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HEAT DISSIPATING SHIELD

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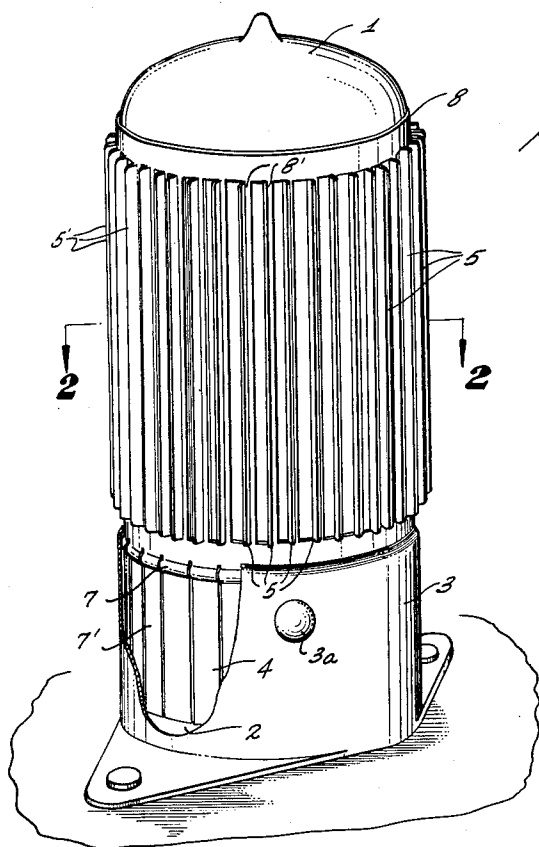


Fig. 1

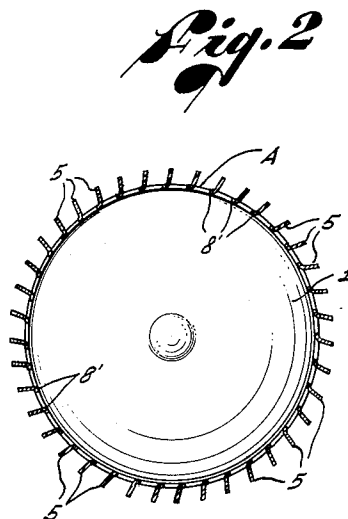


Fig. 2

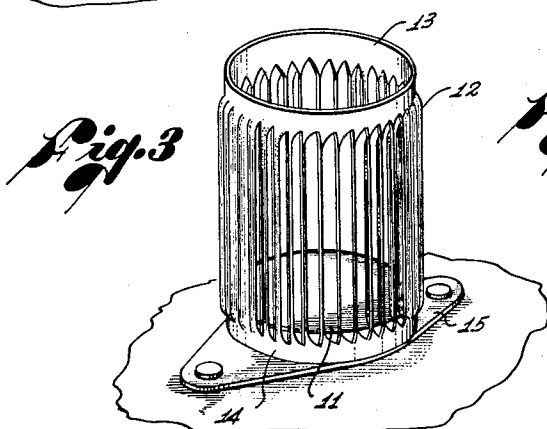
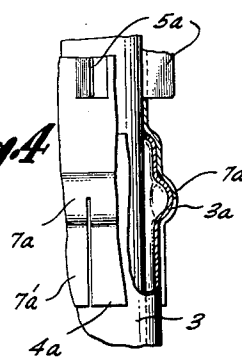


Fig. 3

Fig. 4



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HEAT DISSIPATING SHIELD

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3 Claims. (Cl. 174—35)

This invention relates to the electronic art, and more particularly to improved, low-cost, and lightweight heat dissipators and shields for vacuum tubes, transistors, diodes, and other solid state devices. This present application described a finned heat dissipating shield structure which offers the combination of simplicity, efficiency, compactness, and low cost.

Extensive tests have demonstrated the superior heat-dissipating and shielding properties of the finned shield structure shown in the drawing which is annexed to this specification. When employed as a heat-dissipating shield for vacuum tubes the structures therein depicted simultaneously provide the augmented heat-dissipative area presented by the finned elements combined with effective electrical shielding of the vacuum tube elements, and when employed as a heat dissipator for transistors, the pictured device offers maximized heat dissipative area in a structure which permits free access of cooling air.

At this time there exists no heat-dissipating shield which combines effective shielding and superior heat-dissipation at costs compatible with the economic limitations of "entertainment" electronic equipments, such as radios, television sets, etc.

It therefore is an object of this invention to provide a simple, effective low-cost heat-dissipating shield for vacuum tubes.

It is another object of this invention to provide an effective heat dissipator for transistors, diodes, and other solid state devices, which can be produced at low cost.

A still further object of my invention is to provide a heat-dissipating shield structure which is compact, lightweight, and can readily be produced by automatic machinery.

These and other objects and advantages of my invention will be apparent from consideration of the specification and drawings, in which:

FIGURE 1 is a view in partial section of a heat-dissipating shield constructed in accordance with this invention, mounted on a vacuum tube, and supported by and connected with the shield skirt of the vacuum tube socket;

FIGURE 2 is a partial sectional view of the structure of FIGURE 1, taken through the plane 2—2.

FIGURE 3 shows my invention used as a heat dissipator for a transistor;

FIGURE 4 is a partial sectional view of one form of retentive lock which forms a part of this invention.

