts to balance the bridge, no matter from which side the currents are supplied to the bridge. Hence there remains connected to the coil L_1 a purely inductive potential only which is conducted to the grid of the tube R_1 over coil L_1 in a state of correct phase, that is to say, the back-coupling will be always of the correct phase coincidence, no matter whether transmitter R_2 is loaded or not loaded.

Experiments have shown that it is possible in this way to avoid the said disadvantages and to attain that a small number of stages shall be sufficient. It is to be understood that still other measures than those described may be adopted for effecting that the back-coupling of the controlling transmitter or the tube generator is in general performed by a single potential which is 180° out of phase, and that the other potential influences, due to loading or unloading, are compensated.

What is claimed is:

In an electrical system, an oscillator comprising a space discharge device having input and output circuits coupled by inductance coils, one of which is in the output circuit and with a condenser forms the frequency determining circuit of the oscillator, a variably loaded space discharge device having its input circuit capacitively coupled to the oscillator by said condenser, and means connecting the inductance coil of the frequency determining circuit across one diagonal of a balanced Wheatstone bridge with the output terminals of the second discharge device connected across the other diagonal thereof.

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