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HEAT DISSIPATING TUBE SHIELD

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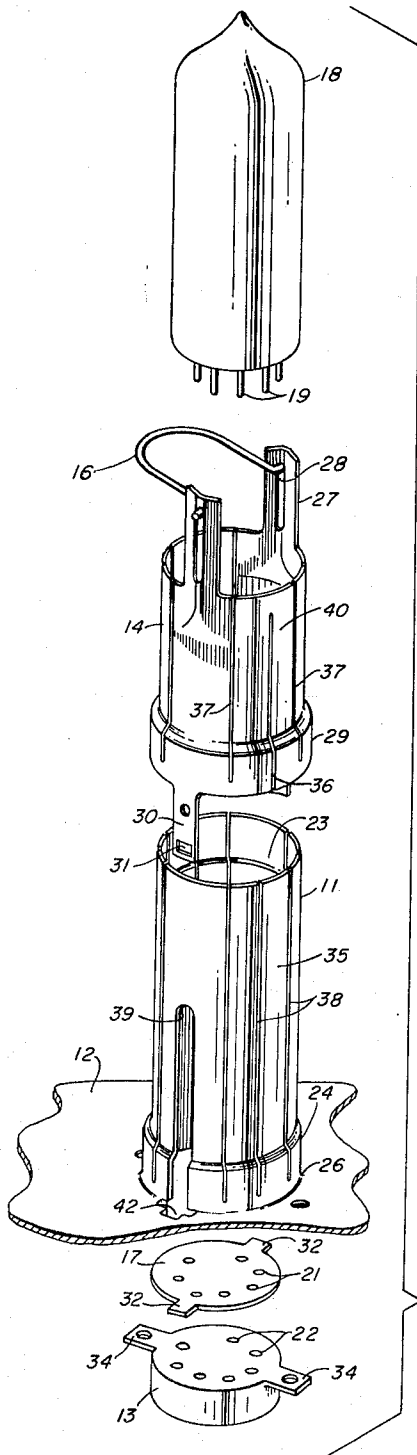


Fig. 1

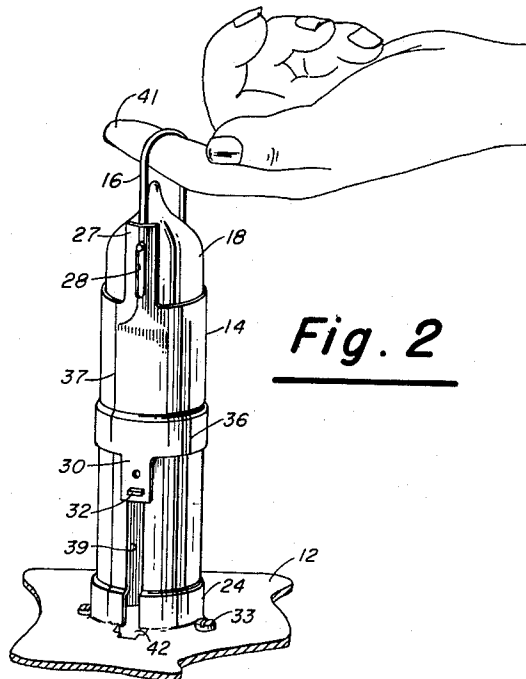


Fig. 2

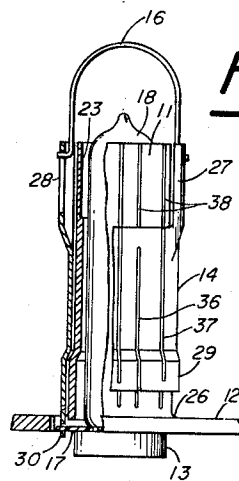


Fig. 3

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HEAT DISSIPATING TUBE SHIELD

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(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to protective devices for electronic components and is especially applicable for tubes to reduce vibration and microphonics, and increase the heat dissipation rate.

