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VACUUM TUBE RETAINER AND HEAT SHIELD

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2 Sheets-Sheet 1

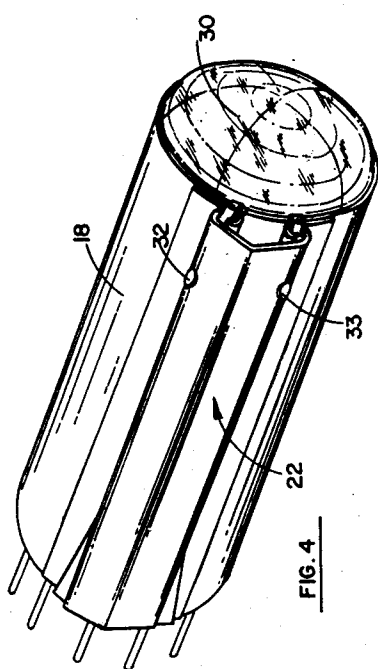


FIG. 4

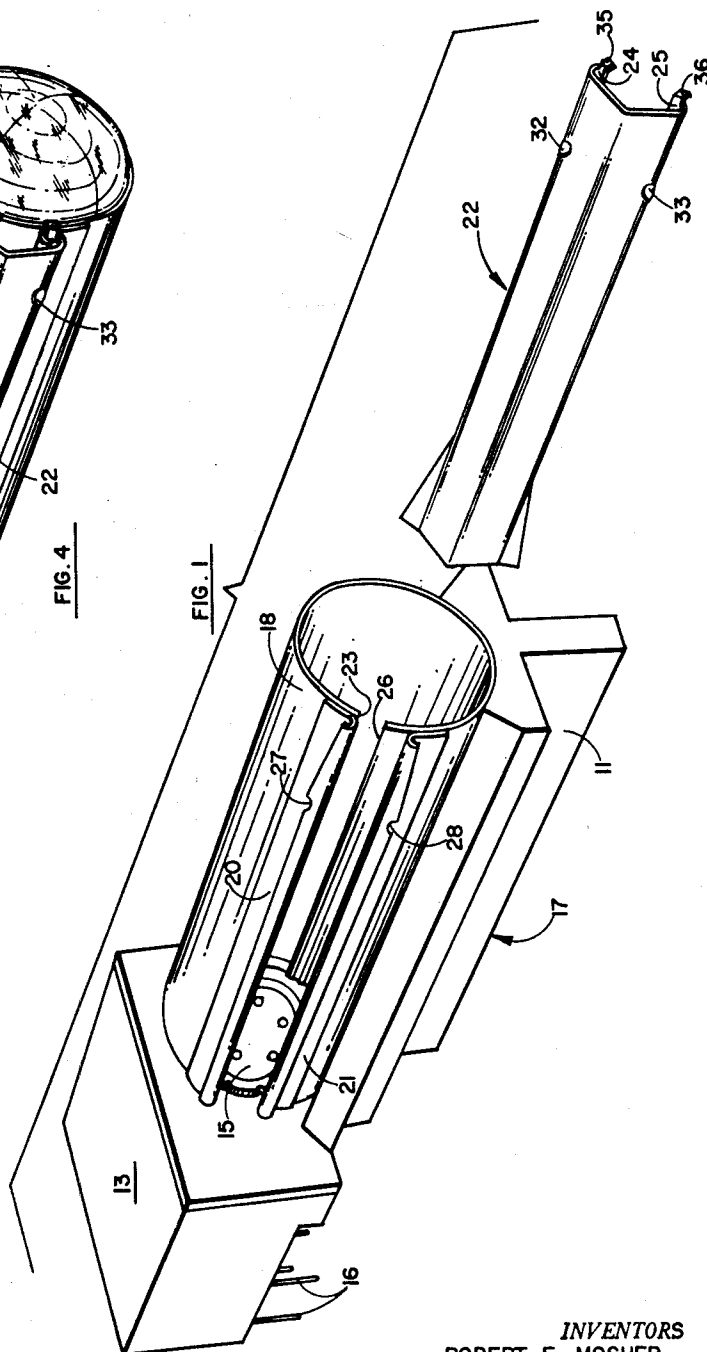


FIG. 1

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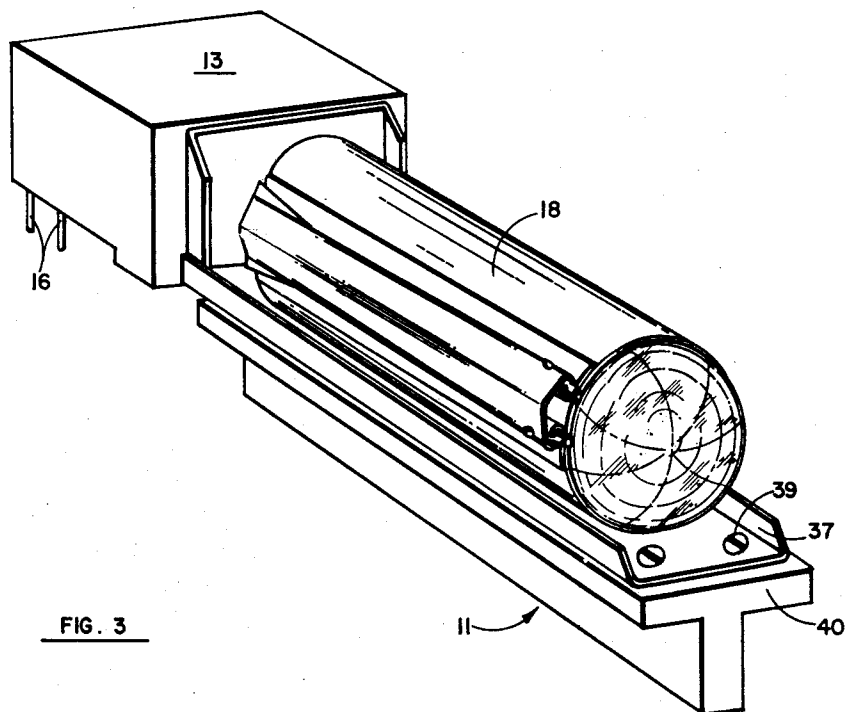
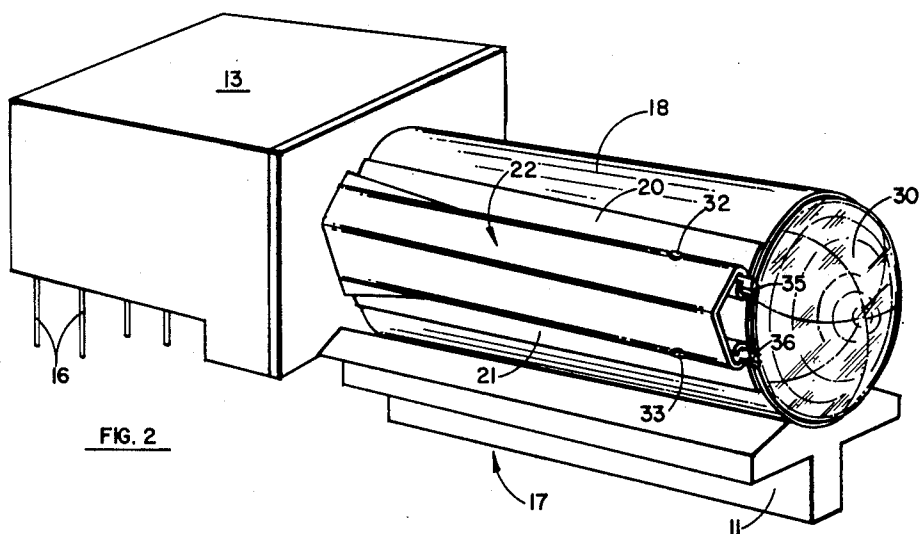
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2 Sheets-Sheet 2



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VACUUM TUBE RETAINER AND HEAT SHIELD
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5 Claims. (Cl. 165-80)

This invention relates to a vacuum tube retainer and heat shield and more particularly to such a device having simplified construction, good retaining capabilities and capable of efficiently conducting heat away from the vacuum tube with which it is utilized.

Many vacuum tube retainers are now in use which conduct heat away from the vacuum tube and thereby provide more efficient cooling of the tube itself and the unit in which it is utilized. To be effective, the retainer must efficiently combine a holding capability and the ability to carry heat away from the tube. In modern electronic equipments, especially those of compact construction, such as are carried in a missile or aircraft, the design problem in achieving optimum capabilities for both of these functions is a difficult one. This is so because of the high vibration conditions that are encountered in such applications combined with the heat dissipation problems due to the necessary compact construction. In addition, some consideration must be given to facilitating the placement of the tube within its retainer in both original assembly and on tube replacement. Many devices now used excel in one or the other of these capabilities, but there are few available which combine all these features.

