United States Patent [19]

Wirtanen

[11] **3,774,681**

[45] **Nov. 27, 1973**

[54] **SELF-SHAPED HEAT RADIATOR**

[76] Inventor: **Theodore E. Wirtanen,** 29 Whippletree Road, Chelmsford, Mass. 01824

[22] Filed: **Apr. 3, 1972**

[21] Appl. No.: **240,483**

[52] **U.S. Cl.** **165/184**

[51] **Int. Cl.** **F28f 1/36**

[58] **Field of Search** 219/530, 540; 165/181–185, 183, 184

[56] **References Cited**

UNITED STATES PATENTS

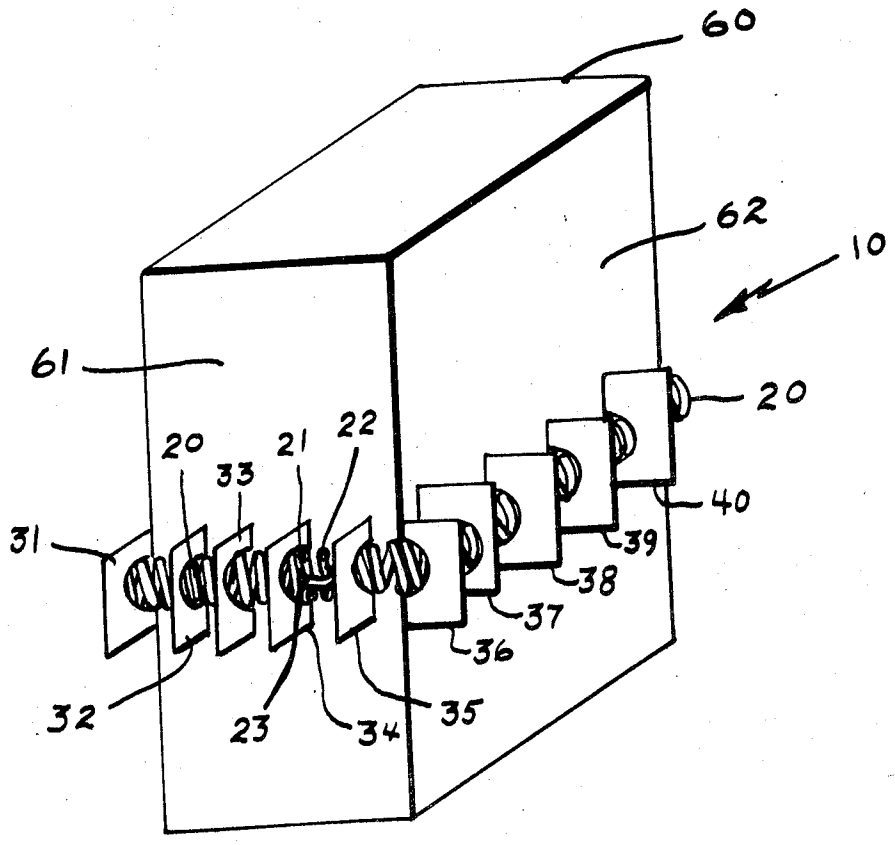
242,300	5/1881	Gold	165/184
3,260,652	7/1966	Ritz et al.	165/184
2,308,319	1/1943	Stanton	165/184

Primary Examiner—Charles J. Myhre
Assistant Examiner—Theophil W. Streule, Jr.
Attorney—Harry A. Herbert, Jr. et al.

[57] **ABSTRACT**

A heat sink especially well-suited for use in dissipating heat from irregularly shaped surfaces. The heat sink comprises an endless coiled carrying spring of high heat conductive material, such as a copper alloy, in contact with, and suitably encompassing, the periphery of the irregularly shaped surface, and a plurality of heat radiating fins, preferably of copper, detachably mounted on, and either lateral to, or longitudinal to, the coiled carrying spring, to best utilize the most advantageous air flow in the mounting area.

