

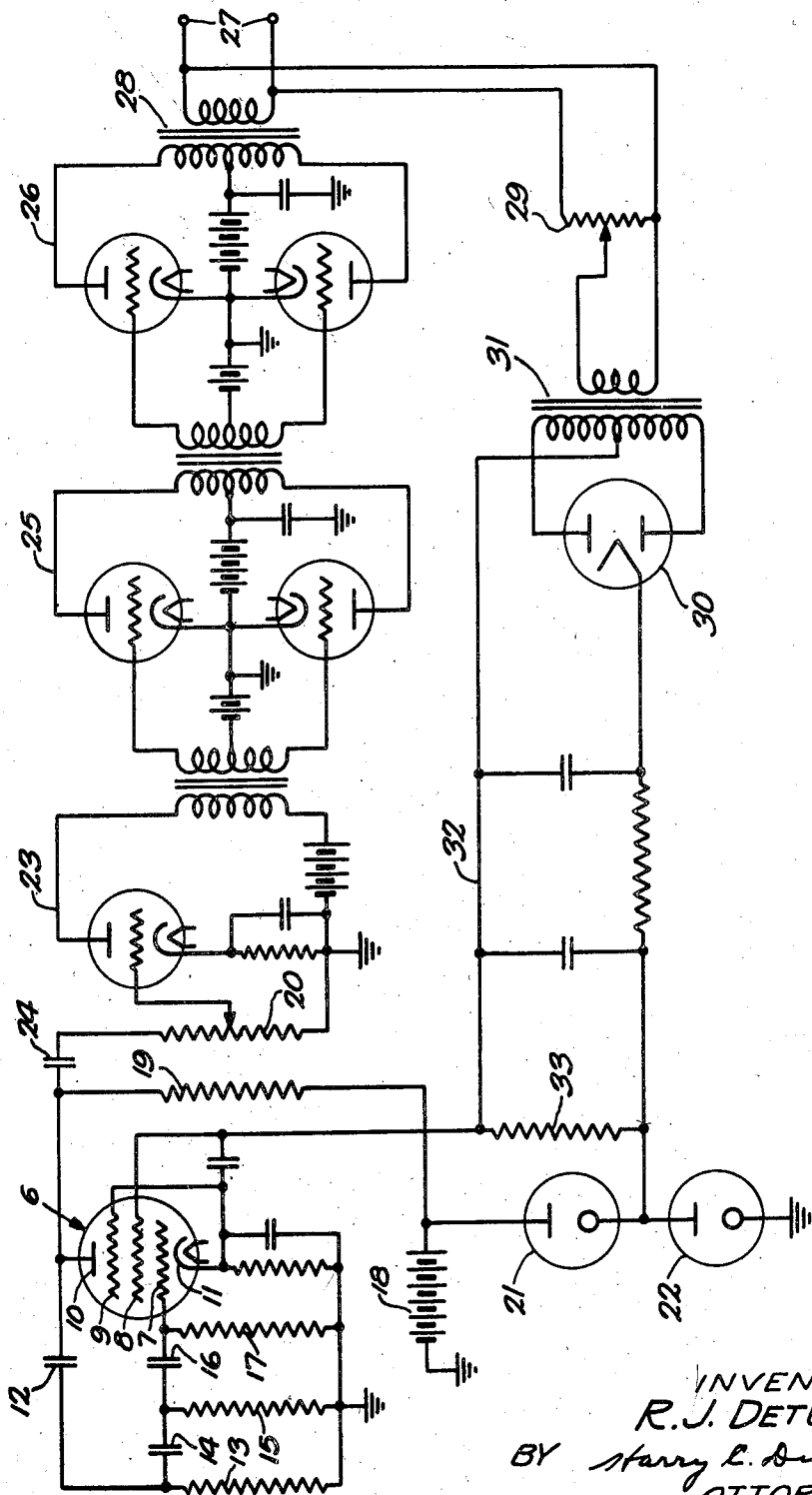
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VOLTAGE REGULATING AMPLIFIER SYSTEM

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VOLTAGE REGULATING AMPLIFIER
SYSTEM

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This invention relates to a voltage regulating amplifier system, and more particularly to a voltage regulating oscillation generator and amplifier.

