Nov. 27, 1934. H. W. PARKER 1,982,068

COMBINED RECTIFIER AND PENTODE

Filed Dec. 1, 1933

Fig. 1

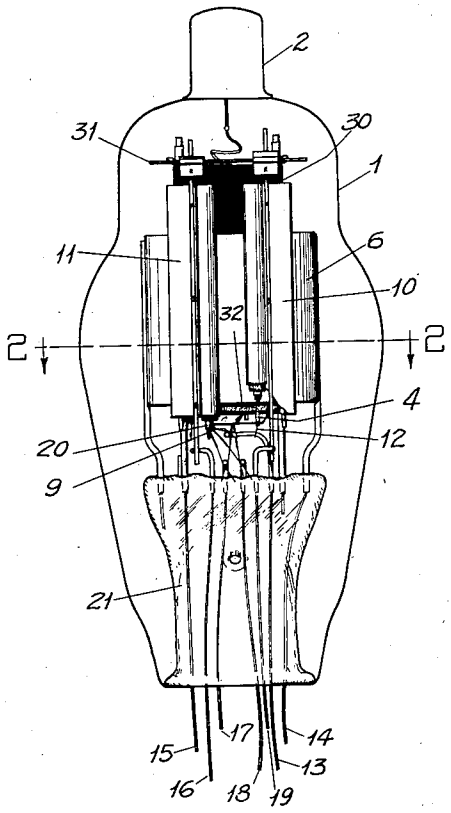


Fig. 2

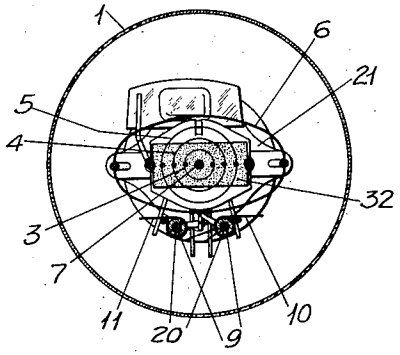
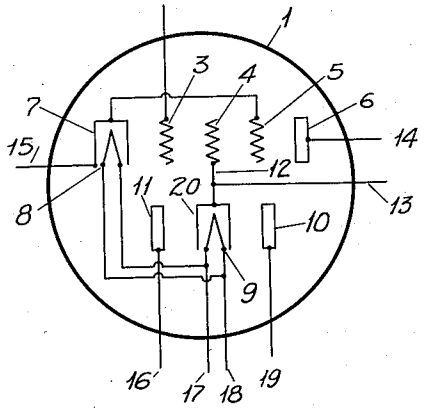


Fig. 3



INVENTOR

Henry W. Parker

BY

Wm. J. Herdman

ATTORNEY

Patented Nov. 27, 1934 1,982,068

UNITED STATES PATENT OFFICE

1,982,068

COMBINED RECTIFIER AND PENTODE

Henry W. Parker, Toronto, Ontario, Canada, assignor to Rogers Radio Tubes, Limited, Toronto, Ontario, Canada, a corporation of Ontario, Canada

Application December 1, 1933, Serial No. 700,377

4 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices and pertains specifically to that type of such devices as are termed thermionic tubes of the kind employing a plurality of thermionic discharge devices in a unitary envelope.

An object of my invention comprises producing a simplified form of thermionic tube combining a plurality of groups of associated electrodes in one unitary envelope.

Another object of my invention comprises producing a simplified form of combined multi-grid thermionic tube, such as a pentode, and a thermionic rectifier in a unitary envelope.

A further object of my invention comprises producing a simplified and efficient combination of power pentode and double wave rectifier in a unitary envelope.

A further object of my invention comprises producing a combined pentode and full wave rectifier in one envelope having a minimum of connecting leads passing through the envelope.

A still further object comprises producing a combined power pentode and full wave rectifier within a unitary envelope so related with respect to each other as to substantially eliminate any disturbance due to impressing alternating current upon the rectifier.

In the figures accompanying and forming a part of this specification and in which like reference numerals designate corresponding parts throughout the separate figures:

Fig. 1 is a partially broken elevation of one embodiment of my invention with the tube contact base removed for the purpose of clarity;

Fig. 2 is a section of the same taken on line 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic representation of the electrodes showing their interconnection within the tube.

Referring now particularly to the figures, which illustrate one preferred form of my invention, comprising a pentode and full wave rectifier in one envelope, there is provided the usual vitreous or glass envelope 1 enclosing the stem 21 terminating in the usual press. All of the electrodes comprising the pentode and the full wave rectifier are supported as shown in Figs. 1 and 2 by the press. The pentode comprises the usual electrodes, a cathode comprising a heater 8 and electron emitting surface 7, a control grid 3, the terminal 2 which is placed as usual at the top of the blank or envelope 1, an accelerating grid 4, a screen grid 5 and an anode 6 enclosing in this preferred form of my invention all of the other electrodes.

The full wave rectifier is preferably constructed of two similar members each comprising an indirectly heated cathode comprising a heater 9 and an electron emitting surface 20 enclosed in a ceramic tube fitted within substantially cylindrical anodes 10 and 11. The anodes are preferably constructed by curling up one portion thereof to enclose the ceramic enclosed cathode, as shown clearly in Figs. 1 and 2. For purposes of clarity, the cathode shown in Fig. 3 is shown as a unitary cathode comprising the heater 9 and electron emitting surface 20 with the anodes 10 and 11 juxtaposed thereto.

