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ELECTRON DISCHARGE DEVICE

Original Filed Feb. 16, 1918

Fig. 1

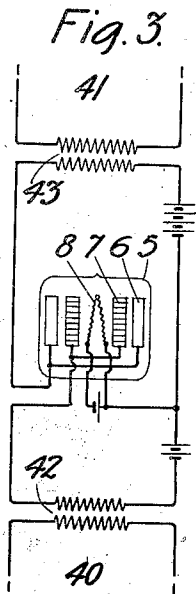
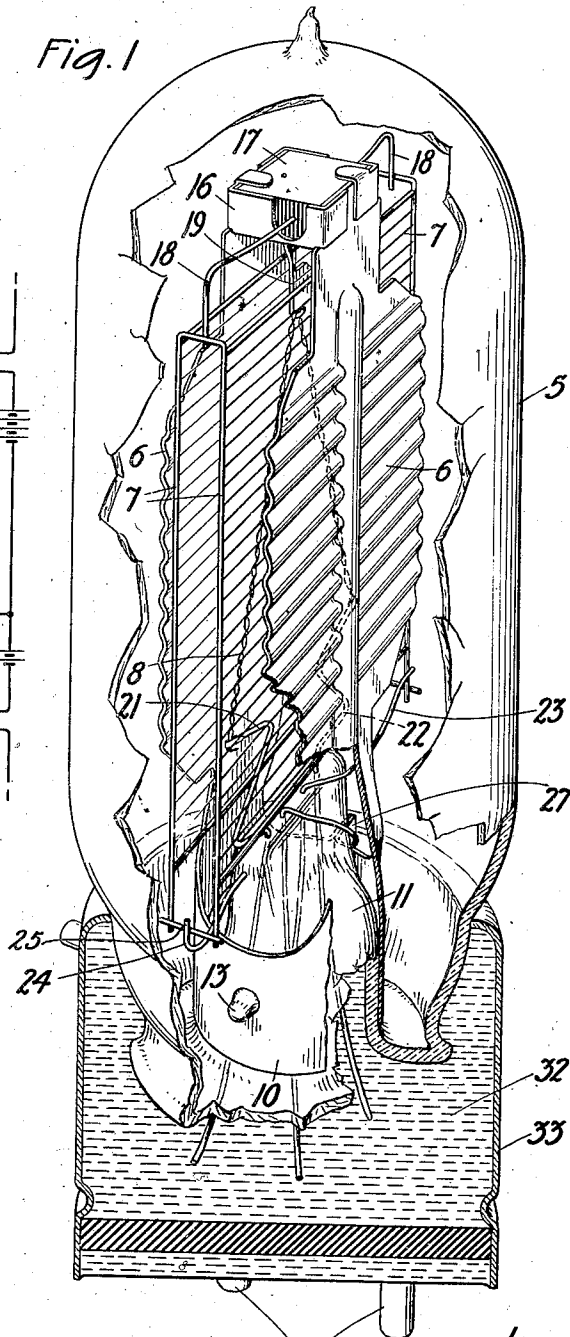
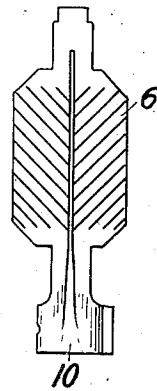


Fig. 2.



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UNITED STATES PATENT OFFICE

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ELECTRON-DISCHARGE DEVICE

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This invention relates to electron discharge devices, and more particularly to three-electrode vacuum tubes, and has as an object the improvement of the electrode supporting and electrode structure.

5 An electron discharge device of this type comprises a gas tight vessel in which there are usually enclosed a cathode or filament, an anode, usually in the form of a plate, and
10 a grid. In some cases it has hitherto been found convenient to support these electrodes from an arm supported by a glass standard attached to the stem of the tube. It has been
15 found, however, that such a method of support is liable to breakage whenever the tube is subjected to a strain, shock or sudden blow.

In accordance with this invention, the objectionable glass standard is eliminated in the specific arrangement hereinafter described by attaching one of the electrodes,
20 preferably the anode, directly to the stem of the tube and supporting the other electrodes therefrom, thereby obtaining a rigid and fixed organization of the electrodes.

25 This invention will be better understood by reference to the following description, taken in connection with the accompanying drawings, in which Fig. 1 illustrates one form of this invention; Fig. 2 represents a modification thereof; and Fig. 3 shows how this
30 invention may be applied for the amplification or repeating of alternating currents.

