

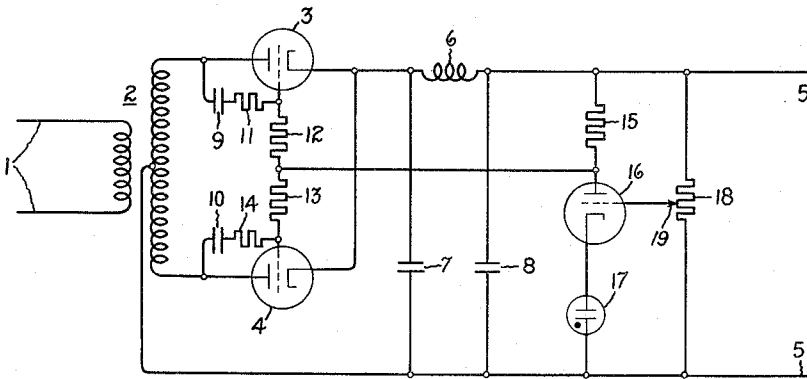
April 24, 1951

G. W. FYLER

2,550,462

RECTIFIER REGULATOR

Filed Jan. 16, 1946



Inventor:
George W. Fyler,
by *Merton D. Moore*
His Attorney.

UNITED STATES PATENT OFFICE

2,550,462

RECTIFIER REGULATOR

George W. Fyler, Stratford, Conn., assignor to
General Electric Company, a corporation of
New York

Application January 16, 1946, Serial No. 641,593

1 Claim. (Cl. 321—39)

1

My invention relates to electric valve converting systems and more particularly to systems suitable for converting and controlling the energy transmitted between an alternating voltage supply circuit and a direct voltage load circuit.

It is frequently necessary to provide unidirectional voltage from a source of alternating voltage in a manner which prevents changes in load impedance or the applied alternating voltage from influencing the unidirectional voltage at the load. My invention relates to an improved rectifier-regulator in which this performance is achieved with minimum voltage drop in the rectifier tubes and in a manner providing a maximum degree of simplicity.

It is the object of my invention, therefore, to provide an improved rectifier-regulator.

It is a further object of my invention to provide an improved rectifier-regulator in which the voltage drop inherent in the rectifier is a minimum.

Still another object of my invention is to provide a rectifier-regulator capable of maintaining a predetermined constant output voltage over a wide range of source voltage and load impedance.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claim. My invention itself, however, both as to its organization and method of operation together with further objects and advantages thereof may best be understood by reference to the following disclosure taken in connection with the accompanying drawing which shows the schematic diagram of an illustrative embodiment of my invention.

Referring now to the drawing, alternating voltage applied to input terminals 1 produces a voltage across the secondary winding of transformer 2. This voltage is rectified by electron discharge devices 3 and 4 of the high vacuum type to provide unidirectional output voltage across load terminals 5. The filter composed of inductance 6, capacitor 7 and capacitor 8 smooths this voltage, thereby eliminating the high frequency components. The series circuit comprising condensers 9 and 10 and resistances 11, 12, 13 and 14 applies an alternating voltage between the cathodes and control electrodes of devices 3 and 4. This voltage is substantially in phase with the voltage between the cathodes and anodes of these devices since the impedance of condensers 9 and 10 is small compared to resistances 11, 12, 13, and 14. The series circuit comprising re-

2

sistance 15, device 16 and gas discharge device 17 passes current by reason of the voltage appearing across terminals 5, the magnitude of this current being determined by the grid bias at device 16. Inasmuch as the grid bias at device 16 is proportional to the difference between a pre-selected portion of the voltage across terminals 5 established by the setting of potentiometer 18 and the relatively constant voltage across gas discharge device 17, the current flow through resistance 15 is determined by the relationship between output voltage and the reference voltage across device 17. The voltage drop in resistance 15, and hence the unidirectional bias at devices 3 and 4, therefore, depends on the relationship between actual voltage at terminals 5 and the reference voltage across gas discharge device 17.

Regulating action is provided by means of the unidirectional bias supplied by current flow through resistance 15. If output voltage across terminals 5 tends to increase, the voltage between the movable contact 19 on potentiometer 18 and the negative load terminal is correspondingly increased and the control electrode of device 16 tends to become positive with respect to the cathode. This increases current flow through resistance 15, thereby causing the anode of device 16 to become more negative. This causes the control electrodes of devices 3 and 4 to be relatively more negative and therefore increases the voltage drop across each device, thereby decreasing the voltage appearing at terminals 5. This degenerative feedback acts to cause the bias of device 16 to assume a definite value relative to the constant potential across gas discharge device 17, thereby tending to cause output voltage to approach the value determined by the setting of potentiometer 18.

Inasmuch as the series circuit comprising condensers 9 and 10 and resistances 11, 12, 13 and 14 is connected directly across the secondary winding of transformer 2, the voltage at the control electrodes of devices 3 and 4 follows the applied alternating voltage. When the anode of device 3, for instance, becomes positive and current flow takes place through the space path of that device, the control electrode is also positive. Inasmuch as this positive control electrode potential tends to increase the flow of space current from the cathode to the anode, the effective resistance of the device is reduced and the voltage drop thereacross made less than the value which would otherwise exist.

While I have shown and described my inven-

tion as applied to a particular system of connections as embodying various devices diagrammatically shown, it will be observed to those skilled in the art that changes and modifications may be made without departing therefrom, and I, therefore, aim in the appended claim to cover all such changes and modifications as fall 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:

A regulated rectifier power supply system comprising a source of alternating voltage, a direct-current load circuit, an electron discharge device of the high vacuum type having a cathode, a control electrode and an anode, a conductive connection from said anode to one terminal of said source, a conductive connection from said cathode to a first terminal of said load circuit and a common conductive connection from the other terminal of said source to the second terminal of said load circuit, means for continuously varying the terminal impedance of said device inversely with variations in the magnitude of said voltage during positive half-cycles thereof at said anode, said means comprising a low-impedance alternating current connection including a blocking capacitor connected between said control electrode and said one terminal, thereby to impress an alternating voltage on said electrode which is substantially proportional to and in phase with the alternating voltage at said anode, an impedance element, means comprising an auxiliary electron discharge device having an anode circuit

and a control electrode circuit for causing a direct current to flow through said impedance element, a reference source of substantially constant direct voltage in said anode circuit, means for impressing the load voltage on said control electrode circuit, said direct current flowing through said impedance element being dependent upon the difference between said reference voltage and the load voltage, and means to apply a unidirectional bias voltage between said control electrode and said cathode which is substantially proportional to the voltage drop across said element, said last means increasing the negative potential of said electrode with respect to said cathode with increasing load voltage, thereby additionally to vary the internal impedance of said device during said positive half-cycles in a sense tending to maintain said load voltage substantially constant.

GEORGE W. FYLER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,928,812	Dawson	Oct. 3, 1933
2,086,994	Barz et al.	July 13, 1937
2,101,802	Winograd	Dec. 7, 1937
2,113,220	Power	Apr. 5, 1938
2,117,908	Okawa	May 17, 1938
2,248,821	Haselton et al.	July 8, 1941
2,315,445	Milarta	Mar. 30, 1943