Sept. 29, 1942. E. HEINECKE 2,297,410

HIGH FREQUENCY CIRCUITS

Filed Dec. 27, 1939

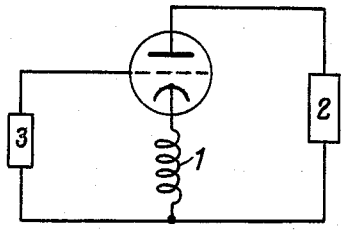

Fig.1

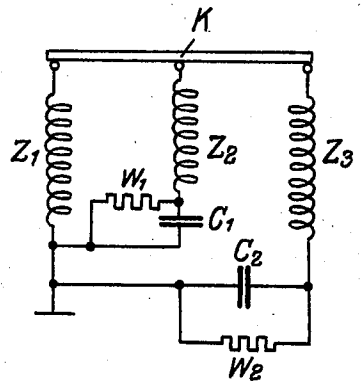

Fig.2

Inventor:
Erich Heinecke
by E. D. Phinney
Attorney

Patented Sept. 29, 1942 2,297,410

UNITED STATES PATENT OFFICE

2,297,410

HIGH FREQUENCY CIRCUIT

Erich Heinecke, Berlin, Germany; vested in the Alien Property Custodian

Application December 27, 1939, Serial No. 311,068
In Germany January 14, 1939

2 Claims. (Cl. 250—27)

This invention relates to high frequency circuits, especially of the kind intended for use in high frequency transmitters, and consists in certain features of novelty which will appear from the following description and be pointed out in the appended claims, reference being had to the accompanying drawing, in which

Fig. 1 is a diagram explanatory of the art, while Fig. 2 shows a circuit arrangement according to my invention.

It is well-known to those skilled in the high frequency art that, in addition to the desirable fundamental frequency generated and/or amplified in the thermionic valves of high frequency transmitters, deleterious spurious oscillations of very high frequencies are occasioned in such valves by several reasons. One cause for such spurious oscillations resides in the fact that the various electrode leads located within the envelope of a thermionic valve constitute a considerable inductive impedance to oscillations of very high frequency. This condition particularly applies to the lead-in conductors for the cathode, as will be readily understood from the conventional circuit arrangement illustrated in Fig. 1, in which the cathode lead-in conductor is represented by an inductive impedance **l**. It is evident that the anode circuit **2** and the grid circuit **3** are coupled with one another by this inductance which, under certain circumstances, may establish feedback conditions in the overall circuit, with the result that the afore-mentioned spurious oscillations may be subject to self-excitation and in consequence thereof to considerable amplification.

It is the object of this invention to provide means in order to overcome the disadvantages referred to in the foregoing. It is proposed according to the main feature of this invention to add supplemental elements to the self-inductive cathode leads of a thermionic valve, which elements are capable of translating the self-inductive effect of these leads into a resistive effect, thus offering a high ohmic component to undesirable spurious oscillations. The fulfillment of this condition would fully exclude the above-mentioned self-excitation. Although a certain amount of coupling is present between the anode circuit **2** and the grid circuit **3** in the arrangement of Fig. 1 in cases when the cathode lead **l** constitutes an ohmic impedance, as taught by this invention, this coupling does by no means give rise either to amplification or to self-excitation, since its effect is retroactive and therefore suitable for fully suppressing existing spurious oscillations of high freqeuncies.

The Fig. 2 is a wiring diagram illustrative to my invention. The cathode K of a thermionic valve is provided with three lead-in conductors, each forming an inductance, as indicated at Z_1, Z_2 and Z_3. By interposing a condenser C_1 and eventually a further condenser C_2, these inductances may be tuned to the resonance frequency of spurious oscillations so that a pure ohmic resistance is rendered effective in the inner of the valve between the actual cathode **2** and the grounded point. Moreover, resistors W_1 and W_2 may be shunted across these condensers so as to allow matching of the artificially produced ohmic impedance to the specific operating characteristics of the valve itself. This novel arrangement is not bound solely to the resonance frequency, since the high degree of attenuation involved insures its effectiveness within a broader frequency band. At frequencies below the resonance frequency, the ohmic component as well as the absolute value of the impedance between the cathode and the grounding point is subject to a rapid decrease so that the effective wave range remains unaffected.

For the sake of convenience, the capacities C_1 and C_2 may be formed by the space capacitances existing within the tube between the separate electrode leads or by the capacities between the connector elements of the valve socket. The magnitudes of these capacitances must be chosen so as to comply with the individual requirements.

This invention is by no means limited for use in connection with cathode leads, since it is applicable to all kinds of electrodes which are equipped with more than one single lead-in conductor.

What is claimed is:

1. A circuit arrangement for high frequency transmitters for short and ultra-short waves including an electron discharge device comprising within an evacuated container a plurality of electrodes and a lead connected to one of said electrodes having an inherent self-induction which tends to set up spurious oscillations, characterized by the provision of at least one additional lead connected directly to said electrode the space capacity between said first-mentioned lead and said additional lead being so dimensioned as to produce in combination with the inherent self-induction of the leads a resonant circuit tuned to the frequency of said spurious oscillations, whereby the inherent self-induction effect is trans-

lated into a resistive effect of high ohmic resistance for said spurious oscillations.

2. A circuit arrangement for high frequency transmitters for short and ultra-short waves including an electron discharge device comprising within an evacuated container a cathode and a lead connected directly to said cathode having an inherent self-induction which tends to set up spurious oscillations, characterized by the provision of at least one additional lead connected to said cathode, the space capacity between said first-mentioned lead and said additional lead being so dimensioned as to produce in combination with the inherent self-induction of the leads a resonant circuit tuned to the frequency of said spurious oscillations, whereby the inherent self-induction effect is translated into a resistive effect of high ohmic resistance for said spurious oscillations.

ERICH HEINECKE.