

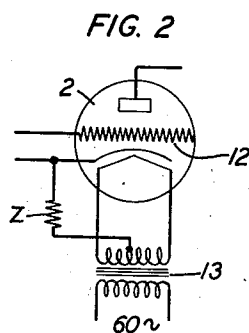
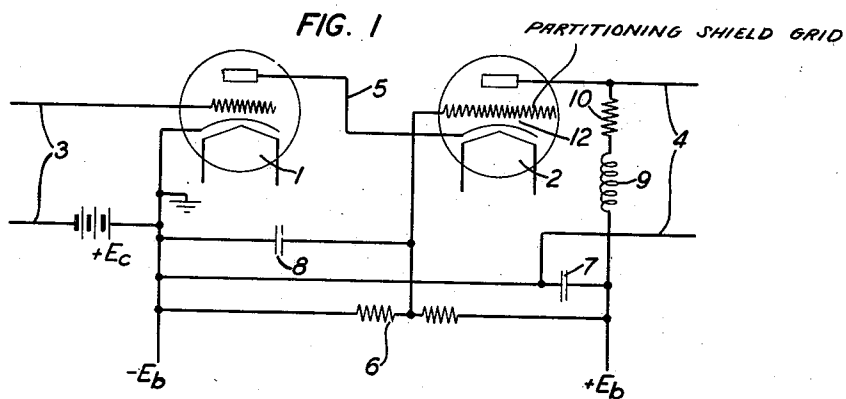
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ELECTRIC SPACE DISCHARGE TUBE SYSTEM

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ELECTRIC SPACE DISCHARGE TUBE
SYSTEM

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4 Claims. (Cl. 179—171)

This invention relates to wave translation systems involving electric space discharge devices, as for example, vacuum tube amplifiers.

An object of the invention is to simplify construction or improve operation of such systems, and it is especially an object of the invention to overcome deleterious effects of inter-electrode capacities in such systems.

In one specific aspect the invention is a circuit using single grid vacuum tubes, which has performance characteristics like those of the usual screen grid amplifier. In this aspect, the invention may be an amplifier of the type comprising two three-electrode vacuum tubes with the anode of the first connected directly to the cathode of the second, and the grid of the second maintained at substantially the potential of the cathode of the first with respect to the waves to be amplified, and in accordance with the invention this grid may be made a shield grid, providing an electrostatic shield between the plate and the cathode of the second tube and making the amplifier circuit a shield grid amplifier circuit with its two tubes having well known desirable characteristics of the usual screen grid type of tube.

Other objects and aspects of the invention will be apparent from the following description and claims:

Fig. 1 shows an amplifier of circuit configuration heretofore proposed, but with a tube which, in accordance with the invention, may be substituted for one heretofore used in that circuit; and Fig. 2 shows the tube which may be so substituted.

The circuit has two three-electrode vacuum tubes 1 and 2 amplifying waves from input circuit 3 and transmitting them to output circuit 4. Conductor 5 directly connects the anode of 1 and the cathode of 2. The usual sources of unidirectional grid and plate potentials E_c and E_b are shown, with their preferred polarities indicated by plus and minus signs. The plate source comprises a potentiometer resistance 6 shunted by a by-pass condenser 7, and has a portion shunted by a by-pass condenser 8 which connects the cathode of 1 and the grid of 2.

Unidirectional space current from the plate source flows in series through an inductance 9, a resistance 10, the anode-cathode space path in tube 2, and the anode-cathode space path in tube 1. Inductance 9 and resistance 10 present high impedance to the amplified waves.

For two tubes so connected, the effective amplification constant is

$$\mu_{\text{eff}} = \mu_1(\mu_2 + 1)$$

and the effective output impedance is

$$Z_{\text{eff}} = R_1(\mu_2 + 1) + R_2$$

where μ_1 and μ_2 are the amplification constants

of tubes 1 and 2, respectively, and R_1 and R_2 are the plate-cathode resistances of tubes 1 and 2, respectively. Using such three-electrode tubes as are normally used would cause the two tubes to operate as a single tube having a high amplification constant μ and a high internal impedance.

It is to be observed that the tube 2 has its grid 12 grounded and the voltage is impressed between the grid and cathode by varying the potential of the cathode. For variable potentials, the grid is grounded through a condenser. In accordance with the invention, by constructing the tube 2 so that the grid is an effective shield between the plate and the cathode, this amplifier circuit becomes a shield grid amplifier circuit and the two tubes show many of the attributes of the shield grid tube. Therefore, tube 2 is shown as having the grid 12 constructed so as to also be a shield between the plate and the cathode. Any customary form of construction may be employed. For example, usually that of bringing the plate out at the top would be very satisfactory.

In Fig. 2 is also shown the secondary winding 25 of transformer 13 supplying power to the heater. To prevent the usual troubles caused by potential differences between the cathode and the heater, this is represented as connected through an impedance Z which may be either high resistance or choke coil.

This type of amplifier, two tubes in series, as stated before, operates like a single tube. It has a high μ (i. e., a high effective amplification constant) and a high output impedance like the screen grid tube. It is, therefore, primarily a voltage amplifier. It can, of course, be used as a detector or for any other purpose for which a screen grid tube would be used.

What is claimed is:

1. A wave translating system comprising an electric space discharge device having an anode, a cathode and a discharge control element, a second electric space discharge device having an anode, a cathode and but a single grid, said grid being constructed to divide the space within the tube into substantially separate parts that contain the cathode and the anode respectively and adapted to form an effective electrostatic shield between the anode and the cathode substantially completely separating the anode and cathode electrostatically, means connecting the anode of the first mentioned device directly to the cathode of said second device, and means for maintaining said grid at substantially the alternating potential of the cathode of said first mentioned device.

2. An amplifier comprising a vacuum tube having an anode, a cathode and a grid, a second vacuum tube having an anode, a cathode and but one grid, the latter grid being formed and positioned

as a partition dividing the space in the tube into two substantially separate parts containing the anode and the cathode respectively, to serve both as a control grid and as a shield between the anode and the cathode of said second tube and substantially completely separate the anode and cathode electrostatically, a source of unidirectional voltage, means connecting said source and the anode-cathode space current paths in said tubes all in serial relation, means for applying waves to be amplified between the grid and the cathode of the first mentioned tube, and means maintaining said grid of said second tube substantially at the potential of the cathode of the first mentioned tube for said waves.

3. An amplifier comprising a vacuum tube having an anode, a cathode and a grid, a second vacuum tube having an anode, a cathode and only one grid, said latter grid being constructed as a partition dividing the space in the tube into substantially separate parts that respectively contain the cathode and the anode, and adapted to both serve as control grid and give substantially complete electrostatic shielding effect between the anode and the cathode of said second tube, said latter grid completely separating the anode

and cathode of said second tube, means for applying waves to be amplified between the grid and the cathode of the first mentioned tube, means connecting the anode-cathode space paths in said tubes in serial relation with respect to the amplified waves, and means for maintaining said grid of said second tube substantially at the potential of the cathode of the first mentioned tube for said waves to be amplified.

4. An amplifier comprising two single grid wave amplifying vacuum tubes, the grid of one of said tubes extending completely across the tube and being formed and positioned as an electrostatic shield between the anode and the cathode of said one tube substantially dividing the space within the tube into separate portions respectively containing the cathode and the anode, a connection between the cathode of said one tube and the anode of the other tube, and a path of low impedance for alternating currents extending from the grid of said one tube to the cathode of said other tube for cooperating with said shield grid to prevent undesired feedback in said amplifier through said connection.

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