

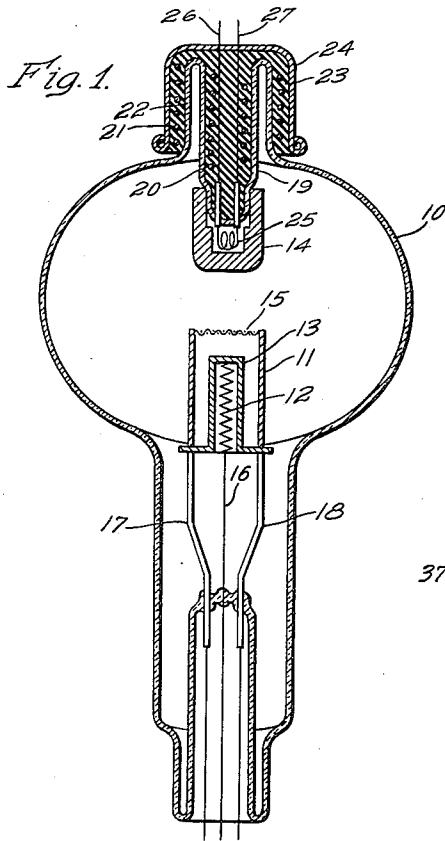
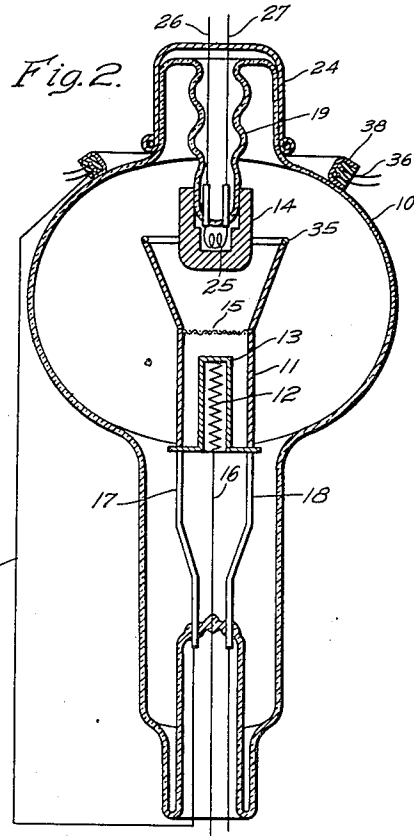
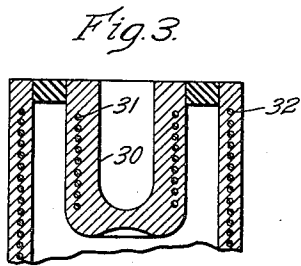
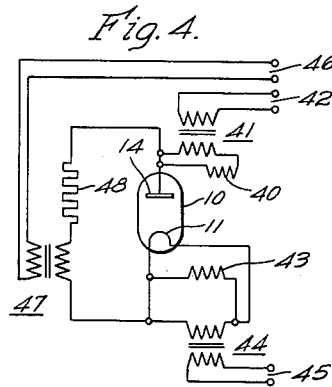
April 27, 1937.

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2,078,642

ELECTRIC DISCHARGE DEVICE HEATER

Filed July 10, 1934



WITNESSES:

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2,078,642

ELECTRIC DISCHARGE DEVICE HEATER

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Application July 10, 1934, Serial No. 734,486
In Germany July 17, 1933

3 Claims. (Cl. 250—27.5)

My invention relates to electric discharge devices and more particularly for heating means for portions of electric discharge devices containing a metallic vapor.

5 An object of the invention is to prevent backfire and similar discharges from the electrodes to the metallic vapor condensed upon the walls of the container.

10 In metallic vapor rectifiers the metallic vapor condenses in the cooler portions of the container especially the supports closely adjacent to the body of the electrodes where the temperature during operation is lower than the temperature of the electrodes. This is especially true in the 15 region surrounding the anode and the supporting portion for the anode. These deposits of the metallic vapor are frequently the cause of backfire and creepage discharge.

20 According to the present invention, these difficulties are overcome by providing heating means for the supports and the parts of the casing closely adjacent to the electrodes and for the anode structure itself. The supporting members and the wall portions adjacent to the electrodes 25 are heated to such a distance from the electrode that no creepage discharges can occur between the electrodes and these parts of the casing under ordinary operating conditions.

30 Other objects of my invention will become apparent upon reading the following specification and the drawing, in which

Figure 1 is a longitudinal cross sectional view of a tube embodying the invention.

35 Fig. 2 is a similar longitudinal cross sectional view of the tube with modifications of the invention as disclosed in Fig. 1.

Fig. 3 is an enlarged cross sectional view through an anode structure in the combination of heating means therein; and

40 Fig. 4 is a diagram of preferred connections to the tube.

45 The tube disclosed in Fig. 1 has a container 10 which is normally vacuum-tight and contains a gaseous filling preferably in the form of a metallic vapor. The most common of these metallic vapors is, of course, mercury. Within the container 10 is the cathode 11 which is preferably 50 in the form of a barium and strontium oxide coated surface on a container with a heater 12 enclosed within the reentrant portion 13 of said container for indirectly heating the oxide surface. The upper portion of the cathode container 11 is open towards the anode 14 and may have a screen 15 across this opening, if desired. 55 The heater 12 may, of course, be of any desired

formation and has a lead 16 connected to the coil with the opposite end of the heater 12 preferably connected to the cathode casing 11 which has the cathode leads 17 and 18.