7 Claims, 4 Drawing Figures



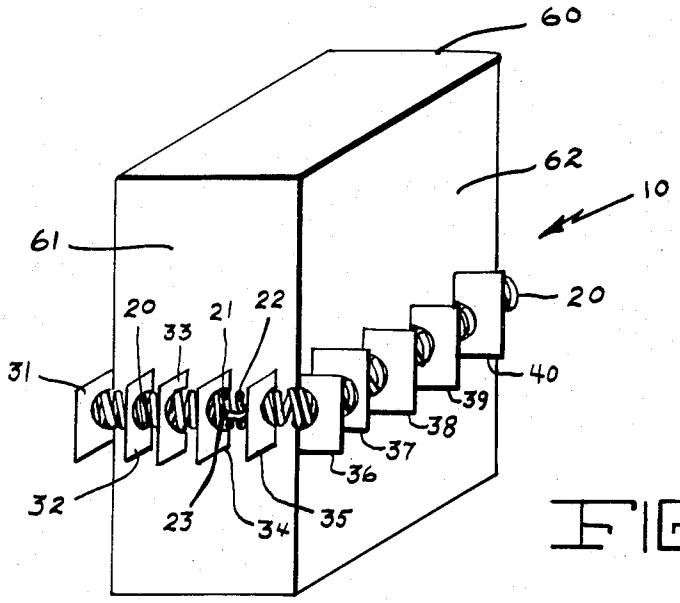

60
62
10
61
20
20
33
21
22
31
40
39
38
37
36
32
23
34
35

FIG. 1

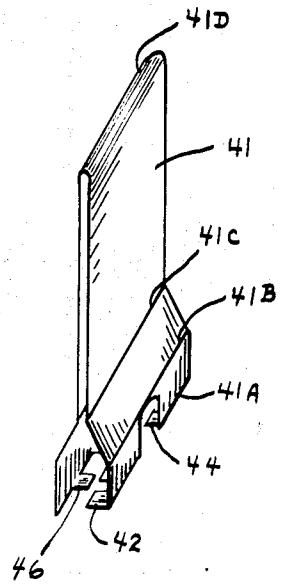

41D
41
41C
41B
41A
44
42
46

FIG. 3

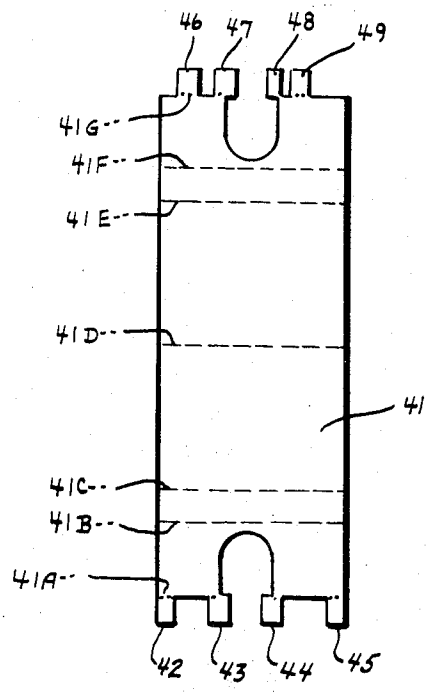


FIG. 2

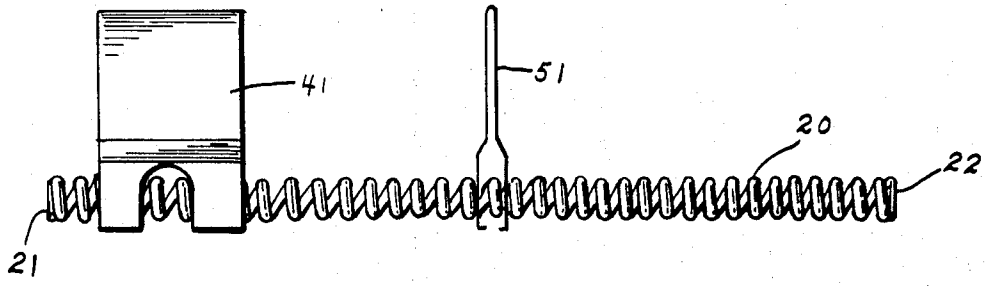


FIG. 4

SELF-SHAPED HEAT RADIATOR

BACKGROUND OF THE INVENTION

This invention relates to the heat dissipating art and, more particularly, to a self-shaping heat radiator, i.e., a self-shaping heat sink.