The device of this invention provides a simple tube retainer which can be more economically fabricated than others of similar construction and includes all of the above enumerated desirable features. This end result is achieved by providing an efficient heat sink member comprising a flexible portion which contacts the tube envelope. The flexible heat sink portion has guides therein into which a spring clamp is fitted which draws the ends of the flexible member together and holds it in close contact with the tube envelope. The heat sink may additionally comprise a rigid portion which attaches to the chassis and to which the flexible portion is attached. The tube can readily be inserted in and removed from the retainer by sliding out the spring clamp which permits the flexible portion to open up. No manual wrap around of the flexible portion is required.

It is therefore an object of this invention to provide an improved vacuum tube retainer and heat shield.

It is another object of this invention to provide a vacuum tube retainer and heat shield of simplified construction which provides more efficient conduction of heat away from the vacuum tube.

It is still another object of this invention to provide a vacuum tube retainer and heat shield in which a vacuum tube can be more easily installed and from which it can be more easily removed.

It is still another object of this invention to provide a vacuum tube retainer and heat shield which can be more economically fabricated without sacrificing efficiency of operation.

Other objects of this invention will become apparent in the following discussion taken in connection with the accompanying drawings in which—

FIG. 1 is an exploded view of a first embodiment of the device of the invention showing the spring clamp removed therefrom;

FIG. 2 is a perspective view of the embodiment illustrated in FIG. 1, completely assembled with a vacuum tube installed therein;

FIG. 3 is a perspective view of a second embodiment of the device of the invention; and

FIG. 4 is a perspective view of a third embodiment of the device of the invention.

Referring now to FIG. 1, a perspective view of a first embodiment of the device of the invention is illustrated with the spring clamp removed. Heat sink 17 comprises a flexible portion 18 and rigid portion 11 which is fixedly attached to a base member 13 by any suitable means such as, for example, cementing. Base member 13 has a tube socket 15 fixedly mounted therein. The pins of the tube socket (not shown) are each attached to a respective one of the connecting pins 16 which protrude from base member 13 and may be utilized to connect the tube to an appropriate mating receptacle which may be mounted on the chassis or circuit board to which the retainer is attached.

Base member 13 may be fabricated of any suitable insulating material such as, for example, a plastic potting compound into which the tube socket 15 has been sealed after its pins have been appropriately connected to contact pins 16. Rigid tube retainer portion 11 may have appropriate threaded portions (not shown) which may be utilized for attaching this member to a chassis.

Flexible heat sink portion 18, which is cylindrical in shape, is fixedly attached to the rigid portion 11 by any appropriate means such as, for example, soldering. Flexible heat sink portion 18 is fabricated of a soft metal having high heat conductivity such as, for example, soft silver. Flexible cylindrical portion 18 has ends 23 and 26 parallel to the cylinder axis which are free. Spring guides 20 and 21, which are fabricated of spring metal, are fixedly attached to flexible member 18 near the free ends 23 and 26 thereof by any suitable means such as, for example, by welding or soldering. Spring clamp 22 which is V shaped is fabricated of spring metal and has runners 24 and 25 which mate with spring guides 20 and 21, respectively. Runners 24 and 25 should be formed so that they will draw spring guides 20 and 21 towards each other to bring free ends 23 and 26 together when the spring clamp 22 is installed in the retainer.

Referring now to FIG. 2, the device of the invention illustrated in FIG. 1 is shown with the tube installed in tube socket 15 and with spring clamp 22 drawing the flexible heat sink portion 18 closely around the sides of tube envelope 30. As can be seen, the flexible heat sink member 18 is drawn around the tube envelope 30 so that it conforms with the configuration of the envelope and uniformly contacts this envelope. The ends 23 and 26 are brought together so that cylindrical heat sink portion 18 forms a complete cylinder around the tube. The tube may readily be removed from the socket by merely sliding spring clamp 22 off the rails formed by spring guides 20 and 21. Indentations 27 and 28 (see FIG. 1) formed in spring guides 20 and 21, respectively, mate with associated dimpled portions 32 and 33 of clamp 22 to more securely hold the clamp and the guides together. Stop tabs 35 and 36 are provided at the end of clamp 22 to limit its travel. It is also to be noted that the rigid heat sink portion 11 is curved to the general configuration of cylindrical portion 18 and the tube envelope where it joins with flexible member 18 to provide a wide area of contacting surface between flexible portion 18 and rigid portion 11. This enhances the transmission of heat from the tube through flexible member 18 to rigid member 11. In the embodiment illustrated, flexible heat sink portion 18 is attached to rigid member 11 at a point which is somewhat off its center. This is done to minimize the total space taken up by the unit to avoid interference with other devices mounted on the chassis. If no such interference problem is encountered, flexible

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heat sink member 18 may be centered on rigid member 11. Heat sink portion 11 may be fabricated in a single piece, for example, by investment or die casting.