When an oscillation generator is used with varying loads there is a tendency for the output voltage to change due to the varying energy losses in the generator and amplifier circuits.

An object of the present invention is to provide a generator or amplifier having a high degree of voltage regulation.

In accordance with one embodiment of the invention an oscillation generator and amplifier is provided in which a portion of the output current is rectified and utilized to reduce a constant positive potential tending to be applied to the regulating grid of a thermionic tube in an oscillator circuit.

A complete understanding of the invention will be had by reference to the following description taken in conjunction with the accompanying drawing in which the single figure is a circuit diagram of an apparatus embodying the invention.

Referring to the drawings, a pentode oscillator tube 6 is shown having a control grid 7, a screen or regulator grid 8, a suppressor grid 9, an anode 10 and an indirectly heated cathode 11. The input circuit of the oscillator tube comprises a conventional circuit consisting of pairs of condensers and resistances 12 and 13, 14 and 15, 16 and 17, each of which displaces the phase of the current from the anode circuit by 60° so that the voltage applied to the control grid 7 will be substantially 180° out of phase with the voltage of the anode 10. A suitable potential may be applied to the anode by means of a direct current source 18 through a resistor 19. The direct current source 18 is also connected to ground through a pair of series connected thermionic regulator tubes 21 and 22 which tend to maintain the potential applied to the anode 10 substantially constant.

The output of the oscillator circuit is connected to an amplifier circuit 23 through a condenser 24 and variable resistance 20. In addition, two or more push-pull amplifier circuits 25 and 26 may be employed, the output of the last amplifier circuit being connected to output terminals 27 through a transformer 28.

In order to control the voltage applied to the output terminals a potentiometer resistance 29 is connected across the secondary circuit of the transformer 28. The potentiometer 29 is used to feed a rectifier 30 connected thereto through a transformer 31. The rectifier circuit includes a filter circuit 32 and an output resistance 33, the

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positive end of resistance 33 being connected to a point between the voltage regulator tubes 21 and 22 and the negative side of the resistance is connected to the regulator grid 8 of the oscillator tube 6. In this manner it will be seen that through the operation of the voltage regulator tube 22 there will be a tendency for a constant positive voltage to be applied to the regulator grid of the oscillator tube. From this positive voltage, however, there will be subtracted (or algebraically added) the negative voltage existing across the resistor 33. Thus, for instance, if the load current taken from the output terminals tends to increase, there will be tendency for the secondary voltage of the transformer 28 to drop. This will result in a decreased voltage being applied to the rectifier tube and a decrease in the negative voltage across the resistor 33, whereby the positive voltage of the regulator grid 8 will be increased, tending to increase the output voltage of the transformer 28. Conversely, when the load current taken from the output terminals is decreased, the secondary voltage of the transformer 28 will tend to increase, producing an increased negative voltage across the resistance 33, resulting in a decrease of the positive voltage tending to be applied to the regulator grid 8. By thus compensating for the tendency of the output voltage to vary, a high voltage regulation may be obtained without materially varying the frequency of the output.

What is claimed is:

1. An amplifier system comprising a circuit including a thermionic tube having an anode, a cathode, an input grid, a screen grid and an anode output circuit, an amplifier connected to said anode output circuit, said amplifier having an output load circuit including an output transformer with a primary winding and a secondary winding, means for rectifying a portion of the output current in said secondary winding to provide a regulating potential inversely proportional to said current, means tending to maintain a constant higher than required positive potential on said screen grid, and means for applying said regulating potential to said screen grid thereby subtracting said regulating potential from the positive potential tending to be applied to said screen grid.

2. A current generator comprising an oscillator circuit including a thermionic tube having an anode, a cathode, an input grid, a screen grid and an anode output circuit, an amplifier connected to said anode output circuit for amplifying the output of said oscillator circuit, said amplifier having an output load circuit, means for rectifying a portion of the output current of said load

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circuit to provide a regulating potential inversely proportional to said current, a regulator tube, means for applying a direct current potential to said regulator tube, and means for applying the differential potential of said rectified current potential and the potential on said regulator tube to said screen grid.

