

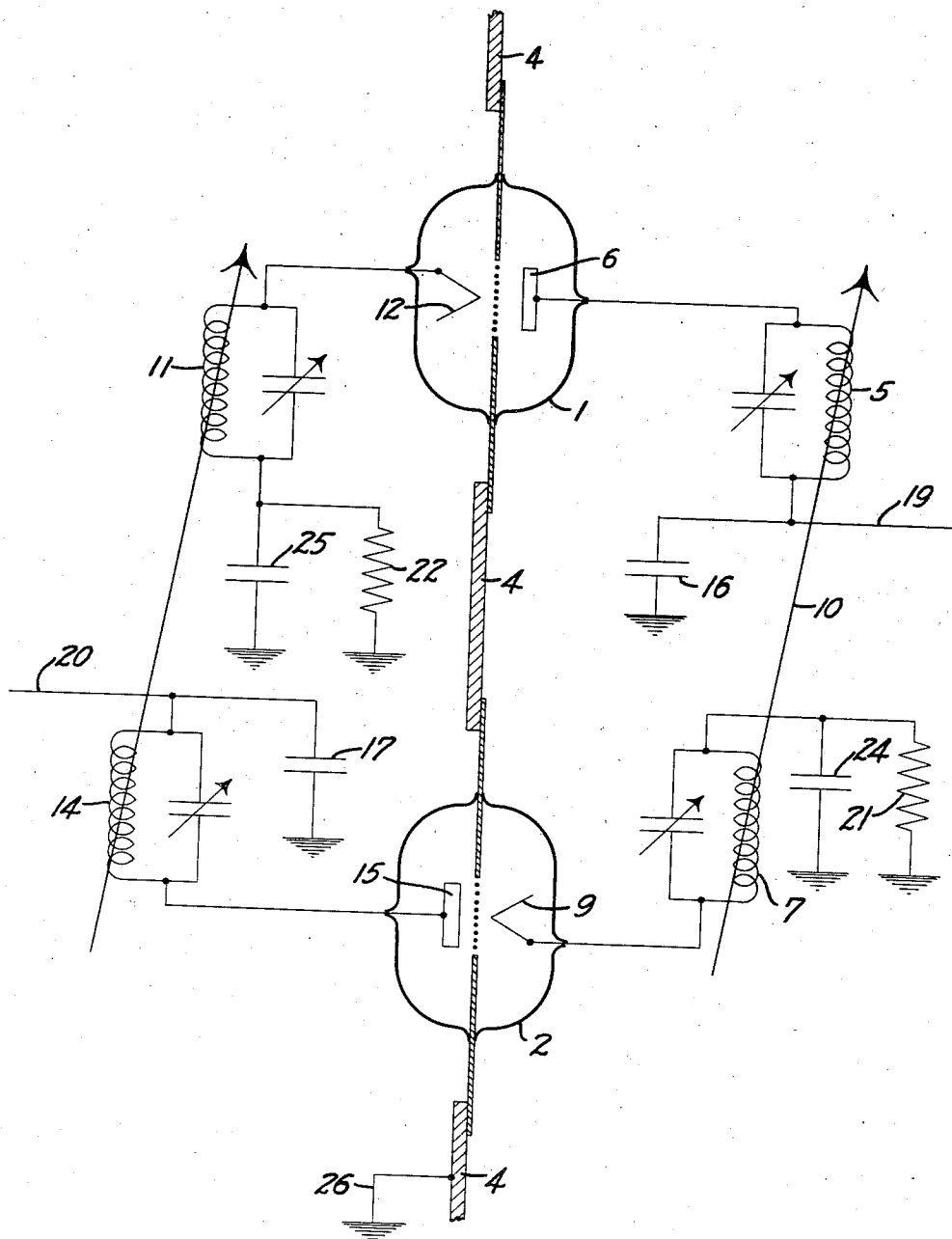
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OSCILLATION SYSTEM

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OSCILLATION SYSTEM

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2 Claims. (Cl. 250—36)

My invention relates to an oscillation system adapted to produce ultra-high frequency currents and more particularly to a system utilizing a pair of electrical discharge tubes in which grids are used as electrostatic shields between anode and cathode.

Among the objects of my invention are:

To provide an oscillation system capable of producing large amounts of ultra-high frequency power; to provide a simple and extremely stable oscillation system; and to provide an oscillation system for utilizing with full efficiency as oscillators, tubes wherein anode to cathode capacity is substantially nil.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of my invention herein described, as various forms may be adopted within the scope of the claims.

The figure shows a preferred circuit, diagrammatic and reduced to lowest terms, employing two grounded-grid tubes of the general type disclosed in the co-pending application of Ralph M. Heintz, Serial Number 688,328, filed September 6, 1933 for a Shielded electrode tube.