One of the most significant factors affecting the life of a tube is that of heat. It has been determined that for reliable operation of most glass miniature tubes, bulb temperatures should not exceed one hundred degrees centigrade. In the past tube shields generally comprised a cylindrical body enclosing an electron tube within a resilient metallic liner and held firmly in place by coil springs, which assembly was attached by a bayonet connection to its base or chassis. Vibration and microphonics were reduced or partially overcome by such devices but the various thermal barriers set up by the construction such as tube envelope to liner, to body, to base, to chassis, impeded heat conduction at each point and usually increased the seriousness of this phase of the protection in place of improving it.

Tube shield designs have been proposed and used which provide the three protections desired but in most cases the facility for removing the tube from a chassis for replacement makes the device impractical. In some cases the shield has been so bulky there was not sufficient room in the limited size chassis to house all the components required. Another object resulted from the inadequate facility for removing the tube for replacement, especially where the tube in question may be located in a group of closely spaced components. In the latter situation, burning of an operator's finger or electric shock are serious drawbacks. Another obstacle results from the inability of the operator to install the replacement tube in its socket with positive assurance that the pin type base of the tube is correctly positioned in its chassis socket or receptacle.

The general object of the proposed invention is to eliminate the foregoing and related disadvantages and provide an improved tube shield.

This has been accomplished by providing a resilient shield rigidly connected to the chassis and in direct contact with the electron tube and its envelope which telescopes into the shield thereby providing a direct conduction path for high heat dissipation due to the elimination of all but one of the usual heat barriers. For purposes of assembly and replacement of the tube, an outer sleeve which presses the shield against the envelope for better conduction contact and stability, is coupled to the tube by a dielectric disc perforated to match the tube pin type base or socket receptacle, whereby the replacement tube may be inserted and then freely rotated to permit the pins to pass through the disc perforations and bottom in the receptacle when the tube is pressed downward into position. By means of the bail, one finger can raise the outer sleeve and tube to the top position to facilitate removing and replacing a tube.

The general object of the aforesaid tube shield design is for the purpose of reducing vibration and microphonics, and increasing the heat dissipation rate.

Another object is to provide a resilient cylindrical shield body as an integral part of the chassis and in direct contact with the tube and envelope.

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Still another object is to provide a resilient sleeve telescopically mounting on said shield for tightening the physical contact between the parts and the tube envelope and improving the heat conduction.

A further object is to provide a linkage between the sleeve and tube whereby the combination can be raised or lowered simultaneously and the tube installed or removed from the shield for replacement.

Still another object is to provide means coupled to said linkage to facilitate assembling the tube in the shield in its correct angular position for mounting in the chassis tube socket. The advantage of this feature can be better appreciated when it is realized that it can be performed by touch or feel, even in the dark.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is an exploded view of the tube shield in perspective;

FIG. 2 is a perspective view of the tube shield showing the method for replacing a tube;

FIG. 3 is a front view partially in section illustrating a tube mounted in the shield in operable position.

In detail, FIG. 1 shows the various parts of the shield in their relative positions ready for assembly. The resilient cylindrical shield body 11 is shown fastened at its lower end to chassis 12. The means for fastening the body to the chassis may be by any suitable method but preferably by brazing to make the body an integral part of the chassis and provide excellent heat conduction. The inside relaxed diameter of said shield 11 is made smaller than the outside diameter of tube 18 in order to provide a press fit when tube 18 is telescoped into said shield 11.

The outer cylinder or ejector 14 has an inside diameter slightly less than the outside diameter of the shield body 11 whereby the outer cylinder 14 may be telescopically forced over the shield 11 by pressed fit to clamp the assembly comprising tube 18, shield 11 and outer cylinder 14 into close contact to provide an excellent heat conducting path from tube 18 to chassis 12.

