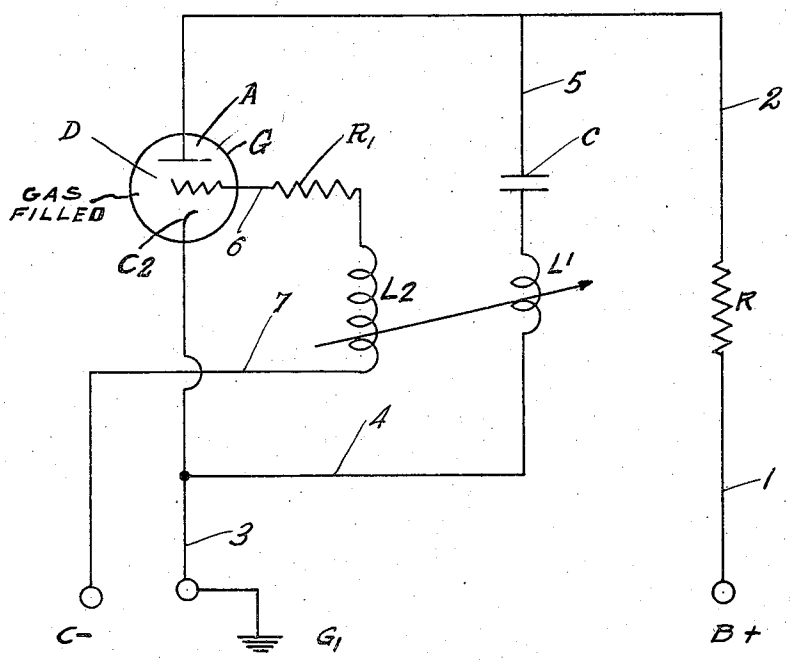
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STABILIZATION OF OSCILLATION GENERATOR

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INVENTOR
WINSTON E. KOCK

BY Herschel E. Tower
ATT'Y

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STABILIZATION OF OSCILLATION GENERATOR

Winston E. Kock, Cincinnati, Ohio, assignor to The Baldwin Company, Cincinnati, Ohio

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It is known that a glow tube is capable of producing sustained oscillations when it is connected in series with a resistance to a source of current and shunted with a condenser. The condenser is charged by means of the current source until the potential difference between its plates reaches the ignition potential of the discharge tube. The tube then lights, allowing the condenser to discharge itself through the tube until its potential difference drops to the extinction potential of the tube. With the tube extinguished, the voltage on the condenser once more builds up and the process continuously repeats itself. Such a type of oscillator is known as a relaxation oscillator.

It is seen that the frequency with which this process occurs depends upon many factors, so that a change or instability of any one of these factors will change or make unstable the frequency generated. The most serious change in such a glow tube oscillator is the change which occurs in the characteristics of the tube.

As pointed out in my Patent No 2,046,463, issued July 7, 1936, on an application copending herewith, filed December 6, 1933 the effect of tube characteristics on frequency can be materially reduced by introducing an inductance in the condenser leg and operating at the frequency of resonance of the inductance-condenser combination. Such a procedure was shown to be applicable to either a two or a three electrode glow tube.

It is a purpose of this application to set forth a means of further improving the stability of such an inductive glow discharge oscillator, using a three electrode glow tube, by utilizing the control action which the third electrode, the grid exerts on the characteristics of the tube.

The drawing portrays a wiring diagram of one method by which the increased stability can be accomplished. G represents a three electrode gaseous discharge tube of which the electrode C_2 is the cathode and may be either of a filament type, an indirectly heated type, or a cold cathode type. C is a condenser, R is a resistance and G_1 is the ground. It will be noticed that the oscillator illustrated in the drawing has three circuits. The first is a feed circuit from B+ to G_1. The source of positive potential B+ is connected by means of leads 1 and 2 to the anode A of the tube with a resistance R in series in said connection. The cathode C_2 of the tube is connected through a lead 3 to ground, or to some other suitable return to negative plate potential. The second circuit is a control circuit comprising a capacity C and an inductance L_1 in series with each other. Capacity C and inductance L_1 form a resonant means connected by leads 4 and 5 respectively, with the cathode C_2 and the anode A of the tube. The third circuit is a grid circuit comprising an inductance L_2 and preferably a resistance R_1 connected by leads 6 and 7 respectively with the grid D of the tube G and with a source of negative bias potential indicated at C—. It will be understood, of course, that the positive side of the source of bias potential is grounded or otherwise returned to the cathode lead of the tube G. The fundamental principle involved is the transference of a voltage generated in the control circuit (the inductance and capacity) to the grid of the discharge tube in order to make the tube characteristics dependent on the control circuit. In other words, the inductance and capacity, through their action on the grid, determine at what time the discharge tube ignites, so that the frequency of discharge is determined by the control circuit to a greater extent than in previous oscillators of this type.

