Sept. 22, 1959 L. R. WOODS 2,905,742

SHIELD FOR ELECTRONIC COMPONENTS

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FIG. 1.

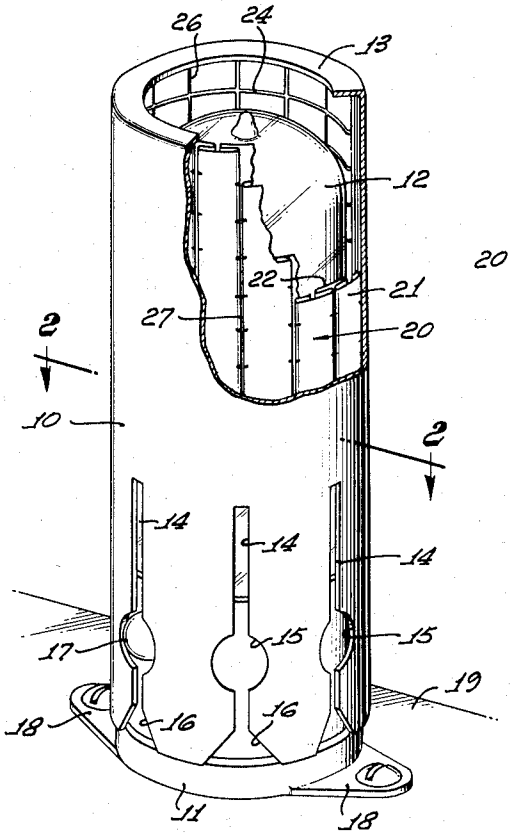


FIG. 3.

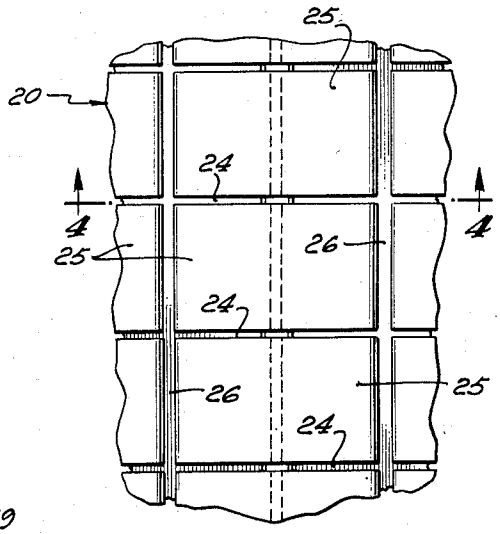


FIG. 4.

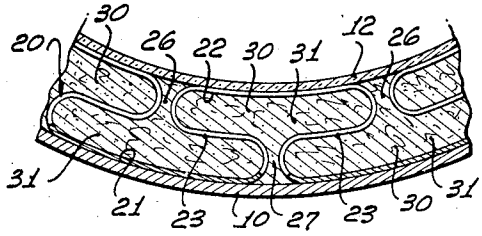
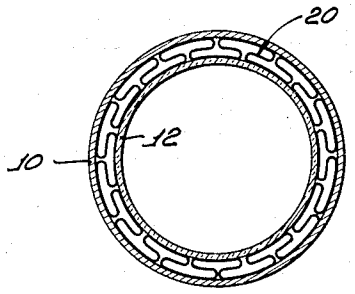


FIG. 2.



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SHIELD FOR ELECTRONIC COMPONENTS

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5 Claims. (Cl. 174—35)

The application relates to shields for application to electronic components for the purpose of damping extraneous high frequency vibrations which might reach the component and at the same time be capable of bleeding off heat generated by the component during its normal performance. More particularly the invention is especially well adapted to the retention of electronic tubes and more particularly miniature electronic tubes by employment of resilient contacting means completely surrounding the glass envelope and in contact with that envelope in order to best conduct heat away from the glass by use of a uniform, well-patterned contact so that there will be no areas of the glass overheated to temperatures greatly different from adjacent areas.

Progress in the development of electronic tubes and particularly miniature tubes has emphasized the need for mounting tubes in such fashion that their life need not be shortened when they are used under extreme conditions of vibration and when also they may be packed into such close quarters that heat normally generated by operation of the tube is not properly conducted away. Although some attempts have already been made to produce tube shields and tube shield liners of a type adapted to the solution of these problems, such structures have to a degree been somewhat complicated and expensive to the extent that widespread use in all fields where they might be beneficial has been curtailed.

It is therefore among the objects of the invention to provide a new and improved multiple purpose retainer for electronic components which is of extremely simplified construction and design and which readily adapts itself for insertion into tube shields already available, thereby making it possible in a simple and inexpensive way to very greatly improve the retention of electronic components and preserve their useful life where high frequency vibration conditions or heating problems are a factor.

