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C. G. LEHR ET AL

2,818,237

COOLING MEANS

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FIG. 1

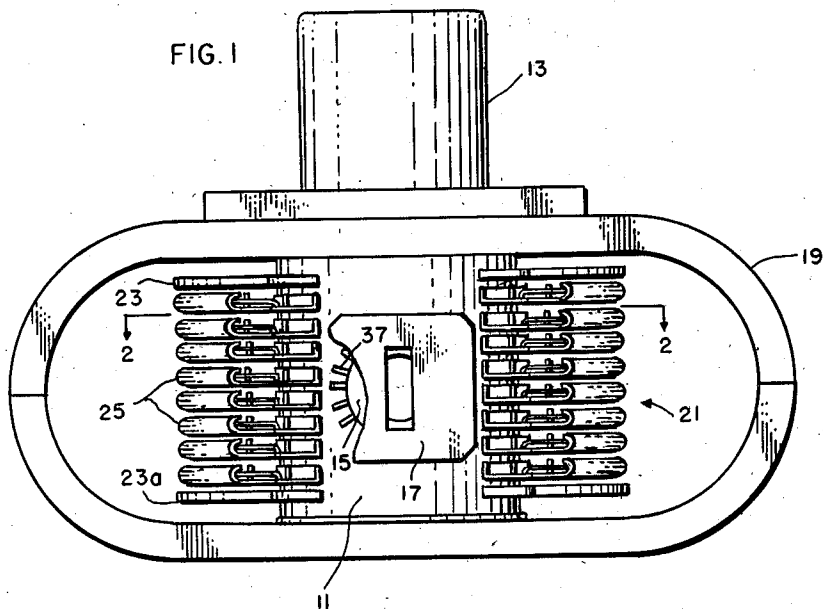


FIG. 2

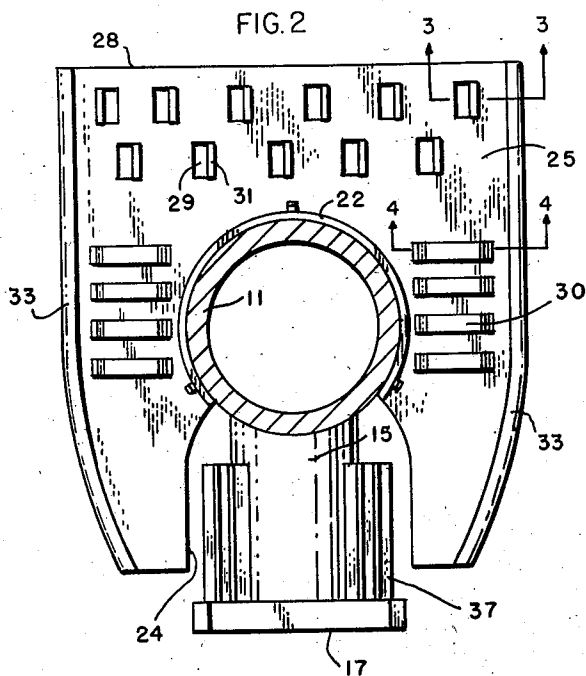


FIG. 3

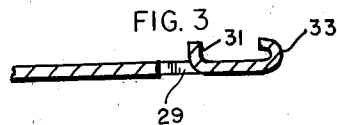
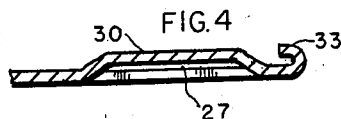


FIG. 4



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COOLING MEANS

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2 Claims. (Cl. 257—263)

The present invention relates to a cooling means for thermionic discharge devices and more particularly to the cooling means for high-power, miniaturized magnetrons. While the present invention will be described in one particular embodiment and application as used in conjunction with a magnetron, it is to be understood that it is not limited thereto.

In utilizing high-powered, miniaturized magnetrons, proper cooling means must be provided to insure adequate heat dissipation. It has been found that the conventional cooling means for such magnetrons, which in some instances utilize a stacked layer of fins or the like and large size blowers, have been found to be impractical and in many instances entirely unsatisfactory when applied to miniature magnetrons. Thus, for instance, in many cases where miniaturized magnetrons were used and relatively large blowers were used, the weight and bulk of the large blower negated the advantages of the miniature tube. It has also been found that excessive heating of the anode results in a loss of efficiency of the magnetron and a reduction in the life thereof. In order to prevent this excessive heating, operation of magnetrons not providing output-flange cooling must be at reduced power output.

It is accordingly an object of the present invention to provide a fin-like cooling means for miniature magnetrons which, because of the uniqueness of the design of said fins, permits a more efficient distribution of cooling air about the magnetron and its associated output flange whereby a blower of considerably smaller size and weight can be utilized in conjunction therewith. An important feature of the invention resides in the unique design of each individual fin of said cooling system whereby the magnetron anode and output flange can be readily cooled at the same time.

Another feature of the invention lies in the more efficient distribution of cooling air about the magnetron.

Another feature of the invention resides in the construction of each cooling fin so as to direct cooling air to the magnetron output flange.

