March 15, 1955 F. L. BOERUM 2,704,354

TUBE CLAMP

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FIG. 1

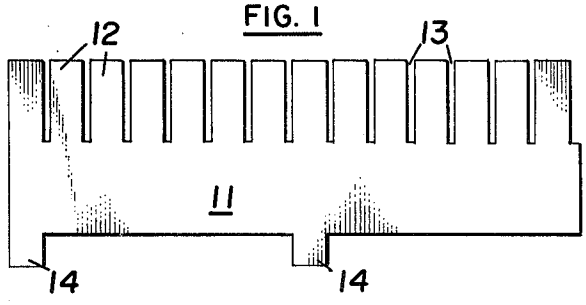


FIG. 2

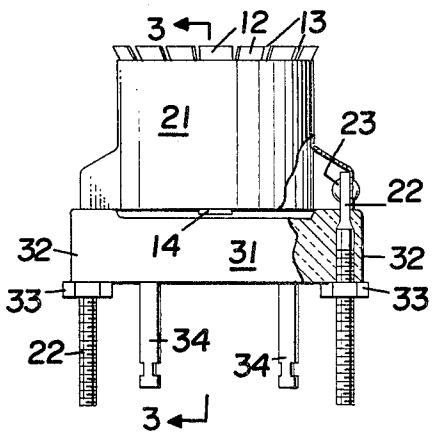
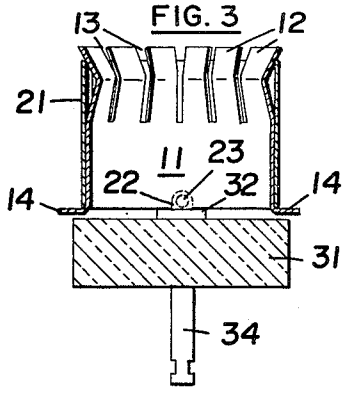


FIG. 3



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TUBE CLAMP

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3 Claims. (Cl. 339—93)

This invention relates to tube clamps and more particularly to clamps for holding electron tubes securely seated in their sockets, reducing the effects of vibration.

Difficulty has been experienced in maintaining electron tubes securely seated and free from damage in installations which are subjected to vibration such as railroad, ship and airplane installations. Vibration is a particular problem in equipment using the newer miniature type tubes since these tubes have no bases and are supported in their sockets by the wires which also serve as electrode supports.

In the past, clamps have been used for holding electron tubes in position and relieving them of shock due to vibration, but these prior art clamps have defects such as the following. Some clamps hold the tubes too tightly, rendering replacement of the tubes difficult, others do not restrict movement in all directions, allowing the tubes to move and the electrode supports to be strained. Some tube clamps cover the entire tube, inhibiting the free circulation of air and preventing their use with tubes having cap connections. In this respect, some electron tubes, such as the one designated 1X2A, have caps which are connected to high voltage circuits, and for this type of tube, a clamp which closely surrounds the top of the tube cannot be used.

It is an object of this invention to provide a novel and improved electron tube clamp.

Another object of this invention is to provide an electron tube clamp which is particularly adapted to protect electron tubes having cap connections from shock due to vibration.

A further object of this invention is to provide a novel and improved clamp for miniature electron tubes, which clamp supports the tube but allows it to be easily replaced.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the annexed drawings, which illustrate a preferred embodiment, and wherein:

Fig. 1 is a plan view of the blank from which the clamp of this invention is formed;

Fig. 2 is an elevational view partially in section of an electron tube socket, shield, and of the clamp of this invention; and

Fig. 3 is a sectional view of the socket, shield, and clamp of Fig. 2, taken on the line 3—3.

Referring now to the drawings and more particularly to Fig. 1, the reference numeral **11** designates the electron tube clamp of this invention prior to final shaping. The clamp **11** comprises a generally rectangular piece of thin spring material such as Phosphor bronze, spring steel, or a suitable plastic, through which parallel slots **13** have been formed, in any manner as by punching, to define fingers **12**. The slots **13** extend from one edge transversely of the rectangular piece **11** for a distance equal to approximately one-half its transverse dimension. Two spaced small extensions or ears **14** are located on the edge of the piece **11** opposite the edge from which the slots **13** extend. After forming into the shape shown in Fig. 1, the fingers **12** are bent near the base of the slots **13** to form an angle of less than 90° with the unslotted portion of the clamp **11** and are bent near their ends less than 90° in the opposite direction. The ears **14** are bent at right angles to the unslotted portion of the clamp **11** in a direction opposite to the direction of the first bend of the fingers **12**. The clamp **11** may then be formed into a cylinder with the ears **14** extending radially outwardly, and may be inserted into a shield for an electron tube.