Insulating and supporting members 31 and 32 of mica serve to position the electrodes of the pentode and to further position the electrodes of the full wave rectifier relatively thereto. I have found by trial and experiment that if the anodes 10 and 11 of the rectifier are placed with their major surfaces juxtaposed and juxtaposed to the exterior surface of one side of the anode 6 of the pentode as shown in Figs. 1 and 2, the hum due to the impressed alternating current voltage on the rectifier is very materially reduced and that by providing a metallic electrostatic screen 30 in the form of a ferrule positioned as shown in Fig. 1, such hum is reduced to a minimum so far as the relative positions of the electrodes within the envelope are concerned.

I have further found that the effectiveness of the organization is materially increased and its manufacture simplified through connecting within the envelope the accelerating grid 4 to the cathodes 20 of the rectifier. This connecting wire 12 is shown clearly in Fig. 3 and a portion of the anode 10 and cathode therein is broken away in Fig. 1 to show clearly the connecting wire 12 in the complete tube. All of the heaters for the cathodes of both the pentode and the rectifier are connected in parallel as clearly shown in Fig. 1 and Fig. 3. In Fig. 1, the parallel connection to the rectifier cathode within the anode 10 is broken away to permit showing the conductor 12 connecting the accelerating grid 4 with the lead 13 connected to both of the cathodes 20. It will be noted that by connecting the accelerating grid 4 with the cathode of the rectifier within the tube, the number of leads emerging from the tube is reduced to seven and that I am therefore able to employ a standard seven prong base and achieve in such a base the necessary insulation resistance between contact prongs. The base of the tube containing the contact prongs is omitted from Fig. 1 so that the conducting leads may be more readily identified. Conducting lead 14 is con-

nected to the anode 6 of the pentode. Conducting lead 13 is connected to the conductor 12 joining accelerating grid 4 of the pentode and the rectifier cathodes 20. Conducting lead 19 is connected to anode 10 of the rectifier. Conducting leads 17 and 18 are connected in parallel with all of the cathode heaters as shown in Figs. 1 and 3. Conducting lead 16 is connected to rectifier anode 11 and conducting lead 15 is connected to cathode 7 of the pentode.

It will be noted that the heaters of all of the cathodes, that is, the two cathodes of the full wave rectifier and the cathode of the pentode, are connected in parallel within the tube.

It will be noted further that the screen grid 5 of the pentode is connected within the tube to the cathode 7 of the pentode as shown in Fig. 3.

From the foregoing, it will be obvious that I have reduced the conducting leads for a device employing a pentode and a full wave rectifier to a minimum and that through connecting the accelerating grid of the pentode with the cathode of the rectifier, I have still further simplified the construction. My device produces a very efficient combined pentode and full wave rectifier of simplified construction, reducing labor and material and permitting the employment of a standard seven prong base having the required insulation resistance between contact prongs.

It will be further noted that through connecting the accelerating grid with the cathode of the double wave rectifier, locating the double wave rectifier on one side of the anode of the pentode with the anodes of the pentode juxtaposed and both juxtaposed to the external surface of the anode of the pentode and, further, by the employment of an electrostatic metallic shield 30, I achieve a substantial elimination of the hum produced by the alternating current impressed upon the heaters and anodes of the full wave rectifier.

The accelerating grid of the pentode is usually operated at a high positive potential and must be connected to ground through a negligibly small impedance. Also, the cathode of the rectifier is usually at a high positive potential and must be connected to ground through a negligibly small impedance in order to reduce the hum of the alternating voltage in the anode circuit. By interconnecting the accelerating grid of the pentode and the cathode of the rectifier, a low impedance connection to ground through one common capacitor in the external circuit is achieved.

While I have illustrated and described one embodiment of my invention, it is to be clearly understood that many modifications may be made without departing from the spirit or narrowing the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. An electron discharge device comprising, a substantially evacuated envelope, a cathode, a control grid, a plurality of screen grids and an anode within said envelope, a second cathode, a third cathode and anodes associated respectively with said second and third cathodes, said second and third cathodes being interconnected and connected within said envelope to one of said screen grids and all of said cathodes being connected in parallel within said envelope.

2. An electron discharge device comprising, a substantially evacuated envelope, a cathode, a control grid, an accelerating grid, a screen grid, and an anode within said envelope and constituting a pentode, and a plurality of additional cathodes, anodes associated respectively with each of said cathodes and constituting a double wave rectifier within said envelope, the cathodes of said rectifier being conductively connected within said envelope to said accelerating grid.

3. An electron discharge device comprising, a substantially evacuated envelope, a cathode, a control grid, an accelerating grid, a screen grid and an anode constituting a pentode within said envelope, a second cathode, a plurality of anodes associated therewith constituting a double wave rectifier within said envelope, said second cathode being conductively connected within said envelope to said accelerating grid, said first mentioned cathode being conductively connected within said envelope to said screen grid and said cathodes all being connected in parallel within said envelope.

4. An electron discharge device comprising, a substantially evacuated envelope, a stem and press within said envelope, a cathode, a control grid, an accelerating grid, a screen grid and an anode all supported from said press and comprising a pentode, a second and third cathode, anodes supporting and substantially enclosing respectively said second and third cathodes and supported from said press, said cathode enclosing anodes being positioned with their major surfaces juxtaposed to each other and to the exterior surface of the anode of said pentode and said second and third cathodes being conductively connected within said envelope to said accelerating grid.

HENRY W. PARKER.