3. An amplifier system having an output circuit connectable to an external load, said system comprising a circuit including a thermionic tube having an anode, a cathode, an input grid and a regulating grid, means including a voltage regulator for applying a constant potential to said anode, means including a constant voltage regulator tending to apply a constant positive potential to said regulating grid, and means connected to said output circuit and responsive to variations in the external load for modifying the potential applied to said regulating grid by a modifying potential obtained from the output circuit of said system, said modifying potential being inversely proportional to the output current of said system.

4. An amplifier system having an output circuit connectable to an external load, said system comprising a circuit including a thermionic tube having an anode, a cathode, an input grid and a regulating grid, means including a constant voltage regulator tending to apply a constant positive potential to said regulating grid, and means responsive to current variations in the external load for modifying the potential applied to said regulating grid by a modifying potential obtained from said output circuit, said modifying potential being inversely proportional to the output current of said system.

5. An amplifier system having an output load circuit connectable to an external load, said system comprising a circuit including a thermionic tube having an anode, a cathode, an input grid, and a regulating grid, means tending to apply a constant higher than required positive potential to said regulating grid, and means connected to said output circuit and responsive to fluctuating external load conditions for adding a negative potential inversely proportional to the output current of said system to said positive potential at said regulating grid.

6. An electronic generator comprising an oscillator circuit including a thermionic tube having an anode, a cathode, an input grid, a regulating grid, and an anode output circuit connectable to an external load, a pair of series connected constant voltage regulator tubes for applying a constant potential to said anode, means utilizing one of said regulator tubes tending to apply a constant positive potential to said regulating grid, and means coupled to said anode output circuit and responsive to fluctuations of the external load for adding a negative potential inversely proportional to the output current of said system to the positive potential tending to be applied to said regulating grid.

7. An electronic generator comprising an oscillator circuit including a thermionic tube having an anode, a cathode, an input grid and a regulating grid, a pair of series connected constant voltage regulator tubes for applying a constant potential to said anode, means utilizing one of said regulator tubes tending to apply a constant positive potential to said regulating grid, means for rectifying a portion of the output current of said generator to provide a regulating potential in-

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versely proportional to said current, and means for modifying the potential tending to be applied to said regulating grid by said regulating potential.

8. An electronic generator comprising an oscillator circuit including a thermionic tube having an anode, a cathode, an input grid and a regulating grid, a pair of serially connected constant voltage regulator tubes for applying a constant potential to said anode, one of said regulator tubes tending to apply a constant potential to said regulating grid, a rectifier circuit, including a rectifier and an output resistance, means for applying a potential inversely proportional to the output current of said generator to said rectifier, the positive output side of said rectifier being connected to said serial connection between said regulator tubes and to one end of said output resistance, the negative output side of said rectifier being connected to the opposite end of said resistance and to said regulating grid whereby the potential drop through said resistance is deducted from the potential tending to be applied to said control grid.

9. An amplifier system including a thermionic tube having an anode, a cathode, an input grid and a screen grid adapted to operate at a positive potential, an amplifier coupled to said tube for amplifying the anode output of said tube, said amplifier having an output circuit, means for rectifying a portion of the current in said amplifier output circuit inversely proportional to the current in said output circuit to provide a regulating potential, means tending to maintain a higher than required potential on said screen grid, and means for applying said regulating potential to said screen grid thereby to subtract said regulating potential from the potential tending to be applied to said screen grid.

10. An amplifier system comprising a thermionic tube having an anode, a cathode, an input grid and a regulator grid, means tending to apply a constant potential to said regulator grid, a thermionic amplifier associated with said tube, said amplifier having an output circuit, and means for adding a negative potential inversely proportional to the current in said output circuit to the positive potential tending to be applied to said regulating grid.

11. An electronic generator having an output circuit connectable to an external load, said generator comprising a thermionic tube having an anode, a cathode, an input grid and a screen grid, means tending to apply a constant positive potential to said screen grid, and means for adding to said positive potential at the screen grid a negative potential inversely proportional to the output current of said system, said last means being coupled to the output circuit and responsive to current fluctuations in the output circuit due to variations in the external load.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,264,369	Golicke	Dec. 2, 1941
2,292,439	Golicke	Aug. 11, 1942
2,323,192	Blair	June 29, 1943
2,369,953	Downey	Feb. 20, 1945