Sept. 14, 1965 L. KATZ 3,205,936

STACKED-FIN HEAT SINK

Filed June 20, 1963

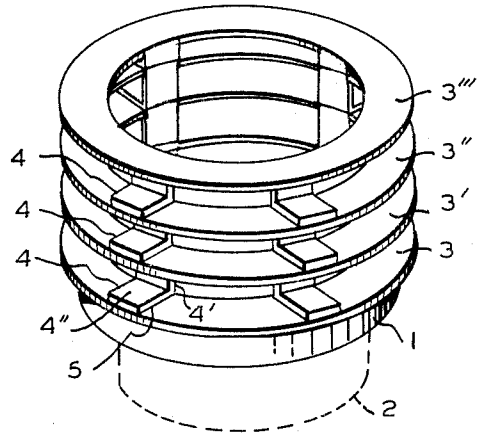


FIG. 1

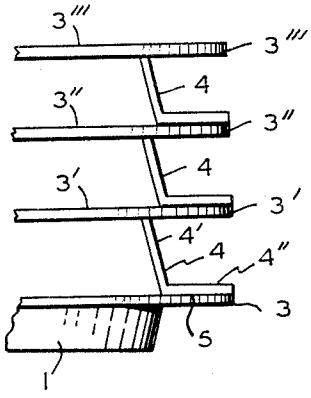


FIG. 2

INVENTOR.
LEONHARD KATZ
BY Lines and Lines
ATTORNEYS

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STACKED-FIN HEAT SINK

Leonhard Katz, Woburn, Mass., assignor to Astro Dynamics, Inc., Burlington, Mass., a corporation of Massachusetts

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The present invention relates to heat sinks and, more particularly, to heat-radiating devices that may be used with transistors and other electrical circuit components and elements to radiate heat therefrom.

It has previously been proposed to employ a conductive base from which posts or other supporting structures extend upward and support peripherally therearound a plurality of spaced heat radiating fin devices and the like. Apart from the fact that it is extremely delicate and costly to assemble a plurality of fins upon supporting structures that integrally or otherwise extend continuously upward from a base portion that is to contact the circuit element, such construction is disadvantageous in that considerable losses are introduced at the interfaces between the fins and the supporting structures where, for example, each of said structures comprises a bolt or other element secured to the base and there are washers provided to separate successive fins mounted thereupon. An interface loss appears between each washer unit and the adjacent fins resulting from an inherent incomplete contact between the fin and the adjacent washer unit. The uppermost fins are not really effective to act as heat dissipators because heat is not conducted to them efficiently from the circuit element in contact with the base. It is, further, extremely difficult to position the supporting structure and fin assembly.

An object of the present invention, therefore, is to provide a multi-fin heat sink or radiator in which the fins themselves support one another upon adjacent fin surfaces with attendant minimal interface loss and with a readily simple manufacturing technique, thus eliminating a support means that actually is secured to and extends from a base region that is being contacted by an electrical circuit element to be cooled.

Another object of the invention is to provide a new and improved heat radiator of more general utility also.

Other and further objects will be explained hereinafter and will be more particularly pointed out in connection with the appended claims.

In summary, the objects of the invention are embodied in a heat radiator comprising a cup-shaped base portion for contacting heated elements and provided with a peripheral fin flange of predetermined width. A plurality of similar fin flanges of substantially the said predetermined width are disposed above the base portion, each provided at a plurality of spaced regions along the periphery thereof with L-shaped spacers comprising feet vertically depending from the inner edge of the fin and terminating in horizontally outwardly extending feet of length substantially equal to the said predetermined width, the horizontally extending feet being secured, as by soldering, across the fin flange therebelow to provide a stacked array of self-supporting fins at substantially equally spaced intervals above the base-portion fin.

The invention will now be described in connection with the accompanying drawing, FIG. 1 of which is an isometric

view of a heat radiator constructed in accordance with teachings of the present invention; and

FIG. 2 is a partial side view of the radiator of FIG. 1.

Referring to FIG. 1, a cup-shaped heat conductive base portion is shown at **1** provided with an integral peripheral annular fin flange **3** of predetermined width that serves as a heat radiating fin to dissipate part of the heat emanating from a heat-generating element, such as a transistor or the like, shown dotted at **2**, that may be clamped or otherwise secured to the base of the cup **1**. A stack of a plurality of similar annular vertically spaced fin flanges **3'**, **3''**, **3'''**, etc., is provided. Each flange, at a plurality of preferably equally spaced circumferentially at regions along the periphery thereof, is provided with L-shaped spacers **4**. The spacers **4** comprise feet substantially vertically depending at **4'** from the inner edge of a fin and terminating in horizontally outwardly extending feet **4''** of length substantially equal to the said predetermined width. The horizontally extending feet **4''** are secured in abutting relation across the said predetermined width, as along **5**.

In this fashion, a heat radiator is formed having a stacked array of self-supporting fins at preferably equally spaced intervals above the base-portion fin. The width of the vertical depending feet **4'** may be substantially the same as the width of the horizontally extending feet **4''**, as shown.

This construction, as distinguished from the before-mentioned prior art technique of connecting fins to supports that extend upward from the base, further assists in minimizing interface losses through the utilization of feet **4''** that are about the same length as the width of the fin rings to which they are secured along the complete interface **5**. Since the substantially vertical spacer feet **4'** are of substantially the same width as the horizontal feet **4''**, matched heat conduction between successive fins is attained.

It is not necessary that the self-spacing feet be connected in line, as shown, which is, of course, a restriction in prior-art rings connected to fixed supports secured and extending from the base; but they may be staggered to aid manufacture thereof, if desired.

The annular-shaped fin flanges **3'**, etc., may be replaced by flanges of rectangular or square shapes (the term "ring-shaped" being used herein to denote either configuration), and the spacers **4** may, in this instance be supplemented by other spacers disposed between adjacent flanges.

Further modifications of the present invention will occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A heat radiator having in combination, a base portion for contacting heat-generating elements and provided with an integral peripheral ring-shaped fin flange of predetermined width, a plurality of parallel vertically spaced ring-shaped fin flanges of substantially the said predetermined width and a plurality of L-shaped spacers spaced circumferentially along the peripheral extent of said flanges and disposed therebetween, with each L-shaped spacer comprising a foot substantially vertically depending from the inner edge of the fin and terminating in a horizontally outwardly extending foot of length substan-

tially equal to the said predetermined width, the horizontally extending foot being secured in abutting relation across the said predetermined width.

2. A heat radiator as claimed in claim **1** and in which the integral fin flange and the vertically spaced fin flanges are annular.

3. A heat radiator as claimed in claim **1** and in which the width of the substantially vertically depending feet is substantially the same as that of the horizontally extending feet.

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ROBERT A. O'LEARY, *Primary Examiner.*

CHARLES SUKALO, *Examiner.*