Heat sinks are not per se novel. They are well known and may vary from the simple, such as a metal alligator-type clip for use in heat sinking while soldering a wire to a terminal, to the complex. However, the prior art, as far as it is known by the applicant, indicates that what is needed, and is not available, is a heat sink, or heat radiator, which will conform to odd shapes, such as irregularly shaped surfaces; which can be used, or can be readily adapted for use, in confined areas, such as in or on an instrument chassis; which can be easily and rapidly assembled and disassembled at the point or place of use; which can be positioned on the irregularly shaped surface or in the combined area to best utilize the most advantageous air flow in the area; which is simple and inexpensive to make; and, which is reusable.

My invention fulfills the need for a heat sink, as described above, and, thereby, constitutes a significant advance in the state-of-the-art.

It is to be noted that the terms "heat radiator," "radiator," and the like, are intended, as indicated above, to be synonymous and interchangeable with the term "heat sink." The term "heat sink" as used herein is intended to mean, as it does in the heat dissipating art, an apparatus for absorbing and transferring heat, and otherwise dissipating heat, from an article, a device, an object, or the like, or from a portion thereof, such as a surface, and thereby cooling it.

SUMMARY OF THE INVENTION

This invention pertains to a novel self-shaping heat sink which is especially well suited for use in heat sinking irregularly shaped surfaces.

Therefore, an object of this invention is to provide a heat sink which will self-shape to conform to odd shapes, such as an irregularly shaped surface.

Another object of this invention is to provide a heat sink which can be used, or can be readily adapted for use, in a confined area.

Still another object of this invention is to provide a heat sink which can be easily and rapidly assembled or disassembled at the point or place of use.

A further object of this invention is to provide a heat sink which can be positioned on the irregularly shaped surface, or in the confined area, to best utilize the most advantageous air flow in the area.

A still further object of this invention is to provide a heat sink which is simple and which is inexpensive to make.

Yet another object of this invention is to provide a heat sink which is reusable.

These objects, and still other and related objects, of this invention will become readily apparent after a consideration of the description of the invention and reference to the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows, in perspective and in simplified schematic form, a preferred embodiment of the invention assembled, mounted, and ready for use on the irregularly shaped surface of an object;

FIG. 2 is a top plan view, in schematic form, and in a flat and unfolded condition, of a preferred configuration of a major component of the preferred embodiment of the invention shown in FIG. 1;

FIG. 3 is a perspective view, in schematic form, and in a folded condition, of the major component shown in FIG. 2; and

FIG. 4 is a side elevation view, in simplified schematic form, of a portion of the preferred embodiment of the invention shown in FIG. 1, depicting some alternative positioned relationships of the major components of the preferred embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIG. 1, therein is shown, in perspective and in simplified schematic form, a preferred embodiment 10 of the invention in assembled form.

The preferred embodiment 10, a self-shaping heat sink, includes, as major components, a coiled carrying spring 20 and a plurality of heat radiating fins, such as 31–40.

Also shown in FIG. 1, in perspective and in simplified schematic form, is an object 60 having an irregularly shaped surface, denoted and defined in part by 61 and 62, which is to be heat sinked, i.e., cooled.

Again with reference to FIG. 1, and preferred embodiment 10, coiled carrying spring 20 thereof is made of material having the property of high heat dissipation, i.e., high heat conductive material, such as a copper alloy. Coiled carrying spring 20 has ends 21 and 22, which are releasably united or joined by suitable conventional means, such as clip or wire 23, to make spring 20 endless. Spring 20, therefore, surrounds object 60 and is in contact with, and encompasses, the periphery of the irregularly shaped surface, of which 61 and 62 are a part. Heat radiating fins, such as 31–40, are also made of material having the property of high heat dissipation, preferably copper, and are detachably mounted at suitable locations, whether these locations are regularly positioned or randomly positioned, on and along coiled spring 20, and in heat conductive contact with coiled spring 20 and also in heat conductive contact with the irregularly shaped surface of which 61 and 62 are a part. Heat radiating fins 31–40 are shown detachably mounted in a position lateral, i.e., transverse, to coiled carrying spring 20. They may, of course, be mounted, with equal ease and with equal satisfactory results, in a position longitudinal, i.e., parallel, to coiled carrying spring 20. The directional mounting position of the heat radiating fins, such as 31–40, is dictated by the manner best suited, in that particular circumstance, to dissipate heat from the specific irregularly shaped surface involved. Controlling factors include, but are not limited to, the peripheral length of the specific irregularly shaped surface involved, the properties and characteristics of the particular coiled carrying spring 20, the amount of space, and the direction thereof, available in the area where the coiled carrying 20 is to be mounted on the object, such as 60, and the direction of the air flow in the mounting area.