Another feature of the invention resides in making possible the use of small sized blowers to be used in conjunction with the newly designed fins of this invention, thereby avoiding the use of large and heavy blowers.

These and other objects, features, and advantages will become apparent from the following description to be read in view of the accompanying drawing in which:

Figure 1 is a front elevational view, partly cut away, of a magnetron and the improved cooling means mounted thereon;

Figure 2 is a view of one of the individual fins of said cooling means taken on the line 2—2 of Figure 1;

Figure 3 is a partial sectional elevational view of a fin taken on the line 3—3 of Figure 2, and

Figure 4 is a view similar to Figure 3 taken on the line 4—4 of Figure 2.

Referring to the drawing and particularly to Figure 1, there is shown part of a magnetron assembly including the anode 11 and its associated input 13. Extending outward-

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ly from the anode 11 is the output 15 and its associated flange 17. Extending about the magnetron anode is shown the conventional magnet 19. Suitably secured to the anode 11 and surrounding it in yokelike fashion is a preferred embodiment of the cooling means, designated generally as 21 and including top and bottom plates 23 and 23a. Plates 23 and 23a are conventional flat members having solid faces and constitute respectively the upper and lower extremities of the cooling means. Disposed between said upper and lower plates is a series of identical fins 25, all similar in shape, design, and form. For ease of description only one of such fins will be described in detail, it being understood that all are alike as indicated above. Each of the fins 25 comprises a substantially flat, U-shaped member having a substantially circular cutout 22 in its mid portion which will be of such diameter as to substantially engirdle the anode 11, and a substantially longitudinal cutout (opening) 24 in which the magnetron output lies. The sizes of both of the cutouts in any modification will be dependent upon the diameter of the anode and size of the output.

Intermediate the cutout 22 and the side edge of the fin, as shown in Figure 2, is a plurality of openings 27 which are made by extruding a portion 30 of the face of the fin upwardly but not breaking such portion, thereby effecting a series of louvre-like openings spaced on either side of said circular cutout. While in the particular embodiment shown in Figure 2 the openings 27 are substantially in alignment with each other on one side of said circular cutout and further in alignment with corresponding openings on the other side of said cutout, it is apparent that such particular configuration is not necessary for the successful fulfillment of the objective of the present invention. It is to be understood that such openings 27 may be staggered about in any particular design on either side of the circular cutout. Intermediate the circular cutout 22 and the rear edge 28 of the fin there is provided a series of openings 29 each of which is so formed that that portion of the face of the fin forced upwardly constitutes a baffle 31.

Each long edge or side of each of the fins 25 is provided with an opened curved bead 33 formed by bending the rim so that it extends perpendicularly from the face of the fins and then bent inwardly as shown in Figures 3 and 4 whereby any air circulating in and about the face of each fin will not escape to the outside atmosphere but will be deflected inwardly toward the anode and output flange of the magnetron.

An important feature of the invention resides in the particular shape and configuration of each fin. As can be seen from Figure 2, each long side of the fin tapers inwardly in the direction of the slotted portion 24, and the tapered beaded portion substantially surrounds the output 15. It is readily apparent that cooling air circulating in and between the fins will be deflected to the output member thereby cooling said member.

In addition to the cooling fins described above, a plurality of fins 37 is affixed about the outer periphery of the output 15 to assist in the overall cooling of the magnetron device. In operation, as cooling air is directed into the magnetron device, such air will be impelled to the openings 27 and at the same time will be circulated between the two plates 23 and 23a through opening 29. At the same time cooling air will be deflected by the beadlike curvatures 33 toward the magnetron output and its flange and thereby accomplish the additional objective of serving as a cooling means for such output and flange.

While there have been described what are at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore,

aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. Cooling means for a heat-emitting device comprising a plurality of stacked, spaced fins, each of said fins being shaped to substantially engirdle the heat-emitting device and having discrete sets of openings, one set comprising a plurality of louvre-like openings, the other set comprising a series of openings having distinct baffles extending perpendicularly from one edge thereof, means operatively associated with each of said fins for deflecting cooling air toward said heat-emitting device comprising discrete shallow beads coextensive with the respective sides of said fins, and top and bottom fins having unbroken surfaces whereby the cooling air is confined substantially within said cooling means.

2. An air cooling means for a thermionic device having an associated output section extending therefrom comprising a first series of radial, circumferentially-spaced fins secured to the outer periphery of said output and a second series of fins that substantially engirdle the thermionic device and its output, each fin of said second series of fins having a cutout that defines a pair of opposing tine-like segments of said fin that surround said output, and dis-

crete sets of openings in said fin, one set comprising a plurality of louvre-like openings in the face of the fin between the cutout and the respective side edges of the fin, the other set comprising a series of openings between the cutout and the rearward edge of the fin and having distinct baffles extending perpendicularly from one edge thereof, means forming part of each of said second series of fins for deflecting cooling air toward said thermionic device and its associated output comprising substantially shallow beads coextensive with the respective sides of said fins, and top and bottom fins comprising solid face plates for confining the cooling medium within said cooling means.

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