The anode 14 has a supporting means or stem 5 19 and within this supporting or reentrant stem 19 are coils 20 for heating the portion of the stem or supporting means adjacent to the anode head 14. Similar coils 21 are also placed about the portion of the casing 22 adjacent to this reentrant stem 19. These heating coils are preferably embedded in any suitable electrical insulation 23 protected by a cap 24. The anode lead also preferably passes through this insulating material 23 and it is preferred to provide a heating coil 25 for the anode head 14. The anode lead can be one of the leads 26 or 27 for this heating coil and the anode can be connected at a certain place on the coil 25. 10 15

A preferred construction of the heating coil 20 for the anode head for rectifiers of very large capacity is disclosed in Fig. 3. The anode head 30 has the coil 31 embedded therein for heating the surface to prevent a metallic vapor from condensing thereon. A similar coil 32 is provided 25 on the supporting portion for said anode head so that no metallic vapor will be deposited on the surface of the head and the parts of the casing adjacent thereto. If desired, a cooling arrangement may be made for the lower portion of the anode head which is loaded electrically to a relatively high degree. There is, of course, no danger of the mercury or other metallic vapor being deposited on this end portion of the anode head because this portion will be entirely heated 35 after a very short time of operation. It may be desired, however, to heat the anode when the apparatus is first connected to prevent backfire from the mercury that might be deposited from the anode. 40

Fig. 2 discloses a tube somewhat similar to Fig. 1 except, in this arrangement, the heating coil 35 is disclosed connected to the cathode. This heating coil has suitable connections with the leads 17 and 18. The remaining portions 45 of the interior of the casing may be similar to that disclosed in Fig. 1. In addition to or in place of the heating coils 20 and 21 of Fig. 1, a heating coil 36 in the form of an annular heater may be placed around the outside of the container adjacent to the anode and this annular heater may be connected to the cathode by the lead 37. This heater may be in place of or in addition to the annular heating coil 35 on the interior of the casing. When this annular heater 55

36 is used, it is preferable to provide a means such as the screen 38 for preventing undesired current leakage between the coil 36 and the cap 24, which may be connected to the anode.

5 A preferred method of making connections to the tube and heating elements is disclosed in Fig. 4. The heating means 40 is preferably connected to the anode 14 and this heating means is energized by means of a transformer 41
10 around the circuit 42. The cathode 11 has the heating means or coil 43 connected thereto which is energized by a transformer 44 connected to the circuit 45. It is, of course, possible also to use heaters, part of which are connected to the anode and part of which are connected to the cathode. These coils, represented
15 diagrammatically by 40 and 43 may be any or all of coils 20, 21, 25, 31, 32, 35 and 36 represented in Figs. 1, 2 and 3. The tube circuit proper is disclosed as the circuit 46 connected to the anode and cathode and including a suitable transformer 47 and resistance 48. It is, of course, apparent that this type and arrangement of the heating means will depend upon
20 the design of the discharge device and upon the individual conditions in each case. The heating coil connected to the cathode may also advantageously be so connected that it is traversed by the heating current of the cathode, that is, it may be connected in series therewith.
25 The circuits 42, 45 and 46 disclosed in Fig. 4 may, of course, be connected by use of suitable transformers to a single source for power purposes.

35 For the sake of simplicity, the invention has been disclosed as applied to two electrode rectifiers but it is obvious that the invention is also applicable to similar metallic vapor devices using more than these two electrodes such as the controlled rectifiers having a grid therein and
40 also to grid controlled inverters or converters. The heating means when applied to such dis-

charge devices may be associated also or only with the auxiliary electrodes serving to control the device. If the heating means is combined with heat storage parts, it may be possible to save heat energy.

While I have in the foregoing described certain particular embodiments of my invention, it will be understood that these are for purposes of illustration only and that the broad principles may be otherwise utilized as will be readily apparent from those skilled in the art. I desire, therefore that the following claims shall be accorded the broadest construction of which their terms are susceptible in view of the limitations imposed by the prior art.

I claim as my invention:

1. An electric discharge device comprising a container, a cathode and an anode in said container, a metallic vapor in said container, supporting means for said anode comprising a neck
20 extending from the inner walls of said container, and heating means within said neck and also about the adjacent container walls.

2. An electric discharge device comprising a container having a metallic vapor therein, a stem
25 projecting into said container, an anode supported on the end of said stem, said stem having a space thereabout entrant to said container, a wall of insulation about said last mentioned space and a heater embedded in said wall
30 whereby said metallic vapor is prevented from condensing on said stem and dropping on said anode.

3. An electric discharge device comprising a container having a metallic vapor therein, a re-
35 entrant stem projecting into said container, an anode supported on said stem, electrical insulation on the outside of said container surrounding said reentrant stem and a heater embedded in said insulation.

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