It is to be noted, at this time, that, although coiled carrying spring 20 is shown in FIG. 1 as being endless, this is by way of illustration only, and not by way of any limitation. Coiled carrying spring 20 may be used in other than endless form merely by removably attaching

each end thereof, such as **21** and **22**, to the irregularly shaped surface at suitable positions thereon.

It is also to be noted that, although heat radiating fins **31–40**, FIG. **1**, are shown therein as being identical in configuration and size, this also is by way of illustration only. Obviously, heat radiating fins of different configurations and of different sizes could be simultaneously and advantageously used in particular situations and circumstances. The parallel spaced relationship of heat radiating fins **31–40** in FIG. **1** is also only by way of illustration. They may, of course, be mounted, individually or collectively, in other ways, as will be later discussed herein.

With reference to FIG. **2**, therein is shown, in top plan view, in schematic form, and in a flat and unfolded condition, a preferred configuration of a heat radiating fin component of my preferred embodiment **10**, FIG. **1**. The heat radiating fin **41** shown is identical to fins **31–40**, FIG. **1**, in configuration; is made preferably of copper; and has extensions **42–49** which, when fin **41** is folded along folding lines **41A**, **41B**, **41C**, **41D**, **41E**, **41F**, and **41G**, which are shown in phantom, become mounting prongs or interlocking fingers which permit the easy and rapid detachable mounting of fins, such as **41**, on coiled carrying spring **20**, FIG. **1**. It is emphasized that the configuration and size of fin **41**, and the configuration, size, and number of mounting prongs **42–49**, are purely matters of preference designed to accomplish the purpose intended and are not intended to be, and are not, limitations.

With reference to FIG. **3**, therein is shown, in a perspective view, in schematic form, and in a folded condition, heat radiating fin **41**, which is shown in an unfolded condition in FIG. **2**. The locations of folding lines **41A**, **41B**, **41C**, and **41D** are easily ascertainable, and the relative positional relationship of the mounting prongs, such as **42** and **46**, when fin **41** is in a folded condition, is easily seen. One can appreciate from viewing fin **41**, FIG. **3**, how the mounting prongs, such as **42** and **46**, permit the easy and rapid detachable mounting of fins, such as **41**, on coiled carrying spring **20**, FIG. **1**, in a "clip on" manner.

With reference to FIG. **4**, therein are shown, in simple schematic form, some alternative positioned relationships of the major components of the preferred embodiment. Heat radiating fin **41** is shown as being detachably mounted in a position longitudinal, i.e., parallel, to coiled carrying spring **20**. Heat radiating fin **51**, which is identical to fin **41**, is shown as being detachably mounted in a position lateral, i.e., transverse, to coiled carrying spring **20**. However, in connection with the longitudinal mounting of fin **41** and the lateral mounting of fin **51** on coiled carrying spring **20**, it is to be noted and understood that the fins may mounted in various rotated positions about coiled carrying spring **20** (e.g., toward the reader) to the extent even of being in an inverted position, and still maintain their respective longitudinal or lateral positions with respect to cooled carrying spring **20**.

MODE OF OPERATION OF THE PREFERRED EMBODIMENT

When an irregularly shaped surface is to be heat sinked, a length of coiled carrying spring, such as **20**, FIGS. **1** and **4**, equal to, or slightly shorter than, the peripheral length of the irregularly shaped surface is easily cut, with a wire cutter, from a roll or the like of uncut coiled carrying spring wire. The length of coiled carrying spring which is needed may be quickly and easily ascertained by positioning the uncut coiled carrying spring wire along, and in contact with, the periphery of the irregularly shaped surface, and then cutting the coiled carrying spring where it meets the end of the periphery. Of course and in addition, depending upon the size or type of object of which the irregularly shaped surface is a part, coiled carrying spring wire which is suitable, both in size of winding and in diameter of the wire, is selected and is used.