The shield body 11 is provided with a plurality of longitudinally narrow slots 38 which run from a point near the bottom, where the slots are closed, through the top where the slots are open, to provide the necessary shield resilience to expand or contract about the tube 18 and be assembled telescopically by press fit. Similarly the outer cylinder or ejector 14 has a plurality of longitudinal slots alternately opening at the top 37 and bottom 36 respectively to provide a uniformly expansible sleeve 14 for telescopic mounting on the tube shield 11. The slots 38 of the shield 11 are positioned about the periphery so as to coincide respectively with alternate slots 36 and 37 of the outer cylinder. As a result the lands 35 between the adjacent slots of the shield coincide with the lands 40 of the outer cylinder and provide a maximum cooperative heat conductive contact between the coinciding lands.

The ejector 14 and tube 18 are linked together by means of the thin dielectric ejector disc 17 whereby downward pressure on the tube 18 will simultaneously force the resilient outer cylinder 14 and tube downward until the tube pins 19 project below the chassis 12 and enter the socket or receptacle 13. In the drawings a pair of extension arms 30 provided with arm holes 31 are shown attached to the lower end of the ejector cylinder 14. The ejector disc 17 has guide arms 32 which mount in arm holes 31 completing the operable linkage between the ejector 14 and tube 18 for simultaneous movement.

To keep the tube pins 19 in their correct angular position in relation to the base pin type receptacle pattern 22 a pair of longitudinal guide slots 39 have been provided in the shield body 11 in which the disc arms 32 slide during longitudinal movement of the outer cylinder 14 and tube 18. These slots continue by means of opening 42 through the lower end of the shield and the chassis to permit the extension arms 30 to project below the chassis where said arms 30 may be sprung apart to permit the ejector disc guide arms 32 to be snapped into the arm holes 31 of the ejector. After the assembly of the disc 17 as a linkage between the tube and outer cylinder, the disc 17 is raised and the socket 13 can then be fastened to the chassis 12 by means of the machine screws 33 through the socket ears 34. Although guide slot 39 is open at the bottom, the slot is closed at the top to provide an upper limit stop for the guide arms 32 and prevent accidental disassembly and at the same time locate the disc in the correct position for inserting the tube 18.

With the disc 17 held in a fixed angular position by its guide arms 32 riding in guide slots 39, this feature coupled to the perforation pattern of the pin holes 21 designed to coincide and match the pin holes 22 of the socket 13 and the pin 19 pattern of the tube 18, provides means whereby the tube will automatically bottom correctly in the chassis socket 13. The assembly operation consists of raising the outer cylinder by placing a finger 41 through the raised bail 16 attached to the bail arms 27 of ejector 14 and raising the assembly until the guide arms 32 reach their upper limit in guide slot 39. FIG. 2 illustrates this upper limit position.

Other features incorporated in the bail 16 and arms 27 include the V-shaped cross section of the arms. The bail pintles ride in the axial groove 28 at the vertex of the V and the bail proper rests in the vertex of said V shaped cross section of the arms to maintain it in its raised or vertical position. When the bail is in its lowest position at the bottom of the grooves 28 it performs the function of a bumper or guard for the top of the tube.

In this upper position, FIG. 2, the tube may be removed by hand and a replacement inserted by rotating the tube 18 until the pins 19 match the perforation pattern 21 and project through the thin ejector disc 17, and thus, are placed in position for bottoming in the receptacle 13. Then by forcing the tube 18 downward, by pressure on top of the tube, the ejector 14 will also move downward and the projecting portion of pins 19 will enter holes 22 in socket 13.

In the original basic design of the telescoping cylinders and tube, changes were made by way of improvement to facilitate operation or make it possible. The upper part of shield 11 is expandible due to slots 38 but the base portion of shield 11 is rigid below the longitudinal slots 38 and, therefore, had a tendency to bind the disc 17 and the tube base. To overcome this, the shield base was enlarged or expanded as indicated at 24.