Referring now to FIGURE 1, a vacuum tube 1 is mounted in a tube socket 2, which is affixed to a flanged supporting shield skirt 3. A tubular shield element 8 encircles and encloses the vacuum tube 1. The central portion of the shield element 8 is slit to form narrow longitudinal strips, and these strips are rotated axially to yield the radial cooling fins 5. A lower tubular portion 4 of the shield element 8 fits inside of the shield skirt 3, and is provided with the outwardly-curved spring fingers 7, 7', etc., formed and positioned to fit tightly inside of the inwardly-curved lip of the shield skirt 3, thereby retaining the shield element firmly with respect to the tube socket 2.

As will be seen in FIGURE 2, the finned radial elements 5 are formed having an L-section cross-section providing the tangential lands 8'. The inside diameter

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measured between the inner faces of the L-section lands, which bear on the outer surface of the envelope of the vacuum tube 1, is made to be slightly smaller than the vacuum tube envelope; therefore, when the finned shield is pressed into position by the spring fingers 7, 7', etc., the inner faces of the L-section lands 8' bear positively against the tube envelope, and serve to retain the vacuum tube in the tube socket under conditions of severe shock and vibration. The retentive action of the shield may be enhanced by forming the upper band 8 with an inward curvature or bead, which bears against the shoulder of the tube envelope.

Referring now to FIGURE 3, the transistor is housed in a squat cylindrical case 11, supported by a mounting flange 15. A tubular heat dissipator element 13 is slit and the resultant strips rotated through an angle of 45° to 90° to form the radial heat dissipating fins 12, over the central portion of the dissipator. The lower portion of the heat-dissipator consists of a tubular section 14, which has an inside diameter just large enough to fit snugly over the cylindrical case 11 of the transistor.

The alternative form of retentive lock shown in FIGURE 4 is so constructed that the lower portion of the shield structure carrying the fins 5a is flared outwardly to fit outside of the socket shield skirt 3, and this flared portion is provided with an annular bead 7a, which is positioned to fit snugly over the projection 3a which forms a part of the socket shield skirt 3. In order to permit the passage of the lower cylindrical portion of the structure over the projections 3a, this cylindrical portion is divided by slits into several segments, of which 7'a and 4a are representative.

Referring again now to FIGURES 1 and 2, the operation of this form of my invention is as follows:

Much of the heat generated within the envelope of the vacuum tube 1 is absorbed by the tube envelope, and is conducted therefrom through the sections of the radial fins, which are in tangential contact with the tube envelope, into the outwardly-projecting fins 5, from whence the heat is dissipated by radiation, conduction, and convection into the air space surrounding the vacuum tube. Some of the heat also is conducted lengthwise through the fins and thence through the tubular skirt 4 to the shield skirt 3, wherefrom it is dissipated by the conduction to the chassis upon which the tube socket is attached by means of its mounting flange.

The multiplicity of vertical fins shown in FIGURES 1 and 2 effectively prevents the interaction of electric fields surrounding the vacuum tube with the internal elements of the vacuum tube. The interstitial spaces between the fins, though of such small dimension laterally as to prevent the entry of electrical energy to the vacuum tube elements, are still sufficiently large to permit the direct dissipation of appreciable amounts of heat from the tube in the form of infrared radiation.

It will be observed that the transistor heat-dissipator shown in FIGURE 3 is mechanically quite similar to the heat-dissipating shield shown in FIGURES 1 and 2. Transistors today are enclosed in metal cases and do not require shielding, but do require effective heat-dissipation for efficient operation. In FIGURE 3, heat conducted from the transistor case 11 to the cylindrical skirt 14 and thence to the radial fins 12 is dissipated by radiation and convection. The total heat dissipative area of this fin structure can easily be ten times the area of the transistor case 11. The upper tubular strip 13 serves to strengthen and stiffen the fin structure. In case only electrostatic shielding of the enclosed element is desired, the strip 13 is fabricated from an electrically non-conductive material, in which case the fins constitute a "Faraday screen."

Having described and shown my invention in several forms, I do not wish to be limited in the scope of the protection afforded to my invention except as limited by the appended claims.

I claim:

1. A heat-dissipating, electrical shield for electronic components comprising: a generally cylindrical, cage-like member of electrically conducting material having generally outwardly projecting and axially extending integral, heat-dissipating fins and axially extending slots through the member between the fins for direct infrared radiation therethrough, the width of said slots being insufficient to permit entry of substantial electrical energy to the elements of the component; integral conducting bands at the opposite ends of said member joining said fins; and means on one of said bands mechanically and conductively connecting it to an electronic chassis.

2. A heat-dissipating, electrical shield for electronic components comprising: a generally cylindrical, cage-like member of metallic material having generally outwardly projecting and axially extending integral, heat-dissipating fins pressed from the main surface of the member to leave axially extending slots therethrough between the fins, said member closely engaging the interior edges of the fins with the envelope of the electronic component on which it is mounted with the fins extend-

ing outwardly of said envelope to present heat dissipating surfaces to the ambient atmosphere, the width of said slots being insufficient to permit entry of substantial electrical energy to the elements of the component.

3. A heat-dissipating electrical shield for electronic components comprising: a cage-like member of metallic material having generally outwardly projecting and axially extending integral fins pressed from the main surface of the member to leave axially extending slots there-
through between the fins, the width of said slots being
insufficient to permit entry of substantial electrical energy
to elements of the component; and integral bands at the
opposite ends of said member structurally and conduc-
tively joining said fins; said member closely engaging the
interior edges of the fins with the envelope of the elec-
tronic component on which it is mounted, with the fins
extending outwardly of said envelope; and means on one
of said bands mechanically and conductively connecting
the member to a socket skirt of an electronic chassis.

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