Referring particularly to Fig. 1, 5 is an evacuated vessel shown partly in perspective
35 and partly in cross-section, containing a double plate electrode 6, a double grid 7 and a filament 8. The double plate 6 as shown terminates in a collar 10, which fits snugly around the neck or squash 11 of the vessel,
40 and is held in place by the glass boss 13. The distance between the plates of the electrode 6 is less than the diameter of the collar 10. The plate is therefore securely self-supported without the intermediary of any additional
45 framework or glass standards. On the upper ends of the two plates and suitably supported thereby is a nest 16 containing insulation material 17. Through this insulation material passes the supporting wire 18 for the grid
50 and the supporting wire 19 for the filament.

The grid and filament are therefore supported through the intermediary of plate 6. The filament has its ends attached to the two leading-in wires 21 and 22, which lead to suitable external terminal connections. The
55 grid 7 has an external circuit connection through lead wire 23. Wire 24, which is preferably welded to the grid at the point 25 aids in maintaining the rigidity of the grid, in
60 order that the desired space-relation between the electrodes will remain fixed. 27 is the lead wire for the plate. Attached to the lower part of the evacuated vessel 5 by the insulation material 32 is a metallic base or
65 shell 33 carrying the posts 35 (only two shown) to which wires from the various electrodes in the vessel may be attached. This shell, however, is not a part of this invention, but constitutes the subject matter of Patent
70 1,491,362, of April 22, 1924, to H. E. Shreeve.

In order to keep the two plates 6 from buckling, thereby destroying the desired
75 space relation between the electrodes when the plate becomes heated by current passing between it and the filament 8, it has been found necessary to employ means for stiffening the plate. In the drawing, the means
80 shown consists of horizontal and vertical corrugations or ridges in that portion of the plate where buckling is liable to occur. Fig. 2 shows a modification that may be made in the plate by having part of the corrugations
85 running diagonally.

The insulation piece 17 may be of any desired material such as glass, lavite or the
85 like. In some respects, however, a block of lavite has been found preferable to a glass bead, in that the lavite can be readily machined into the shape desired and holes
90 drilled therethrough. In order to give additional stiffness to the grid and the filament, their supporting wires are preferably flattened over the portion passing through the
95 insulation material 17, thereby laterally extending the wires to frictionally engage the inner wall of the apertures in block 17.

Fig. 3 shows how this invention may be employed to amplify currents from an incoming line 40 and impress them in amplified
100 form upon the outgoing line 41. Impulses

coming from the line 40 through transformer 42 may be impressed on the grid and the filament of tube 5, thereby varying the output circuit current flowing between the filament 8 and the anode 6 in accordance with these impulses. The amplified impulses in the output circuit of the tube may be impressed by transformer 43 upon any suitable outgoing line 41.

It is apparent to one skilled in the art that varied modifications may be made in this invention other than those above described without departing anyway from the spirit of this invention as defined in the appended claims.

What is claimed is:

1. An electron discharge device comprising a gas tight vessel containing a plurality of spaced electrodes, said device having a neck portion, a support for said electrodes comprising an additional electrode partially enclosing said other electrodes and attached to the necks of said device and a lead in wire for said additional electrode sealed in the neck of said device.
2. An electron discharge device comprising a gas tight vessel having a reentrant neck and having a cathode, a control electrode, and an anode, said anode comprising two plates terminating in a collar resting on said neck.
3. An electron discharge device comprising a gas tight vessel having a reentrant neck, a cathode, two parallel plates forming the anode of said device and terminating in a collar resting on said neck, and an additional electrode having a supporting member attached to said anode by insulating material.
4. An electron discharge device comprising an anode, a cathode and a third electrode, said anode consisting of two corrugated plates, said third electrode and said cathode being situated between said plates.
5. In an electron discharge device, a gas tight vessel having a neck, an anode consisting of two parallel plates supported by a collar resting on the neck of said vessel, and a plurality of additional electrodes situated between said plates.
6. An electron discharge device comprising a gas tight vessel having a neck, an anode, a cathode and a grid, said anode consisting of two parallel plates terminating at one end in a collar resting on the neck of said vessel, insulation material at the other end of said plates and supported thereby, said grid and filament being attached to said insulation material by supporting members.
7. A vacuum tube containing a cathode, a second electrode and a plurality of separated metallic members integral with said electrode and supported by a circumferentially complete cylindrical band resting on the neck of said tube.
8. An electron discharge device comprising a gas tight vessel having a constricted

portion and containing a plurality of electrodes, one of said electrodes terminating in a circumferentially complete cylindrical band surrounding said constricted portion of said vessel, and a lead in wire for said last mentioned electrode sealed in said vessel at a point adjacent the constricted portion thereof.

9. An electron discharge device comprising a gas tight vessel having a tubular neck, a cathode, an electrode comprising two parallel plates terminating in a circumferentially complete cylindrical band resting on said neck, the connection between said band and said plates being circumferentially incomplete at a point adjacent the inwardly projecting end of said stem.

