Dec. 29, 1931. J. F. TRAVER 1,838,201

ELECTRONIC VALVE

Filed Sept. 30, 1925

Fig. 1.

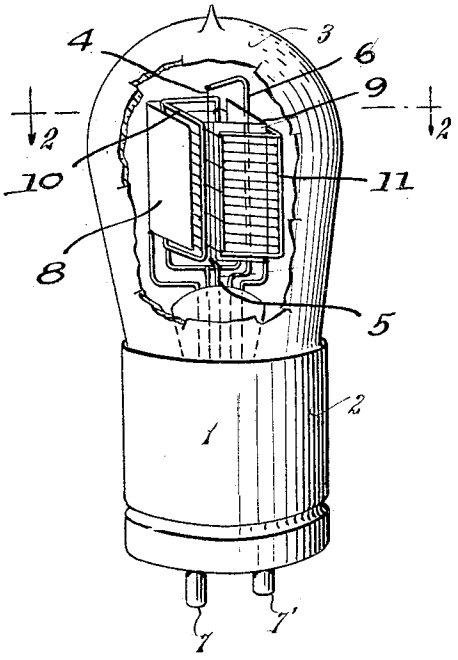
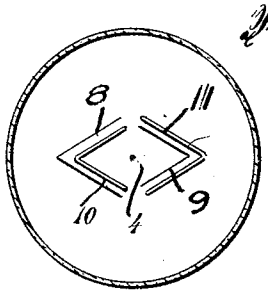


Fig. 2.



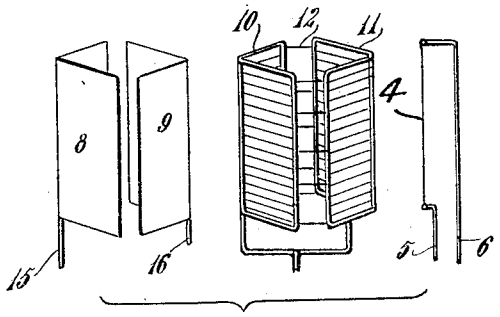
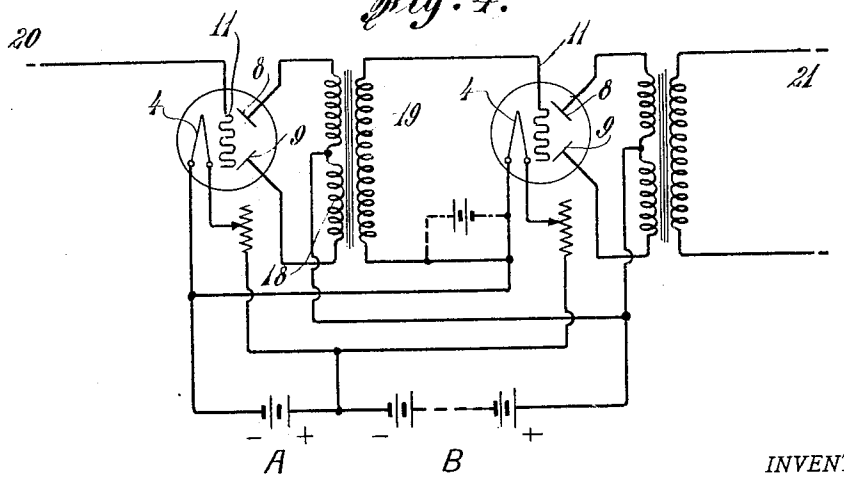


Fig. 3.

Fig. 4.



INVENTOR
John F. Traver
BY
ATTORNEY

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UNITED STATES PATENT OFFICE

JOHN F. TRAVER, OF NEW YORK, N. Y.

ELECTRONIC VALVE

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My invention relates to new and useful improvements in electronic valves for use in radio and other electrical circuits.

It is broadly the purpose of this invention to produce a valve or tube in which the elements producing or controlling the flow of the electrons are so formed as to produce a valve or tube of more evenly distributed balance and greater efficiency than those heretofore produced.

It is an object of this invention to produce a vacuum tube of an increased efficiency and possessing certain inherent self-neutralizing characteristics. In the vacuum tubes in common use, a grid is transposed between the grid and filament to control the electron discharge, effect of such a combination being that when the grid is of one polarity the electrons from the filament are repelled, and do not reach the plate. In accordance with such a tube, the electrons so repelled fly off into space and perform no useful function.

It is an object of this invention to produce an electron tube which can make use of the attraction of the electrons during one polarity of the grid but can make use also of the electrons which are repelled thereby increasing the effective electron flow.

With the customary present day tubes, moreover, with the grid of an appreciable size and inserted in close proximity to the plate, the variable charge upon the plate re-acts upon the grid through the capacity between them to increase the grid voltage. This phenomenon customarily referred to as feed back becomes more objectionable the greater the relative size of the grid.

It is a further object of this invention to provide a tube in which the grid is so situated with reference to the plate that the feed back is inherently neutralized, whereby the size of the grid may be determined by the desirable operating characteristics of the circuit, without being dominated by the feed back evil.

It is also an object of this invention to provide a tube with a new form of grid and plate element which will produce the maximum operating effect.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claim.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of a tube embodying my invention, a portion of the glass being broken away, for the sake of clearness.