Referring now to FIG. 3, a perspective view of a second embodiment of the device of the invention is illustrated. This second embodiment is similar in configuration to first embodiment except for the construction of the rigid heat sink portion 11. As can be noted in FIG. 3, in this second embodiment, rigid heat sink portion 11 is not shaped to fit the contours of the vacuum tube. Rigid heat sink portion 11 comprises a rectangular piece 37 to which flexible heat sink portion is attached and a T-shaped piece 40 to which piece 37 is attached by means of rivets 39. This second embodiment does not have quite as good heat transfer capabilities as the first. However, in other respects, it is equally as efficient as the first and it may be used where application demands dictate.

Referring now to FIG. 4, a third embodiment of the device of the invention is illustrated. This embodiment utilizes only the flexible cylindrical heat sink portion 18 and the clamp 22 illustrated and described for the other embodiments to transfer heat from tube envelope 30. Heat sink member 18 may be attached to a chassis by any suitable means (not shown). This embodiment, of course, is not as efficient in heat transference as the other embodiments, but may be used where space and economy considerations preclude the use of a more elaborate device.

The device of this invention is especially suited for retaining miniature and subminiature tubes which are utilized in printed circuit type construction. It may, of course, be used to equal advantage with other types of tubes and in wired units, and for retaining and transferring heat from other components, such as resistors, capacitors, and the like.

The device of this invention thus provides a simple yet highly efficient retainer capable of adequately retaining components and at the same time providing efficient transfer of heat to a heat sink member which may be mounted on a chassis. At the same time, the structure of the device of the invention is amenable to ready installation and removal of the component which is retained thereby.

Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the terms of the appended claims.

We claim:

1. In a retainer suitable for retaining an electronic component, a heat sink member having a rigid portion and a springless wrap-around flexible portion, said springless wrap-around flexible portion being fixedly attached to

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said rigid portion, said springless wrap-around flexible portion having free ends parallel to the cylinder axis, spring guide members fabricated of spring metal, and having hook-like rails fixedly attached to said springless wrap-around flexible portion proximate to each of said free ends, and longitudinal spring means for sliding longitudinally over said hook-like edges of said spring guides, and engaging each of said hook-like rails of said spring guides, drawing them together, and wrapping said flexible portion of said heat sink member substantially closely around 360 degrees of the envelope of the component.

2. The device as recited in claim 1 wherein said rigid heat sink portion has the surface adjacent said flexible heat sink portion shaped to match the contour of the envelope of the component.

3. In combination a vacuum tube retainer and a vacuum tube, said retainer comprising a base member, a tube socket mounted in said base member, a heat sink member, said heat sink member having a rigid portion fixedly attached to said base, and a springless cylindrically-shapable flexible portion fixedly attached to said rigid portion, said springless flexible portion having the ends thereof parallel to the cylinder axis, guide means having hook-like rails fixedly attached to said flexible heat sink portion near the free ends thereof, and longitudinally-slidable V-shaped tapered spring means for sliding longitudinally over said hook-like rails of said guide means, causing said V-shaped portion of said spring means to engage said hook-like rails of said guide means, causing said tapered spring means to draw the free ends of said flexible portion towards each other into a substantially abutting relation, and causing the flexible portion of said heat sink member to surround the envelope of said tube, whereby said tube is retained in said retainer and heat generated by said tube is efficiently transferred through only the thickness of said flexible portion to the rigid portion of said heat sink member.

4. The device as recited in claim 3 wherein said rigid heat sink portion has a substantially T-shaped cross-section, the surface thereof adjacent said cylindrical flexible portion being curved to mate with the cylinder wall of the vacuum tube.

5. The device as recited in claim 3 wherein said spring guides each have an indentation therein and said spring clamp means has a pair of dimples formed therein adapted to mate with said indentations.

References Cited in the file of this patent

UNITED STATES PATENTS

2,715,518	Bickler	Aug. 16, 1955
2,766,020	Woods	Oct. 9, 1956
2,771,278	Slack	Nov. 20, 1956
2,808,576	Brown	Oct. 1, 1957
2,840,629	Roth et al.	June 24, 1958