Referring now to Fig. 2, the clamp **11** is shown in final form within a tube shield **21**. The shield **21** comprises a cylinder of sheet metal having a pair of threaded spade lugs **22** fastened thereto by rivets **23**. A tube shocket **31** of insulating material such as porcelain or a synthetic resin is generally cylindrical in form and has raised pierced shoulders **32** for supporting and restraining the shield **21** by the threaded lugs **22** passing through the perforations therein, which lugs **22** are held firmly in position by nuts **33** on their threaded portions. The shoulders **32** support the shield **21** in spaced relation to the body of the socket **31** providing a slot through which the ears **14** may extend to maintain the clamp **11** within the shield **21**. Terminals **34** are used to connect the tube socket **31** in the circuit with which it is to be used.

Fig. 3 shows more clearly the arrangement of the clamp **11** within the shield **21**. The unslotted portion of the clamp **11** is parallel with the walls of the shield **21** and the fingers **12** are bent inwardly at their bases and outwardly at their ends with respect to the axis of the clamp **11**. The ears **14** extend outwardly from the clamp **11** at right angles thereto and pass between the shield **21** and the socket **31**.

In operation, the clamp **11** is manually bent into generally cylindrical form and is inserted into the shield **21** so that the ears **14** extend outwardly through the slot between the shield **21** and the socket **31**. The outwardly bent portions of the fingers **12** form a funnel into which an electron tube may easily be inserted. Since the base portions of the fingers **12** are bent inwardly, the inside diameter of the cylinder formed thereby is less than the outside diameter of the electron tube to be accommodated therein, and when an electron tube is inserted into the clamp **11**, the fingers **12** are forced toward the shield **21** and grip the tube, holding it securely. The unslotted portion of the clamp **11** tends to spring outwardly due to its elasticity, thus tending to engage the ears **14** in the slot. This prevents the clamp **11** from moving axially when a tube is removed from the socket **31**. The clamp **11** is readily removed from the shield **21** by bending it to decrease the diameter of the cylinder formed thereby until the ears **14** are withdrawn from the slot between the shield **21** and the socket **31**, and then moving the clamp **11** axially away from the socket **31**.

The clamp of this invention is inexpensive to manufacture and effective in its operation. The elasticity of the spring material from which the clamp **11** is formed allows the clamp **11** to absorb vibration and shock and to thereby inhibit damage to the tube. The clamp **11** does not interfere with connections to tube caps since its end is open, and it is readily adaptable for tubes of different diameters.

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 clamp for maintaining an electron tube in a relatively fixed position in a receptacle therefor, said clamp comprising a sheet of spring material in generally cylindrical form, a series of spaced parallel fingers extending generally axially from a first edge of said sheet, said fingers being formed of said spring material and being affixed to said sheet at their bases, said fingers being bent in a first direction at their bases to form an angle of less than 90° with said sheet, each said finger being bent in a second direction opposite to said first direction at a point spaced from its base a distance equal to at least one-half its length to form an angle of less than 90° with the remainder of said finger, at least one projection from a second edge of said sheet, said second edge being opposite said first edge, said projection forming a right angle with said sheet in said second direction, a metal cylindrical shield surrounding said sheet in such a manner that said projection extends radially outward from one end of said shield and said fingers extend generally axially from the other end of said shield, said shield confining said sheet to a generally cylindrical form having an inside diameter at least at one point smaller than the outside diameter of an electron tube to be accommodated therein,

and means fastened to said shield to support an electron tube.

2. In a receptacle for an electron tube, said receptacle having a base and connectors in said base for receiving the prongs of said electron tube, and a shield secured to said base to surround the lower portions of said tube when the prongs thereof are inserted in said base, the lower edge of said shield being spaced at least in part from said base to form a slot between said base and said shield, a resilient spacing element positioned in said shield to lie between said shield and said tube when inserted in said receptacle, said element consisting of a unitary piece of sheet spring material bent into the general shape of a cylinder and inserted in said shield to expand therein, said cylinder of spring material having at least one ear formed on its lower edge and bent outwardly of said cylinder at right angles to the axis thereof, said ear protruding through said slot, said cylinder of spring material having axial slots extending downwardly from the upper edge of said cylinder to form fingers, said fingers being bent inwardly of said cylinder near their lower ends and outwardly near their upper ends.

3. A tube holding device which comprises a cylindrical collar having one end secured in fixed position to a tube socket, said collar and said socket being arranged to provide a space adjacent the one end of the collar, clamping means formed of sheet spring material, said clamping means having a solid portion with lug means extending from one edge thereof and a slotted portion, providing spring fingers, extending from the edge opposed to said one edge, said lug means being bent in one direction at substantially a right angle to the solid portion and each of said fingers being bent upon itself to provide an arch therein in proximity to the free end of each finger whereby the clamping means may be formed into a cylinder and compressed for insertion into the collar in order to permit the lug means to spring outwardly through the space for holding the clamping means in position against the one end of the collar and the arch portions forced inwardly by the other end of the collar to frictionally receive and hold the tube.

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