The invention is, however, adaptable to all tubes having a grid or control element therein which may act as an effective electrostatic shield between anode and cathode.

As the anode-cathode capacity in a vacuum tube as ordinarily used in the well-known tuned-grid, tuned-plate circuit is depended on for feed back, it must therefore necessarily enter into the determination of the frequency at which the tube will oscillate. At extremely low frequencies, tubes in which the capacity is considerable, are over-excited, necessitating a reversed feed back, or neutralization of the capacity effect. It is well known that outputs under such conditions are low, and one of the main objects of the Heintz invention above referred to was to obtain large power outputs in tubes having electrodes of normal size and in the usual spacing relationships.

I have found, however, that when the development of the Heintz tube is carried to its logical conclusion, that the effective anode-cathode capacity became substantially nil, and there was not sufficient feed back to excite the tube even at extreme ultra-high frequencies.

I have solved the problem of making such tubes efficient oscillators by positively and mutually exciting two tubes having the above described characteristics, thereby causing them to become stable and efficient generators of high frequency power.

My invention may be best understood by reference to the drawing.

A pair of tubes 1 and 2, preferably of a type described in the above-mentioned application are positioned on a shield 4 electrostatically dividing a container or other space into two portions. The tubes referred to have their grids extended to, or through the walls of the envelope to cooperate with the shield and having grid wires so spaced that the effective capacity between cathode and anode is substantially nil. The two tubes are reversed in relation, so that the anode of one is the same side of the shield as the cathode of the other.

I then connect a tuned circuit 5 to the anode of tube 1, and a similar circuit 7 to the cathode of tube 2. Both of these circuits are on the same side of the shield and are preferably loosely coupled as indicated by the arrow 10.

On the other side of the shield another tuned circuit 11 is connected to the cathode 12 of the tube 1, and a fourth tuned circuit 14 is connected to the anode 15 of tube 2. All of the tuned circuits are similar. The two latter circuits are also loosely coupled.

Each of the tuned anode circuits is grounded for radio frequency through by-pass condensers 16 and 17, and the anodes energized through anode leads 19 and 20.

Each of the tuned cathode circuits is provided with leak resistors 21 and 22 shunting grid condensers 24 and 25. I prefer to provide the shield with a ground connection 26.

Each tube as hooked up, taken by itself, is a complete oscillating system such as described in the application above referred to, the system being a tuned cathode-tuned anode circuit having a grounded grid. It will only oscillate, however, when the anode-cathode capacity is sufficient to provide the proper feed back. If, as is desired in the instant case, the grid control is made high by the use of fine, closely spaced grid control wires, the tube will not oscillate as the feed back is insufficient, due to the substantially complete shield provided by the grid.

When however, two tubes, both circuits of which are of the tuned anode-tuned cathode type, as above described, are so coupled that the anode circuit of one positively drives the cathode circuit of the other, the system will then oscillate freely over an extremely wide range of frequencies, the oscillators being entirely independent of the anode-cathode couplings. The circuit I have just described fulfills all the requirements for oscillation at ultra-high frequencies.

In addition, the system is exceptionally stable. The four tuned circuits, all having similar constants, stabilize the output to a remarkable degree. It is well known that the tuned grid-tuned plate circuit is stable, but the circuit shown is even more so due to the additional tuned circuits involved.

I have found, that by utilizing the positive drive herein shown, that there is no need of making tubes dimensionally small in order to get them to generate ultra-high frequencies. Such reduction in size, of course, greatly reduces their output. I am able to employ large tubes having the ability to produce considerable amounts of power, and obtain that power by substantially completely shielding the anode from the cathode and using one tube to drive another.

I claim:

1. A short wave oscillator system comprising a pair of thermionic tubes having coplanar grounded grids, a shield connecting said grids in the same plane therewith and arranged to sub-

stantially electrostatically isolate the anodes from the cathodes of said tubes, said tubes being so positioned as to have the anode of one and the cathode of the other on the same side of said shield, means for coupling the anode of one to the cathode of the other to produce oscillations, and means for controlling the frequency.

2. A short wave oscillator system comprising a pair of thermionic tubes having coplanar grounded grids, a shield connecting said grids in the same plane therewith and arranged to substantially electrostatically isolate the anodes from the cathodes of said tubes, said tubes being so positioned as to have the anode of one and the cathode of the other on the same side of said shield, a tuned circuit connected to each of said anodes and cathodes positioned on the same side of the shield as the electrodes to which they are connected, the tuned circuits on each side of the shield being coupled to produce oscillations in said tubes.

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