

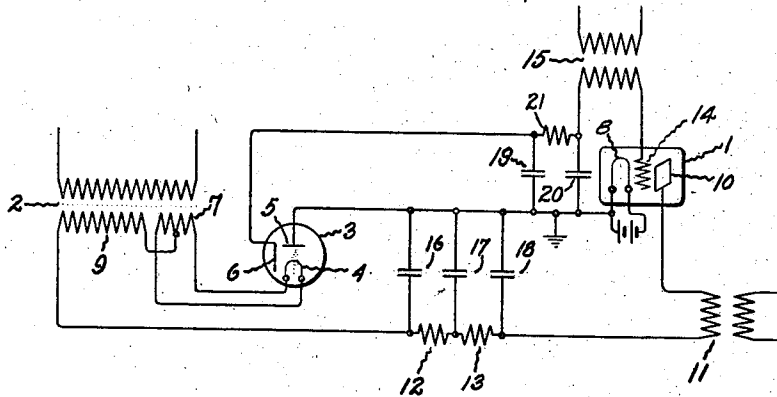
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ELECTRICAL SYSTEM

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Inventor:
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UNITED STATES PATENT OFFICE

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ELECTRICAL SYSTEM

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My invention relates to electrical systems comprising a space discharge device which is provided with a grid arranged to control the current transmitted between its cathode and anode, and has for its principal object the provision of an improved apparatus and method of operation whereby the control of the grid potential of such devices is greatly simplified.

Where current is supplied from an alternating current circuit through a rectifier to a thermionic amplifier provided with a control grid, it is frequently desirable that this grid be subjected to a bias potential. In accordance with my invention this result is produced by means comprising an auxiliary electrode mounted within the evacuated vessel of the rectifier and arranged to provide a source of grid bias potential for the amplifier, depending upon the space charge drop of the rectifier.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

The drawing is a wiring diagram of a system wherein my invention has been embodied.

This system comprises a thermionic amplifier 1 and transformer 2 which are interconnected through a rectifier 3 provided with a cathode 4, an anode 5 and auxiliary electrode 6. Heating current is supplied to the cathode 4 through winding 7 of the transformer 2. The amplifier 1 comprises a cathode 8 connected through the rectifier 3 to one terminal of a secondary winding 9 of the transformer 2, an anode 10 connected to the other terminal of this winding through an output transformer 11 and reactors 12 and 13, and a control grid 14 connected to the cathode 8 through an input transformer 15 and the auxiliary anode 6 of the rectifier 3. A filter which includes the reactors 12 and 13 and a plurality of condensers 16, 17 and 18 is provided for smoothing out the ripples of the rectified current supplied to the output circuit of the amplifier, and condensers 19 and 20 and reactor 21 are connected in the grid circuit of the amplifier for a like purpose.

When the rectifier is in operation the auxiliary anode 6 takes a potential practically equal to the extreme negative potential reached by the cathode 4, a negligibly small electron current between the cathode and anode 6, being sufficient to keep the latter charged. The extreme negative potential reached by the cathode, however, is negative with respect to the main anode 5 by the amount of the space charge drop in the rectifier during that fraction of the cycle when electrons are passing from cathode 4 to anode 5. Therefore, anode 6 is negative with respect to anode 5 by the amount of the space charge drop. This space charge drop is determined by the current supplied through the rectifier to the output circuit of the rectifier. Thus if the secondary voltage of the transformer 2 increases, the output current of the amplifier tends to increase but this increase in current is less than would be the case where fixed or battery bias is employed due to the fact that the negative grid bias potential of the amplifier is increased simultaneously with the current. Likewise, when the output current decreases, the grid bias potential is correspondingly reduced.

In order to apply 500 volts to the output circuit of the amplifier, for example, the voltage of the cathode 4 should swing between something like 100 volts negative and 1100 volts positive with respect to the ground. During the part of the cycle when the cathode 4 is 100 volts negative with respect to ground, enough electrons pass from the cathode 4 to the anode 5 to maintain the current between cathode 8 and anode 10 of the amplifier 1 during the entire cycle, keeping the filter condensers 16, 17 and 18 charged to an average of 500 volts. Since the grid bias system takes practically no current, the auxiliary anode 6 will become charged to the extreme negative potential reached by the cathode 4, or 100 volts negative in the case used for illustration. If smaller grid bias is desired, a leak to ground or a potentiometer may be used.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the

principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use, and I therefore aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination of an amplifier provided with grid and anode circuits, a rectifier connected in said anode circuit, and means within the rectifier arranged to regulate the potential of said grid circuit in accordance with the space charge drop of said rectifier.
2. The combination of an amplifier provided with grid and anode circuits, a rectifier connected in said anode circuit, and means comprising an auxiliary electrode arranged within said rectifier to regulate the potential of said grid circuit in accordance with the current of said anode circuit.
3. The combination of an amplifier provided with grid and anode circuits, a rectifier connected in said anode circuit, and means arranged within said rectifier and subjected to voltage established by the space charge drop therein to apply to said grid circuit a negative bias potential which varies in accordance with the current supplied to said anode circuit through said rectifier.
4. The combination with an electric discharge device having a grid circuit and an anode circuit, of means for supplying operating potentials to said circuits including a source of potential, a second electric discharge device having a separate electrode connected with each of said circuits and a cathode connected in common with both of said circuits between said electrodes and said source.
5. The combination with an electric discharge device having a grid circuit and an anode circuit, of means for supplying operating potentials to said circuits including a source of potential, a second electric discharge device having a separate electrode connected with each of said circuits and a cathode connected in common with both of said circuits between said electrodes and said source, and a filter means interposed in each of said circuits between said first and second named devices.
6. The combination with an electric discharge device having grid and anode circuits, a rectifier having a cathode and an anode connected in said anode circuit, and an auxiliary electrode arranged within the rectifier to receive a negative potential in response to current flow between said cathode and anode, and means connecting said grid circuit with said auxiliary electrode

for applying a corresponding potential thereto.

In witness whereof, I have hereunto set my hand this 24th day of March, 1927.

EDWARD W. KELLOGG.

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