

July 19, 1949.

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2,476,647

COOLING SYSTEM FOR ELECTRON DISCHARGE DEVICES

Filed June 29, 1946

Fig. 1

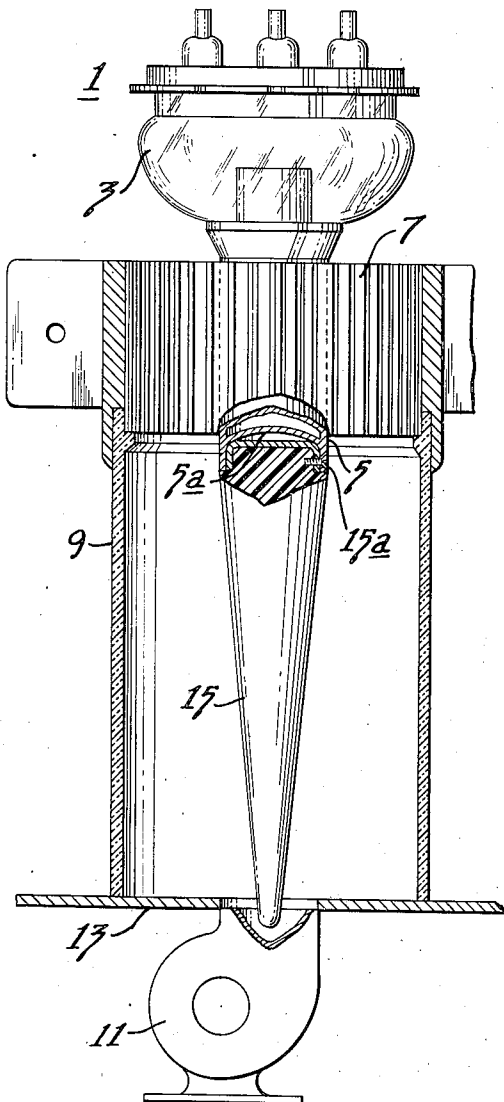
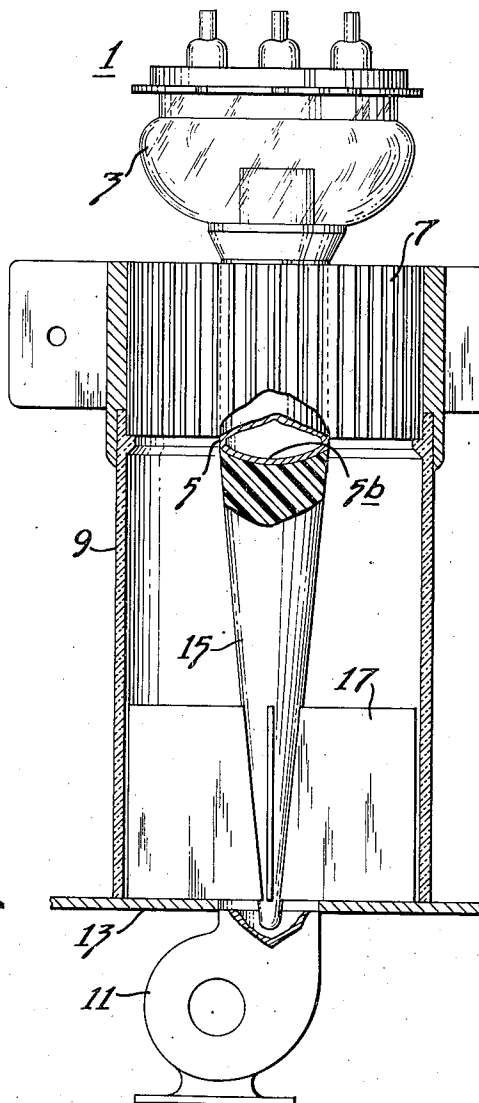


Fig. 2



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2,476,647

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DISCHARGE DEVICES

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Application June 29, 1946, Serial No. 680,490

6 Claims. (Cl. 250—27.5)

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This invention relates to cooling systems and particularly to an improved method of and means for dissipating excess heat generated during the operation of electron discharge devices of the type wherein the anode or other part to be cooled comprises a portion of the envelope of the device.

In one usual form of cooling system for medium powered vacuum tubes the tube is seated on the upper edge of an open-ended duct or pedestal with the end of the anode, and its heat radiating fins, presented to a rapidly moving column of air which is introduced through the opening at the bottom of the pedestal. If, as is usually the case, the cooling air impinges upon the end of the anode with substantial force, considerable turbulence is set up adjacent to the said end of the tube. The resulting static air pressure adjacent to the end of the tube not only decreases the cooling efficiency of the system but may also give rise to wind noise and to microphonic disturbances in the electrode structure within the tube.

Accordingly, the principal object of the present invention is to improve the cooling efficiency and reduce the noise and microphonic disturbances incident to the operation of present day vacuum tube cooling systems, and this too without any increase in the length of the cooling column or in the original velocity of the cooling medium.