This is accomplished by means of a transformer, the primary of which, L_1, is the inductance of the control circuit and the secondary L_2 is in the grid circuit. Coupling between the two coils is indicated by an arrow. It was found that the polarity of the secondary leads had an effect on the effectiveness of the stabilization, so that the best results are obtained only when the proper polarity is used. It was also found that a high resistance primary is very effective in this circuit.

It is evident that the transformer method is not the only way in which the above effect can be accomplished. Various types of voltage transference could be applied, such as condenser or resistance coupling.

What I claim is:

1. A stabilized electrical oscillation generator comprising a gaseous discharge tube having an anode, a cathode and a grid, an anode-to-cathode circuit containing a resistance and a source of potential, said circuit being a feed circuit for said tube, an anode-to-cathode circuit comprising a capacity and an inductance and being a control circuit for said tube, said inductance and capacity constituting a tuned couple, whereby the frequency of oscillation of said tube is stabilized, and a grid-to-cathode circuit comprising an inductance and a source of grid bias potential, said inductance in said grid circuit

being inductively coupled with said inductance in said control circuit.

2. A stabilized electrical oscillation generator comprising a gaseous discharge tube having an anode, a cathode and a grid, an anode-to-cathode circuit containing a resistance and a source of potential, said circuit being a feed circuit for said tube, an anode-to-cathode circuit comprising a capacity and an inductance and being a control circuit for said tube, said inductance and capacity constituting a tuned couple whereby the frequency of oscillation of said tube is stabilized, and a grid-to-cathode circuit comprising an inductance and a source of grid bias potential, said inductance in said grid circuit being inductively coupled with said inductance in said control circuit, and a resistance in series with said inductance in said grid circuit.

3. An inductive glow discharge oscillator comprising a glow discharge tube having an anode, a cathode and a grid, an anode-to-cathode feed circuit for said tube containing a source of potential and a resistance, and an anode-to-cathode control circuit for said tube containing both capacity and inductance, and being a tuned circuit whereby the frequency of oscillations of said oscillator is stabilized, and a grid-to-cathode circuit for said tube comprising a source of grid bias potential and means for coupling said grid circuit to said control circuit, whereby the potential of the grid of said tube is caused to vary in accordance with oscillations in said control circuit.

4. A stabilized oscillator comprising a single gaseous glow discharge tube having an anode, a cathode and a grid, an anode-to-cathode feed circuit including a source of potential and a resistance, an anode-to-cathode control circuit containing a winding of a transformer and a capacity, and a grid to cathode circuit containing another winding of said transformer and a source of bias potential.

5. A stabilized oscillator comprising a single gaseous glow discharge tube having an anode, a cathode and a grid, an anode-to-cathode feed circuit including a source of potential and a resistance, an anode-to-cathode control circuit containing a winding of a transformer and a capacity, and a grid-to-cathode circuit containing another winding of said transformer and a source of bias potential, said grid circuit also containing a resistance.

6. In an electrical oscillator, a gaseous glow-discharge tube having at least a cathode, an anode and a grid; an anode-to-cathode control circuit comprising a capacity; an anode-to-cathode supply circuit containing a resistance and a source of positive potential; means for imposing upon said grid a steady negative bias affecting the ignition potential of said tube; and means, coupled to the said anode-to-cathode control circuit and distinct from the first said means, for diminishing the negative bias of said grid to cause the tube to ignite upon the attainment of a predetermined potential by said anode.

7. A glow discharge oscillator comprising a glow-discharge tube having an anode, a cathode and a grid, an anode-to-cathode feed circuit for said tube containing a source of potential and a resistance, and an anode-to-cathode control circuit for said tube containing a capacity, and a grid-to-cathode circuit for said tube comprising a steady source of grid bias potential, and means distinct from said source of steady potential for coupling said grid circuit to said control circuit, whereby the potential of the grid of said tube is caused to vary in accordance with oscillations in said control circuit.

WINSTON E. KOCK.