Another step in the assembly requiring improvement occurred when the tube 18 was rotated in shield 11 during the step of locating the tube pins 19 in the disc perforations 21. Freedom of rotation being necessary was solved by counter boring the shield body 11 at the upper portion 23, FIG. 3. The aforesaid design improvements in the shield 11 at 24 promotes a cooperate change at the bottom of the outer cylinder 14 where the cylinder is enlarged at 29 to fit over the expanded base 24 of shield 11.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A tube shield for reducing vibration and micro-

phonics, and increasing the heat dissipation rate comprising in combination a longitudinally slotted cylindrical shield body fixed at its base to a chassis and aligned with a tube socket mounted on said chassis, an electron tube located in said cylindrical shield body, said tube having an outside diameter slightly larger than the inside diameter of said shield body to provide a press fit therein, a longitudinally slotted cylindrical ejector body telescopically mounted and slidably supported by press fit on the outer surface of said shield body, a dielectric element operably linking the ejector body and electron tube so that axial pressure on said tube will simultaneously telescope the ejector body over said shield body and the electron tube into said shield body, said dielectric element being angularly disposed relative to the tube socket and perforated to match both the tube base pin pattern and the pin type receptacle pattern of said socket so that the components are assembled in correct operative relationship and in surface to surface heat conductive contact.

2. A tube shield for reducing vibration and microphonics, and increasing the heat dissipation rate comprising in combination a tube socket provided with a multiple pin type receptacle and mounted in a chassis aperture, a resilient cylindrical shield body integrally connected at its base to said chassis and in alignment with said socket, a resilient outer cylinder sized for telescopically mounting by pressure fit over said shield body, a dielectric disc fixed to the bottom of said outer cylinder and positioned for axial movement in said shield body, said disc being perforated to match the socket multiple pin type receptacle, and an electron tube having a pin type base matching said disc perforations and pin type receptacle, said outer cylinder and dielectric disc being adapted to be raised on said shield to its top position for loading a replacement tube therein, and means for automatically guiding said tube downward through said shield by merely exerting pressure on the top of the tube so that the tube base will bottom in the matching socket receptacle and concurrently form a press fit between the component parts to produce high heat conduction contacts.

3. A tube shield comprising a chassis having a tube socket aperture, a tube socket provided with a multiple pin type receptacle mounted in said chassis aperture, a resilient cylindrical shield body integrally connected at its base to said chassis and in alignment with said socket, a resilient outer cylinder having an inside diameter slightly smaller than the outside diameter of the cylindrical shield for telescopically mounting on said shield by press fit, an electron tube provided with a pin type base mating with said pin type receptacle, said tube having its envelope outside diameter slightly larger than the inside diameter of said shield body for telescopically mounting therein by press fit and dielectric means linking the outer cylinder and electron tube for concurrent axial movement so that said resilient outer cylinder, tube and shield body may be simultaneously telescoped into an operative assembly and in positive direct heat conductive contact with said chassis.

4. A tube shield as set forth in claim 3 wherein said dielectric linkage means for telescopically assembling said tube, outer cylinder and shield concurrently comprises a dielectric ejector disc located in said shield body and adapted for axial movement therein, said disc being fixed to said outer cylinder, said disc being provided with a plurality of pin holes matching the pin type receptacle pattern, said disc being thin as compared with the length of the pins so that the pins projecting through the ejector disc match and enter the pin type receptacle of said socket.

5. A tube shield as described in claim 4 wherein said linkage means for telescopically assembling said tube, outer cylinder and shield concurrently, includes a pair of diametrically opposed longitudinal guide slots in said shield body, said dielectric disc being provided with radi-

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ally projecting guide arms extending through said guide slots and fastened to said outer cylinder.

6. A tube shield as described in claim 5 wherein said guide slots terminate at a point below the upper end of said shield body to provide a limit stop for the top of the travel of said disc guide arms and prevent disassembly of telescoping components.

