March 24, 1959 R. T. ROSS 2,879,041

HEAT RADIATOR

Filed Oct. 15, 1956

Fig. 1.

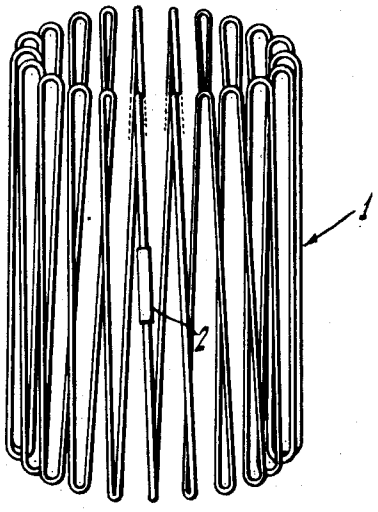
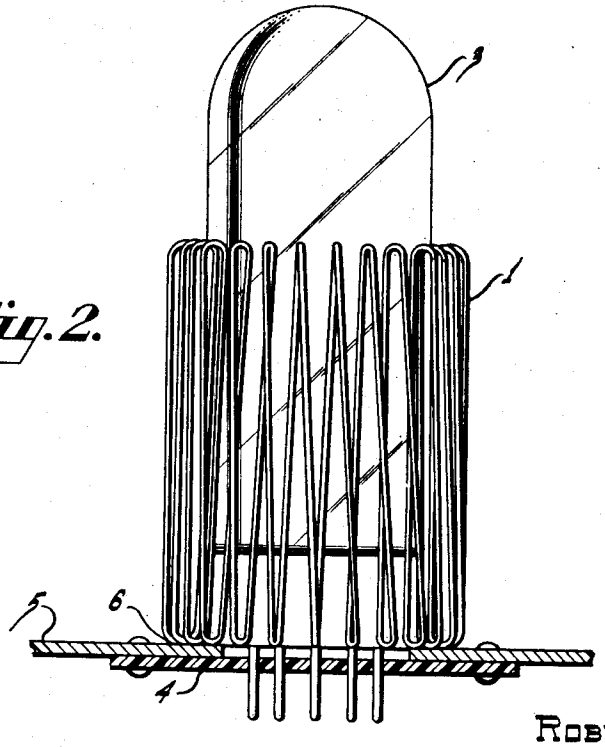


Fig. 2.



INVENTOR.
ROBERT T. ROSS

BY
Charles H. Brown
ATTORNEY

United States Patent Office 2,879,041 Patented Mar. 24, 1959

2,879,041

HEAT RADIATOR

Robert T. Ross, Plainfield, N.J., assignor to Radio Corporation of America, a corporation of Delaware

Application October 15, 1956, Serial No. 615,999

1 Claim. (Cl. 257—263)

This invention relates to heat radiators and has for one of its objects to provide a novel and improved device for increasing the rate of heat radiation from a hot body, such as a vacuum tube, so as to effect a rapid and substantial decrease in its average body temperature, and hot spot temperature.

Another object of the invention is to provide a self-adjusting coiled heat radiator for vacuum tubes, in which the individual turns of the radiator are wound in the lengthwise direction and fit over and engage the tube or other object to be cooled, thereby greatly increasing its heat radiating surface, and which is automatically adaptable to objects of various diameters, lengths and cross-sectional shapes.

Still another object is to provide a simple, inexpensive and improved heat radiator which may be manufactured and sold as a unit and may be instantly applied to or removed from the object to be cooled, even when the latter is in operation, without in any way altering the object to which the radiator is applied.

A further object is to provide a heat radiator of the type specified which, when mounted on a vacuum tube or other object to be cooled, is adapted to engage the metal base or chassis customarily supporting said object and thus further aid in dissipating the heat by conduction.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The self-adjusting heat radiator of the invention will be described in its preferred application to drop the bulk temperature of a vacuum tube in order to make it run cooler, although it will be evident as the description proceeds that it is equally useful for reducing the temperature of various other heated objects to which the device may be applied.

The heat radiator is constructed of a length of bare, flexible, solid wire, either round or flatted, which is wound on a flat mandrel for a number of turns, each turn being rounded at the top and bottom; after which it is removed from the mandrel and the ends of the wire fastened together, the whole thereby forming a flexible cylindrical or collar-shaped piece which could actually be slipped over the hand to encircle the wrist somewhat like an expansible bracelet. The overall length of each turn of the radiator is preferably greater than the width.

The individual turns of the finished convoluted collar-shaped radiator provide a spring tension reminiscent of an expansible bracelet, so that when the device is slipped lengthwise over the outside of a vacuum tube along the longitudinal axis thereof, so as to surround the tube, the tension results in good contact between the tube and the individual turns of the radiator, thereby enabling the individual turns to absorb heat from the surface of the tube.