Fig. 2 is a horizontal sectional view, taken on the lines 2—2 of Fig. 1.

Fig. 3 is a perspective view of one form of plates, grids, and filaments; and

Fig. 4 is a diagrammatic view of one form of hook-up or wiring diagram, employing my valve or tube.

In accordance with this invention, a tube is provided having a plurality of plates one of which is adapted to respond to the electrons attracted by the grid potential and the other of which is arranged to respond to those electrons which are repelled by the grid potential. This is preferably accomplished by associating one plate with the grid transposed between it and the source of electron discharge, while the other plate is placed preferably upon the opposite side of the filament.

Referring particularly to the reference characters in the drawings; numeral 1 represents a bulb or tube having a base 2, and a glass enclosure 3, of any well known form. Within the tube there is mounted, in any satisfactory manner, a filament 4, which filament, for the purpose of this showing, is supported through members 5 and 6, consisting of long and short arms to be connected to the primary of an "A" battery by any well known means, not shown, by the contacts 7 and 7'. As shown in Fig. 3, the filament which I prefer to use comprises a single thread 4 of proper conductive and electron

emitting material vertically disposed as shown, for in many cases it will be found desirable to locate the electronic generating element in a single fixed plane. The tube is exhausted in any well known manner.

In accordance with this invention two separate plate elements are employed, as shown at 8 and 9, one of which has a grid element 10 disposed between it and the filament 4, while the other 9 is disposed in similar relation to the filament 4, but with no grid transposed. With a tube of this construction, it will be obvious that with a positive electric potential imposed on both plates and with a high negative potential upon the grid a minimum current will flow to the plate 8 while the plate 9 will tend to absorb the total electron flow from the filament. As soon, however, as the grid potential decreases its repulsion will decrease with a consequent increase in current to the plate 8. Until, when the grid 10 becomes positive, it assists the plate 8 in attracting the electron flow. In this manner there is utilized not only the positive half of the wave, that is, those electrons which are positively attracted by the grid, but it in effect utilizes also the negative half of the wave through the plate 9, thus increasing the effective alternating current.

It will be observed, moreover, that with this type of grid, the alternating current is largely independent of the electron flow from the filament, since the effective current is the difference in flow to the two grids, hence an increase in the electron flow to both grids simultaneously and in equal amounts would not affect the alternating current. This feature is of assistance in rendering the tube independent of fluctuations in the electron emission, as for example, where alternating current is used to heat the filament.

The arrangement, moreover, assists in rendering the tube independent of fluctuations in the plate voltage, since this plate voltage is impressed upon two plates simultaneously which are connected electrically in opposition, thus a decrease in the current flowing to the one plate due to a decrease in the plate voltage, is neutralized by the corresponding and equal decrease in the current flowing to the other plate.

With the above construction, under many circumstances it is also desirable to employ a second grid member 11 associated with the plate 9, but in such a manner that it does not control the electron flow. This may be conveniently accomplished by mounting the grid 11 outside of the plate 9 but spaced from it the same distance which separates the grid 10 from the plate 8. The grid elements 10 and 11 are connected in multiple. The effect of this grid arrangement is to neutralize any feed back tendency when associated with the proper electric circuit.

Both the plate and grid members are V shaped angle bars and are located, as shown in Fig. 2, in positions whereby they substantially surround the filament member 4, which filament member 4 is positioned an equal distance from the apex of the angularly formed plate members 8 and 9.

In Fig. 4 is shown a typical circuit in which this invention may be employed, including an initial source of variable energy 20 connected to the grid 11 of the first tube and A batteries for operating the filaments in both tubes. A transformer 19 has a split primary, the central tap being connected to the positive side of the B batteries, and the terminals being connected respectively to the plates 8 and 9. The secondary of the transformer 19 is connected to the grid 11 of the second tube in cascade. With this construction it will be clear that the operation of the primary of the transformer 19 and the plate 8 will be effected by the grid 11 and will transfer this effect to the secondary of the transformer 19 in the usual manner. When the current to plate 8 is decreased, the current to plate 9 is increased and since the current changes from the plates 8 and 9 are fed to opposite ends of the primary winding of the transformer 19, the changes are accumulative, that is, since the current increases at one end of the primary winding and at the same instant decreases at the other end of the winding, the total effect appearing at the secondary is the addition of the currents.

It will be obvious that with the foregoing construction a grid or current flow will result from a given grid potential and a greater tube capacity will result from the same total electron emission. At the same time, by reason of the association of the double grid member to the plate member, the feed back from the plate 8 to the grid 11 is directly opposed by the equal and opposite feed back from the plate 9, with the result that there is no feed back through the tube, even where the grid and plate circuits are accurately tuned to the frequency.

The transformer in Fig. 4 is illustrated in the conventional manner of illustrating an audio frequency transformer, but it will be observed that the functioning and effect of the tube will be the same where radio frequency transformer is employed. Thus, by the above construction are accomplished the objects hereinbefore set forth.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claim is intended to cover all of the

generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

An electron discharge device comprising a cathode, an anode located on one side of said cathode, a control electrode having a portion between said cathode and said anode, a second anode on the other side of said cathode, the space between said second anode and said cathode being free from other electrodes and said second anode being located between said cathode and another portion of said control electrode.

JOHN F. TRAVER.