April 26, 1932. A. W. HULL 1,855,886

ELECTRON DISCHARGE DEVICE

Original Filed Aug. 19, 1927

Fig. 1.

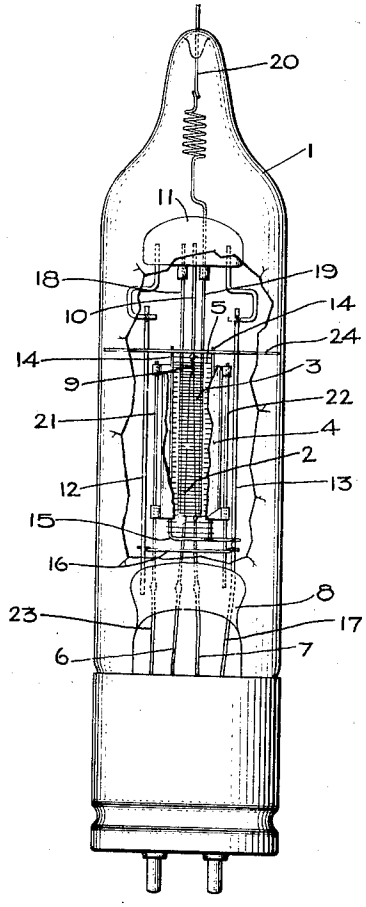


Fig. 2.

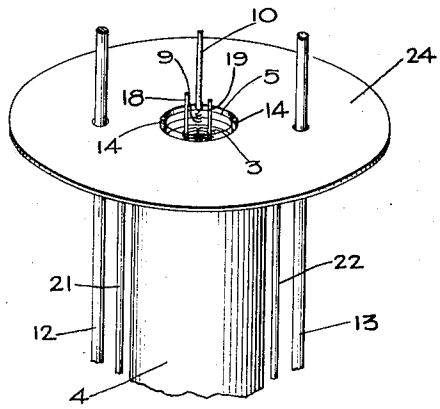
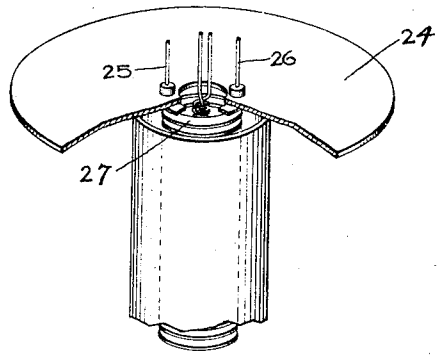


Fig. 3.



Inventor:
Albert W. Hull,
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Patented Apr. 26, 1932

1,855,886

UNITED STATES PATENT OFFICE

ALBERT W. HULL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

ELECTRON DISCHARGE DEVICE

Application filed August 19, 1927, Serial No. 214,198. Renewed February 17, 1932.

The present invention relates to electron discharge devices of the four-electrode type. In my copending application, Serial No. 696,665, filed March 3, 1924, of which the present application is a continuation in part, I have disclosed an arrangement in which a screening grid interposed between an anode and a control grid and extending slightly beyond the control grid and anode serves to intercept electrostatic lines of force extending beyond the ends of these electrodes. Although such an arrangement is effective in intercepting such lines of force to thereby reduce the capacity between the grid and anode to a minimum, I have found that the same result may be produced by the use of a thin metal washer mounted adjacent one end of the screening grid, the inner diameter of the washer being slightly greater than the diameter of the shielding grid and the outer diameter of the washer being substantially equal to the inner diameter of the receptacle in which the electrodes are mounted.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, will best be understood from reference to the following specification when considered in connection with the accompanying drawings in which Fig. 1 shows an elevation partly broken away of an electron discharge device constructed in accordance with the present invention; Fig. 2 is a perspective view on an enlarged scale of the upper end portion of the electrode structure shown in Fig. 1; while Fig. 3 indicates a modified form of shielding grid.

I have indicated in Fig. 1 an evacuated receptacle 1 in which are mounted a V shaped filamentary cathode 2, a control grid 3, an anode 4 and a screening grid 5 interposed between the control grid and anode. Current for the cathode 2 is supplied by leading-in conductors 6 and 7 which extend through stem 8. The end of cathode 2 remote from the stem is supported by a spring 9 secured to the end of a supporting rod 10. The opposite end of rod 10 is embedded in a block 11 of insulating material. Block 11 is supported by rods 12 and 13, the opposite ends of which are embedded in stem 8. Screening grid 5, at its lower end, is provided with a ring 15 secured to the grid supporting wires 14. Ring 15 is provided with a lateral extension secured to rod 13. Rods 12 and 13 are provided at a point adjacent stem 8 with a flat rectangular metal brace 16 having a central opening, not shown, to accommodate the leads for filament 2. Supporting member 13 extends through stem 8 and forms a continuation of the leading-in conductor 17 by which current is supplied to the screening grid. Supports 18 and 19 of the control grid are also embedded in the insulating block 11 and support 19 is connected to the leading-in conductor 20 whereby current is supplied to the control grid. Anode 4 is supported from stem 8 by supports 21 and 22 and support 21 is connected to leading-in conductor 23 which supplies current to the anode. The screening grid extends an appreciable distance beyond the lower ends of the control grid and anode. A thin annular metal member or washer 24 having an outer diameter substantially equal to the diameter of receptacle 1 and an inner diameter slightly larger than the diameter of the screening grid is mounted on rods 12 and 13 adjacent the end of the screening grid and secured to the grid supporting rods 14. The control grid lead 20 is brought out of receptacle 1 at the opposite end from the anode lead so that there is no unscreened capacity between the two leads.