7. A tube shield as described in claim 5 wherein said guide slots extend through the lower end of said shield and the chassis, and the outer cylinder is provided with a pair of extension arms in which the guide arms fasten, said extension arms jutting beyond said shields lower edge and adapted to project below the chassis so that the disc may be assembled onto said outer cylinder.

8. A tube shield as set forth in claim 3 wherein the cylindrical shield body and the outer cylinder are provided with coinciding longitudinal slots for expansion and contraction so that the coinciding lands between said slots are held in tight conducting contact by press fit for heat dissipation.

9. A tube shield as set forth in claim 8 wherein said longitudinal slots in the shield body extend through the upper edge and terminate above the lower end of said shield body so that maximum expansion of said body is provided at the upper end, and the longitudinal slots in the outer cylinder alternately open at the top and bottom respectively, to allow for uniform expansion of the outer cylinder throughout its entire length.

10. A tube shield as set forth in claim 9 wherein said cylindrical shield body is provided with an enlarged section in its lower portion to receive the tube base where the shield is rigidly connected to the chassis as an integral part thereof, and the lower portion of said outer cylinder is enlarged to accommodate the aforesaid enlarged section of said shield body to prevent binding.

11. A tube shield as described in claim 3 including means for ejecting said tube from the shield assembly comprising a pair of bail arms projecting axially from the top of the outer cylinder, said bail arms being V shaped in cross-section with the vertex pointed outwardly, a longitudinal slot in the bail arms at the vertex of the V, a bail having a loop large enough to accommodate at least one finger and provided with pintles terminating in said slots respectively so that the bail will be held vertically by said V shaped bail arms whereby said outer cylinder and tube may be simultaneously raised to their top position by the pull of one finger through said bail for removal of the tube.

12. A tube shield for reducing vibration and microphonics, and increasing the heat dissipation rate comprising in combination a chassis provided with a tube socket aperture, a cylindrical shield body fixed at its base to said chassis to form an integral part thereof and aligned with said aperture, a plurality of narrow longitudinal slots in said body open at the top and terminating

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adjacent its base for expansion or contraction of said body, a resilient, outer cylinder telescopically mounted by pressure fit over said shield body, a plurality of narrow longitudinal slots in said outer cylinder said slots being alternately open at the top and bottom respectively and coinciding with the openings in said shield body slots so that coinciding lands in heat conductive contact are provided between each pair of adjacent slots thus forming a direct heat dissipating path to the chassis, an ejector disc located in said shield body and provided with guide arms fixed to the lower end of said outer cylinder, a pair of longitudinal guide slots in said shield body for slidably holding said guide arms, said guide slots being open at the base for assembling the ejector disc on said outer cylinder and closed at the top to provide a limit stop, a tube socket provided with a multiple pin type receptacle mounted in said chassis aperture, an electron tube provided with a pin type base mating with said pin type receptacle and having its envelope diameter slightly larger than the inside diameter of said shield body for telescopically mounting therein by press fit, said ejector disc being perforated to match the pin type receptacle and allow said tube base pins to pass through said disc and make operable contact in said tube socket receptacle, and a bail pivotally fastened to the outer cylinder whereby the outer cylinder and tube may be raised concurrently thereby until the disc guide arms are stopped at the upper limit of the guide slot for replacing the tube.

13. A tube shield for reducing vibration and microphonics and increasing the heat dissipation rate comprising in combination a tube socket fastened to a chassis, a resilient cylindrical tube shield aligned with said socket and integrally fastened to said chassis for positive heat conduction, an electron tube and envelope having an outside diameter slightly larger than the inside diameter of said shield and telescopically positioned therein by press fit, a resilient outer cylinder having an inside diameter slightly smaller than the outside diameter of said shield and telescopically mounted thereon by press fit, a dielectric linkage connecting said tube and outer cylinder for telescopically assembling said tube, cylinder and shield simultaneously into a high heat dissipating unit, said dielectric linkage being provided with a perforation pattern of pin holes coinciding with the pin holes of said socket so that said tube will be correctly positioned in said socket.

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