Then, the cut length of coiled carrying spring, such as **20**, FIGS. **1** and **4**, is positioned in heat conductive contact with, and encompassing, the periphery of the irregularly shaped surface, such as defined in part by **61** and **62**, FIG. **1**.

Next, the ends, such as **21** and **22**, FIG. **1**, of coiled carrying spring **20** are removably attached to, and along, the irregularly shaped surface. Alternatively, the coiled carrying spring **20** is made endless by releasably joining or uniting the ends **21** and **22**, by suitable conventional means, such as a clip or a wire **23**, FIG. **1**, or, for example, by simply intertwining the ends **21** and **22**. Whether in endless form or not, the coiled carrying spring **20** self-shapes itself to conform to, and fits snugly on, and along, the periphery of the irregularly shaped surface.

Then, a plurality of heat radiating fins (such as **31–40**, FIG. **1**; **41**, FIGS. **2**, **3** and **4**; and **51**, FIG. **4**) are detachably mounted on the coiled carrying spring **20** at suitable locations along the coiled carrying spring in a directional position relative to the coiled carrying spring (such as longitudinal to, or lateral to, the coiled carrying spring) for the most effective heat dissipation from the irregularly shaped surface to the coiled carrying spring.

In essence, efficient and effective heat dissipation from the irregularly shaped surface is accomplished by my invention by the transfer to, absorption by, and radiation from coiled carrying spring **20** of the heat from the irregularly shaped surface, coupled with the transfer to, absorption by, and radiation from fins, such as **31–40**, FIG. **1**, of the heat from the coiled carrying spring **20**, and also of the heat from the irregularly shaped surface, if in a particular position any portion of the fin (such as the bottom or the side) also abuts the periphery of the irregularly shaped surface.

As seen by the above, the assembly of my invention for use is easy and rapid. Similarly, when heat sinking of the irregularly shaped surface is completed, my invention may be disassembled equally easily and rapidly.

Further, from the foregoing it can also be readily seen that my invention, with its almost unlimited structural variations and combinations (i.e., as to length, diameter of wire, size of windings, and manner of attachment or mounting of the coiled carrying spring, such as **20**, FIGS. **1** and **4**; and, as to size, configuration, number used, and location of direction of mounting of the fins, such as **41** and **51**, FIG. **4**, on the coiled carrying spring), can be used, or can be very easily adapted for use, in a confined area, such as in or on an instrument chassis, and that the invention can be structured and positioned to best utilize the most advantageous air flow in the area.

Additionally, while there have been shown and described the fundamental features of the invention, as applied to a preferred embodiment, it is to be under-

stood that, obviously, various substitutions and omissions may be made by those of ordinary skill in the art without departing from the spirit of the invention.

What is claimed is:

1. A heat sink adapted to encompass an irregularly shaped surface from which heat is to be dissipated;

a coiled carrying spring made of material having the property of high heat dissipation;

and fin means detachably mounted to said coiled carrying spring and in heat exchange contact therewith for dissipating heat from said coiled carrying spring.

2. A heat sink, as set forth in claim **1,** wherein said coiled carrying spring is made of a copper alloy.

3. A heat sink, as set forth in claim **1,** wherein said coiled carrying spring is in endless form.

4. A heat sink, as set forth in claim **1,** wherein said detachably mounted fin means for dissipating heat from said coiled carrying spring is a plurality of heat radiating fins having mounting prongs, with said fins made of a material having the property of high heat dissipation, and with said fins detachably mounted on said coiled carrying spring at suitable locations along said coiled carrying spring.

5. Heat radiating fins, as set forth in claim **4,** wherein said fins are detachably mounted on said coiled carrying spring at suitable locations along said coiled carrying spring in selected positions lateral to said coiled carrying spring.

6. Heat radiating fins, as set forth in claim **4,** wherein said fins are detachably mounted on said coiled carrying spring at suitable locations along said coiled carrying spring in a position longitudinal to said coiled carrying spring.

7. Heat radiating fins, as set forth in claim **4,** wherein said fins are made of copper.

* * * * *