It will be apparent that the disc 24 is effectively interposed between the end of the anode and the lead to the control grid and thus serves to intercept any electrostatic lines of force extending from the anode toward that lead.

In the arrangement shown in Fig. 3, I employ a modified form of screening grid construction in which the screening grid is made up of annular metal discs 27 threaded on rods 25 and 26. At the upper end of the screening grid, an annular metal shield or disc 24, similar to that disclosed in Figs. 1 and 2, is mounted. A similar disc may be provided at the opposite end of the screening grid if desired.

The potential applied to the screening grid

for producing screening action is preferably a constant potential so chosen that it has no deleterious effect upon the usual operation of the discharge device. This potential is preferably fixed at a value which is more positive with respect to the cathode than the potential of the control grid at any time. With the arrangement disclosed the capacity effect between the control grid and the anode is substantially eliminated, the arrangement of the metal shield serving to intercept not only the direct electrostatic lines of force extending between the control grid and anode but also electrostatic lines extending in curved paths between the two electrodes as well as the electrostatic lines extending from the anode to the lead for the control grid or from the anode lead to the lead from the control grid. Although I have indicated the screening grid as extending slightly beyond the upper end of anode 4, such an arrangement is not essential. Grid 5 might be so disposed within anode 4 that it would not extend beyond the upper end of the anode. The shield 24 should of course be spaced a slight distance from the anode. This might be accomplished by extending the supporting wires of the shielding grid a slight distance beyond the end of the anode.

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

1. An electron discharge device comprising a receptacle, a plurality of electrodes mounted therein, said electrodes comprising a cathode, anode and control grid, and a screening grid interposed between the anode and control grid and adapted to eliminate the coupling effect between the last mentioned electrodes, said screening grid being provided at one end thereof with a substantially flat annular conducting shielding member.

2. An electron discharge device comprising a container, a plurality of electrodes mounted therein, said electrodes comprising an electron emitting cathode, an anode and a control grid, and means for eliminating the coupling effect of capacity between the control grid and anode, said means comprising a screening grid provided with a flat metal shielding disc adjacent one end thereof and interposed between the end of the anode and a lead connected to the control grid.

3. An electron discharge device comprising a receptacle, a plurality of electrodes mounted therein, said electrodes comprising a cathode, anode and control grid, and a screening grid interposed between the anode and control grid, said screening grid having an annular conducting shielding member mounted adjacent one end thereof and electrically connected thereto, said member having an outer diameter substantially equal to the inner diameter of the receptacle.

4. An electron discharge device comprising a receptacle, an electron emitting cathode, an anode and a control grid mounted in the receptacle, a screening grid interposed between the anode and the control grid and insulated from the control grid, and a connection at one end of the screening grid comprising a metal washer having an outer diameter substantially equal to the inner diameter of the receptacle and an inner diameter substantially equal to the diameter of the screening grid.

5. An electron discharge device comprising a container, a plurality of electrodes mounted therein, said electrodes comprising an anode and a control grid, the conductors of which pass through opposite ends of the container and means for eliminating the effect of capacity coupling between the control grid and the anode, said means comprising a screening grid and a metallic member adjacent the end of said electrodes from which the grid conductor is taken.

6. An electron discharge device comprising a container, a plurality of electrodes concentrically mounted therein, said electrodes comprising an anode and a control grid, means for eliminating the effect of capacity coupling between the control grid and anode, said means comprising a screening grid interposed between the anode and control grid and provided with a metallic member extending in a plane transverse to the principal axis of the electrodes and electrically connected to said screening grid and interposed between the end of the anode and a lead connected to the control grid.

7. An electron discharge device comprising a container, a plurality of electrodes concentrically mounted therein, said electrodes comprising an anode and a control grid, means for eliminating the effect of capacity coupling between the control grid and anode, said means comprising a screening grid interposed between the anode and control grid and provided with a metallic member extending in a plane transverse to the principal axis of the electrodes and having an area greater than the transverse cross-sectional area of the anode said member being interposed between the end of the anode and a lead connected to the control grid.

8. An electron discharge device comprising a container, a plurality of cylindrical electrodes concentrically mounted therein, said electrodes comprising an anode and a control grid, means for eliminating the effect of capacity coupling between the control grid and the anode, said means comprising a metal washer having an outer diameter substantially equal to the inner diameter of the container and an inner diameter relatively larger than the diameter of the control grid.

In witness whereof I have hereunto set my hand this 17th day of August, 1927.

ALBERT W. HULL.

CERTIFICATE OF CORRECTION.

Patent No. 1,855,886. Granted April 26, 1932, to

ALBERT W. HULL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 59, claim 3, after the word "grid" first occurrence, insert the words and comma and adapted to eliminate the coupling effect between the last mentioned electrodes,; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of June, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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