The foregoing and other objects are achieved in accordance with the invention by the provision, within the pedestal or cooling duct of the system, of an axially disposed inverted cone-shaped baffle which serves to direct the cooling fluid away from the free end of the anode and through the fin structure of the tube in a continuous non-turbulent stream. With the cooling efficiency of the system thus increased it is entirely practical to decrease the length or height of the cooling duct and thereby to provide a more compact installation than is dictated by the prior art.

In the drawing, Figs. 1 and 2 are elevational views, partly in section, showing two alternative embodiments of a vacuum tube cooling system within the invention.

In the drawing, wherein like reference characters designate the same parts in both Figs. 1 and 2, there is shown a conventional vacuum tube 1 (say an RCA type 827R or 7C24) comprising a bulbous glass portion 3 and a centrally disposed dependent metal portion 5, which latter part comprises the anode of the device. As in standard practice this external anode 5 is

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provided with a multiplicity of radially extending metal fins 7 for dissipating heat generated within the tube 1 during its operation. As is also conventional the tube is shown supported by its fins 7 upon a vertically arranged hollow cylindrical duct or pedestal 9, wherein the dependent anode 5 and its radiating structure 7 are presented to a cooling stream of air generated by a blower 11, which is conveniently mounted beneath the panel or other base 13 upon which the pedestal 9 stands. The fins 7 will ordinarily extend the full length of the anode 5 but in the drawing the said tube part has been extended beyond the lower edges of the fins to reveal the structure of that part of the anode which extends across the axis of the pedestal and has heretofore been presented to the air stream. In Fig. 1 the said part or extremity of the anode is shown as a concave surface 5a and, in Fig. 2 is convex, as shown at 5b. The anodes of other air-cooled tubes may terminate in a relatively flat surface.

As previously indicated, the present invention is predicated upon an appreciation of the fact that when the cooling blast is permitted to impinge upon the dependent lower face of the anode, considerable turbulence and a resulting static pressure, is set up thereabouts. To obviate, or at least to minimize, this objection to prior art cooling systems the present invention dictates the use of shield or baffle 15 axially disposed between the blower 11 and the tube for directing the cooling stream away from the end face (5a—5b) of the anode outwardly through the cooling fins 7 and upwardly along the cylindrical side walls of the anode.

In the embodiment of the invention shown in Fig. 1 the shield 15 comprises simply an inverted solid cone made of porcelain, steatite, Bakelite or other suitable insulating material, arranged with the apex of the cone presented to the outlet of the blower 11 and its "base" affixed to the concave end 5a of the anode as by means of a screw 15a. In the preferred embodiment of the invention shown in Fig. 2 the narrow lower end of the shield 15 is provided with a number (in this case, four) of radially extending baffles 17 which span the opening in the panel 13 through which the cooling air enters the duct or pedestal 9. These baffles thus serve as a support for the cone 15. Furthermore, the presence of these vertically extending plates 17 eliminate any eddy currents in the entering air, by preventing circular or lateral flow, within the duct or pedestal 9. Since the end of the anode

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is shielded by the abutting base of the cone there is no "transverse" surface within the duct (other than the narrow edges of the baffles 17 and fins 7) against which the air stream can impinge. It follows therefore, that since the cylindrical sides of the anode and the flat surfaces of the baffles 17 and fins 7 all extend in the same (vertical) direction as the air stream, static pressure, turbulence, wind noise and microphonic disturbances are all minimized.

What is claimed is:

1. A cooling system for an electron discharge device of the type having a tubular part to be cooled, comprising a duct through which a cooling fluid is adapted to flow, said duct having an internal diameter greater than that of said tubular part, means mounting said discharge device within said duct with the end surface of said tubular part extending in a direction transverse to the direction of flow of said cooling fluid, and cone-shaped shielding means within said duct with the base of the cone adjacent said end surface for directing a cooling fluid in a longitudinal path away from said end surface, whereby to minimize turbulence in the flow of said cooling fluid adjacent to said part.

2. In combination, an electron discharge device having an external anode and a cooling system therefor comprising an open ended vertically arranged cylinder in communication with a source of cooling fluid, said discharge device being seated on said cylinder, the free end of said anode extending across the vertical axis of said cylinder, and a cone-shaped shield mounted within said

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cylinder with the base of said cone-shaped shield in registry with said free end of said anode for minimizing turbulence in the flow of said cooling fluid adjacent said anode.

3. A cooling system for an electron discharge device comprising cooling vanes disposed laterally of a portion of said device to be cooled, a duct for conducting cooling fluid, said vanes extending into said duct, and a cone-shaped member in said duct disposed endwise of said portion and directing the cooling fluid solely to said vanes.

4. The invention as set forth in claim 2 and wherein said shield is supported upon said anode.

5. The invention as set forth in claim 2 and wherein said shield comprises an auxiliary support for said discharge tube.

6. The invention as set forth in claim 2 and wherein said cone-shape shield is provided adjacent to its narrow end with a plurality of radially extending baffles for minimizing eddy currents in said cooling fluid.

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