10. An electron discharge device comprising a gas tight vessel having a reentrant tubular portion, an electrode, means contacting with the outer surface of said portion and supporting said electrode, other electrodes supported by said first electrode and a projection from said tubular portion extending into said means.

11. An electron discharge device comprising a gas tight vessel, an anode, a cathode and a control electrode, a neck and metallic means contacting with said neck for supporting one of said electrodes, said supported electrode having opposing portions, the distance between the two opposing portions of said last mentioned electrode differing substantially from the effective diameter of said neck.

12. An electron discharge device containing an electrode, a block of insulating material, a metallic band clamping one side of said block against a surface of said electrode and a second electrode supported from said block.

13. An electron discharge device comprising a gas tight vessel containing an electrode, a block of insulating material, a metallic band substantially surrounding the surfaces of said block, which are parallel to the principal axis of said vessel and fastening said block to said electrode, and a cathode supported by said block.

14. An electron discharge device comprising a gas tight vessel having a neck of glass-like material, a plurality of electrodes, and a metallic standard contacting with the outer surface of said neck and supporting one of said electrodes and an interlocking connection between said neck and said standard for positioning said standard.

15. An electron discharge device comprising a cathode and an anode, said anode having a substantially plane surface in a definite space relation with respect to said cathode, said surface being corrugated to prevent its buckling under heat.

16. A vacuum discharge device comprising an anode, a cathode and a control elec-

trode in the form of a grid, said anode having a substantially plane surface in parallel space relation with respect to said control electrode and in fixed relation with respect to said cathode, said surface being corrugated to prevent its buckling under heat, whereby the space relation of the electrodes is maintained constant.

17. An electron discharge device comprising a cathode and an anode, said anode having a substantially plane surface in a definite space relation with respect to said cathode, said surface being corrugated in two directions to prevent its buckling under heat.

18. An electron discharge device comprising several electrodes, a containing vessel therefor having an integral inwardly projecting neck, one of said electrodes having an integral portion thereof substantially surrounding said neck, and a lead-in wire for said last mentioned electrode sealed in said vessel at that end of said vessel having said neck.

19. The combination with a neck, of a plurality of electrode elements supported at one end thereby, and a block of insulating material securing said elements together into a rigid unitary structure, a hook carried by said block, means for maintaining a spring tension on said hook, said hook being adapted to engage one of said electrode elements.

20. The combination with a neck, of a filament electrode supported by said neck, a plate supported by said neck and bent to extend on opposite sides of said filament, a grid between the filament and the opposite sides of said plate, and a block of insulating material carried by said plate and forming the sole support for the ends of the grid and filament opposite to that supported by the neck.

21. The combination with a neck, of a filament electrode supported by said neck, a plate supported by said neck, a grid positioned between said plate and filament, and a block of insulating material carried by said plate and forming the sole support for the ends of the grid and filament opposite to that supported by the neck.

22. The combination with a neck, of a filament electrode supported by said neck, a plate supported by said neck, a grid positioned between said plate and filament, and a block of insulating material carried by said plate and forming the sole support for the ends of the grid and filament opposite to that supported by the neck, and means carried by said block for holding said filament under tension relative thereto.

23. The combination with a neck, of a filament electrode supported by said neck, a plate supported by said neck, a grid positioned between said plate and filament, and a block of insulating material carried by said plate and forming the sole support for the

free ends of the grid and filament, a hook carried by said block to engage said filament, and means for maintaining said hook under tension tending to draw said filament in a taut position.

24. An evacuated vessel containing an anode, a grid and filament, said grid being intermediate the anode and filament, and a block of insulating material supported by the anode and serving as the sole support for the free ends of the grid and filament.

25. A vacuum tube comprising a press, anode, cathode and control electrodes, metallic means on said press for supporting said anode and means on said anode forming the sole support for the free ends of said other electrodes.

26. A vacuum tube comprising a cathode, an anode and a grid, an insulating member on said anode and means for supporting said cathode solely from said insulating member and the neck of the tube.

27. A vacuum tube comprising a cathode, an anode and a grid, a block of insulating material secured to the anode, and means for supporting said cathode solely from said insulating block and the neck of the tube, the free end of said grid being also secured to said block.

28. A vacuum tube comprising a cathode, a grid and a double plate anode, a block of insulation secured to the free ends of the anode plates to space the same, a member secured to the free end of said grid and to said insulation to position the grid, and a member secured to said insulation, said member forming, with the neck of the tube, the sole support for the cathode.

29. A vacuum tube comprising a stem, an anode, a cathode and a grid mounted on the stem, a block of insulation secured between the plates of said anode, said grid being secured to and held in position by said block, and a hook carried by the under face of said block to suspend the upper end of the cathode.

In testimony whereof, I hereunto subscribe my name this 5th day of February, A. D. 1918.

W. F. HENDRY. 115

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