Another object of the invention is to provide a new and improved liner for electronic tube shield components which can be constructed of a single sheet of material given suitable axial configurations capable of building into the liner a resilient character applicable over the entire length and breadth of the tube regardless of minor variations in shape and size of the tube, the shield being one which, once in position, is particularly effective, both in damping the transmission of vibrations to the tube and in dissipating heat generated by the tube.

Still another object of the invention is to provide a new and improved holder for electronic components in the nature of tube shields wherein by employment of as few as two pieces there is provided a casing or jacket formed for retention of a liner of a resilient type which can be slid into place and combined with the casing in a manner providing a high degree of contact over a uniform pattern on the exterior of the component and which further includes a metal to metal contact with the base so that heat may readily be dissipated.

Still further among the objects of the invention is to

provide a new and improved simple and inexpensive liner capable of combination with a cylindrical shield wherein should vibration damping properties be of especial importance, additional damping material can be included between the liner and the shield so as to greatly enhance the vibration damping characteristics without in any way detracting from the ability of the combination to dissipate heat generated by the component.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a longitudinal elevational view of an assembly including the liner partially broken away to show the positioning of the liner in the exterior casing.

Figure 2 is a cross-sectional view taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged longitudinal view of a fragment of the liner viewed from the interior.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 3.

In the embodiment chosen for the purpose of illustration there is shown an assembled tube shield casing **10** secured to a base **11** for the purpose of retaining an electronic tube **12** in position. The tube shield casing is cylindrical in form and somewhat elongated so as to be capable of accommodating any one of a number of different types and kinds of electronic tubes. The casing **10** has an inwardly extending annular flange **13** at the upper end and at the lower end is provided with a series of circumferentially spaced inwardly extending slots **14**. The slots have enlarged portions **15** and bevelled ends **16** to facilitate application of the slots over a button **17**.

There may be one or more buttons **17** on the base **11**. In turn the base is provided with feet **18** by means of which the base may be attached to a suitable support **19**.

The liner consists essentially of a single sheet **20** of relatively thin resilient material which is folded so as to provide outer or exterior loops **21** and inner or interior loops **22**. The exterior and interior loops are joined at adjacent ends by reversely curved portions **23**. These reversely curved portions are important elements of structure of the liner in that they provide a resilient connection between the exterior and interior loops. The resilient connection is long and admits of considerable springiness without the precise degree of springiness being critical. They also admit of a considerable variation in the location or position of the interior loops so that the liner can accommodate itself readily to the glass envelope of an electronic tube, for example, which may be oversize or undersize to a considerable degree. Further still, the exterior loops by reason of the construction shown and described are permitted to assume an arcuate shape conforming to the interior wall of the tube shield casing **10**. The interior loops also because of their length and resilient consistency readily accommodate themselves to the arcuate shape of the glass envelope of the tube **12**.

To add to the versatility of the liner permitting it to still more readily conform to whatever shape the exterior of the tube may take, the interior loops and the adjacent reversely curved portions are cut to form slits **24**. The slits are, in the example shown, spaced in an axial direction to provide independent pads or areas **25** to the extent that the interior loops are broken up into a checkered pattern of pads throughout the entire interior circumference of the liner. While the precise spacing of the slits may be varied to establish spring supported areas having different inherent vibration characteristics, for practical purposes they may be equidistant as shown. The pads,

moreover, are separated by spaces 26 so that there is ample opportunity for each individual pad 25 to adjust itself independently of every other pad to accommodate any roughness which might exist on the surface of the tube. By providing additional spaces 27 between adjacent ends of the exterior loops there is avoided any prospect of a binding against the free action of the pads near the exterior as well as at the interior.

On specific occasions there may be necessity for insuring to a greater degree against the transmission of vibrations of damaging frequency between the base and the tube shield casing and the tube. Such added dampening of the transmission of vibrations can be accomplished by filling pockets 30 with a somewhat flocculent material which may be any one of a member of substances such, for example, as a bituminuous material, a spongy resinous plastic material of any one of a number of commercially available varieties capable of resisting heat to a degree, or for example some cellulosic or fibrous substance capable of being placed within the pockets without suffering any great degree of compaction and which will remain in a position filling the pockets and tending to assist in the dampening of vibrations which might be set up. In addition to showing pockets 30 filled with the damping material, pockets 31 on occasions may be filled with a similar material with or without the presence of material in the pockets 30, thereby to modify to a desired degree the ability of the composite structure to damp out vibrations of specific frequencies.