The spacing between the legs forming each turn of the convoluted wire structure, and the spacing between the adjacent turns (especially when the radiator is expanded by being slipped over the vacuum tube) permits rapid and free movement of air, either forced or free-moving, between and around each turn so as to absorb heat from

the turns and conduct it away rapidly enough to effect a rapid and substantial lowering of the surface temperature of the vacuum tube. The inherent tension of the device makes it suitable to use one size interchangeably to fit a range of tube shapes and sizes. Its inherent flexibility and conformability enables it to snugly fit variously shaped objects, whether of round, rectangular or other cross-section. Should the surface of the object be irregular so that there is no contact in some places between the individual turns and the surface of the object, an air space results at these places through which air can freely move, thus preventing the development of hot spots on the hot object. The end of the radiator which is closest to the vacuum tube socket preferably engages the conventional metallic chassis, thus further aiding in dissipating the heat by conduction.

The invention is described in connection with a preferred embodiment shown in the accompanying drawing, in which:

Fig. 1 is a perspective view of a self-adjusting heat radiator embodying the invention; and

Fig. 2 is a view in elevation partly in section to show the heat radiator mounted on a conventional vacuum tube.

The heat radiator shown in Fig. 1 is constructed of a single length of bare, flexible solid wire **1** preferably having a dull, rough finish. The wire may be composed of any suitable metal or alloy having good heat conducting and radiating properties. Among other suitable materials may be mentioned a copper-iron alloy composed of 98% copper and 2% iron; also nickel, and various beryllium-copper alloys. The wire illustrated in the drawing is of circular cross-section and of $\frac{1}{16}$ inch diameter.

The wire **1** is wound on a flat rectangular board or mandrel of suitable width (for example 2¼ inches) and for a suitable number of turns (for example 25 turns). Each turn has elongated linear sides and is rounded at the top and bottom ends. The device is then removed from the mandrel and the two ends of the wire are secured together as by welding at **2** to form a continuous unit. The finished device thus assumes the shape of a cylinder or collar which, in the specific embodiment mentioned above, measures 2⅜ inches in height and about 2 inches in width overall.

While the finished radiator possesses great strength and rigidity in an axial direction, it is freely expansible and retractable in a transverse direction so that, when slipped over objects of various shapes and sizes, it will instantly and automatically adjust itself to fit the shape of any such object. Thus, if the radiator is slipped axially over a cylindrical object of suitable size, it will assume a corresponding cylindrical shape with the inner sides of the radiator turns snugly engaging the cylindrical wall of the object. Similarly, the radiator will readily accommodate itself to fit objects of rectangular, oval, conical, or pyramidal shape.

Fig. 2 shows a conventional vacuum tube **3** having a cylindrical glass envelope, mounted in a socket **4** on a metallic chassis **5**. The wire heat radiator **1** is shown slipped over the outside of the glass envelope of vacuum tube **3** parallel to the longitudinal axis thereof so that it surrounds the tube. Only the inner legs of the wire convolutions contact the glass envelope of the tube, while the rounded bottom ends of the wire convolutions contact the chassis **5** as illustrated.

In operation, the vacuum tube **3** becomes quite hot, which, of course, heats the contacting radiator **1**. However, the free movement of air between and around the convolutions of the radiator causes the air to absorb heat from the turns and conduct it away rapidly enough to effect a rapid and substantial lowering of the surface

temperature of the tube 3. Since the rounded bottom ends of the wire convolutions contact the metal chassis 5, heat is also carried away by conduction and further dissipated in this manner. In one installation generally similar to that illustrated in Fig. 2, a temperature reading of 185° C. was obtained in one spot on a vacuum tube without using the heat radiator, while the temperature at the same spot dropped to 145° C. when the radiator was used. In another installation the temperature without the radiator was 270.5° C., and with the radiator it dropped to 229.5° C.

While the idea of cooling a hot body by means of fin-like radiating members is not broadly new, the devices heretofore proposed for this purpose have been open to various objections. One objection has been that such devices have had to be made in special sizes to fit only the particular object which they were designed to cool. Furthermore, some such devices must be permanently welded or otherwise secured to the object to be cooled. Others, consisting of coil springs seated in grooves in insulating plugs, etc., have dissipated very little heat or have been inefficient for other reasons. Still others have depended on wires or rods to conduct heat out of the ends thereof from a hot zone to a cooled surface. Very little heat is conducted away in this manner. The self-adjusting heat radiator of the invention, on the other hand, effectively cools any hot body on which it can be

placed, is adaptable to objects of various sizes and many different shapes, requires no alteration of the body on which it is used, is simple and inexpensive to construct, and is readily applied or removed at any time, even when the body is in operation.

What is claimed is:

The combination with a metal support, of a vacuum tube mounted on said support, a self-adjusting heat radiator surrounding and engaging said vacuum tube and comprising a continuous flexible strand of heat radiating material wound in a plurality of convolutions in the shape of a cylindrical collar having elongated linear sides connected by rounded ends, one of the linear sides of each of said convolutions engaging said vacuum tube over substantially the entire length of said linear sides, said convolutions at one end of said radiator engaging said metal support.

References Cited in the file of this patent

UNITED STATES PATENTS

2,523,701	Kuehl	Sept. 26, 1950
2,673,721	Dickinson	Mar. 30, 1954
2,745,895	Lideen	May 15, 1956

FOREIGN PATENTS

692,164	France	July 29, 1930