There has accordingly been herein shown and described a liner for tube shield casings of an extremely simple construction in that it consists of a single sheet of material folded into cylindrical shape and which can be cut and sized with ease to fit inside of a tube shield casing of any diameter. It is necessary only that the vertical edges of the liner approximately meet each other when the liner is contained within the tube shield casing. Thus formed the liner may be inventoried in relatively few sizes and admits of ready cutting lengthwise to fit casings of different diameters and also permits of ready cutting in a direction transverse thereto along any one of the slits 24 so that the liner can be sized to fit tube shield casings of different lengths. The checker-like pattern of resilient pads is one especially well adapted to irregular contours as well as regular cylindrical contours such as might be expected in a commercial run of electronic tubes.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a shield assembly for an electronic component including a casing the combination of a vibration damping and heat dissipating liner comprising a sheet of metal substantially in the form of a cylinder, said sheet being formed in a plurality of axially extending external loops alternating with a plurality of axially extending internal loops, a reversely curved portion of said liner forming leaf spring elements joining side edges of said exterior loops with corresponding side edges of adjacent interior loops and spaced one from another, said interior loops having a plurality of spaced slits providing a checkered pattern of individual areas in said internal loops adapted individually to engage the exterior of the component, said leaf spring elements being spring biased outwardly and inwardly at opposite ends thereof whereby the external loops are adapted to be pressed against the casing and the internal loops are adapted to be pressed against the component.

2. A vibration damping and heat dissipating tube shield assembly for an electronic component comprising a cylindrical casing having an inwardly extending configuration at an outer end and socket-engaging means at an inner end thereof, a liner comprising a sheet of metal folded into a plurality of axially extending alternating sets of exterior and interior loops and reversely curved portions forming leaf spring elements joining corresponding edges of adjacent exterior and interior loops, an end portion of said liner being contained by said configuration, one of said sets of loops and the reversely curved portions having a plurality of spaced circumferentially extending slots therethrough forming a plurality of separate spring contact areas throughout the length and circumference of the liner, said leaf spring elements being biased outwardly and inwardly at opposite ends whereby said exterior loops are adapted to be pressed outwardly against the casing and said interior loops are adapted to be pressed inwardly against the component.

3. A vibration damping and heat dissipating tube shield assembly for an electronic component comprising a cylindrical casing having an inwardly extending annular flange at an open outer end and socket-engaging means at an inner end thereof and a liner comprising a sheet of resilient metal having a form folded into a plurality of axially extending alternating sets of exterior and interior separate resilient loops and reversely curved resilient portions joining corresponding edges of adjacent exterior and interior loops, the outer edge of said liner being contained beneath said flange, and a mass of non-metallic vibration damping material having a compressive resistance less than the resistance of said resilient portions filling spaces within said loops, said resilient portions being biased respectively outwardly and inwardly at opposite ends thereof whereby said exterior separate resilient loops are adapted to be pressed against said casing and said interior separate resilient loops are adapted to be pressed against said component.

4. In a shield assembly for an electronic component adapted to be mounted upon a base the combination of a metallic casing having a base engaging portion, a vibration damping and heat dissipating liner therein, said liner comprising a sheet of electric shielding and heat conducting metal having a resilient character when subjected to heat and substantially in the form of a closed cylinder, said metal being in the form of a plurality of axially extending external sections alternating with a plurality of axially extending internal sections, said external sections being spaced radially outwardly of said internal sections, opposite longitudinal edges of each said external section being spaced from each other forming an elongated area adapted to engage the interior of the shield, opposite longitudinal edges of each said internal section being spaced from each other forming an elongated area adapted to engage the exterior of the electronic component, areas inwardly of said edges of said external sections being at locations overlapping areas of adjacent internal sections and areas inwardly of edges of said internal sections being at locations overlapping areas of adjacent external sections, and connecting portions of said liner forming leaf spring elements spanning the space between external sections and internal sections and occupying the space between the overlapped portions of adjacent external and internal sections, said connecting portion extending in alternately opposite directions and respectively joining longitudinal edges of said exterior sections with corresponding longitudinal edges of said interior sections whereby the external sections are adapted to be spring pressed against the casing and the internal sections are adapted to be spring pressed against the component.

5. A heat dissipating and vibration damping liner for use with a casing for an electronic component, a heat conductive casing, a liner in said casing comprising a resilient springy character when subjected to heat and substantially in a form comprising a cylinder, said sheet

being formed in a set of axially extending external sections each having spaced longitudinal edges defining an elongated area therebetween alternating with a set of axially extending internal sections each having separated longitudinal edges defining an elongated area therebetween, intermediate portions of said liner forming spring elements joining longitudinal edges of said external sections with adjacent longitudinal edges of adjacent internal sections and separated one from another, said intermediate portions having generally obliquely extending and alternating oppositely facing positions overlapping respectively adjacent portions of said exterior sections and said interior sections and being biased in a direction whereby when in use the external sections are pressed outwardly into engagement with the casing and the internal sections are pressed inwardly into engagement with the component.

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