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F. E. GEHRKE
ELECTRON DISCHARGE DEVICE

2,680,208

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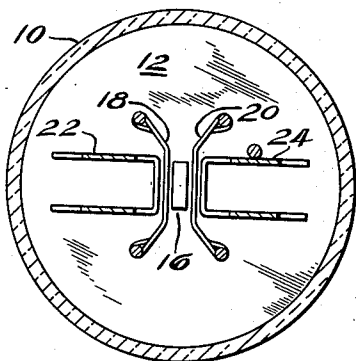


Fig. 2

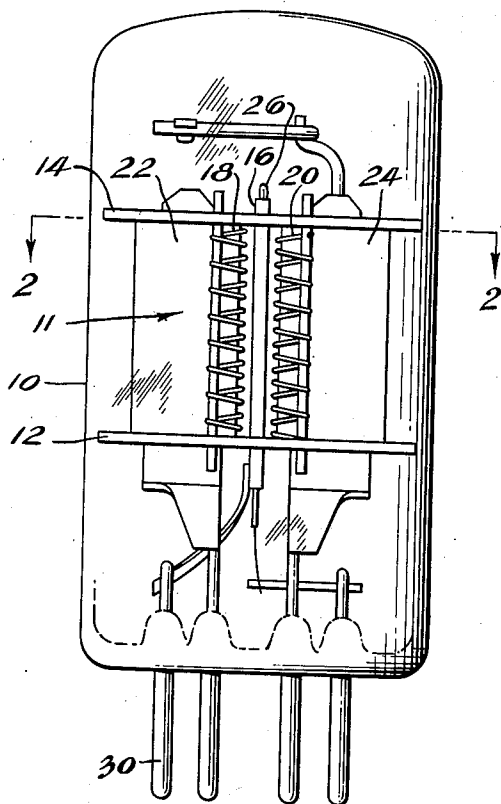


Fig. 1

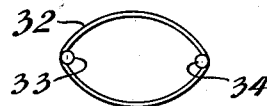


Fig. 3

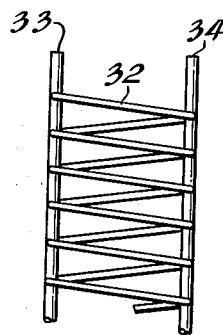


Fig. 4

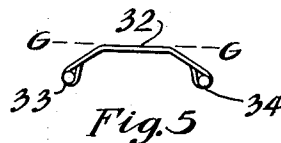


Fig. 5

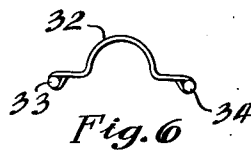


Fig. 6

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ELECTRON DISCHARGE DEVICE

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The present invention relates to electron discharge devices, and more particularly to an improved form of grid structure for use in electron discharge tubes.

An object of the present invention is to improve the operation of high frequency electron discharge tubes.

Another object of the present invention is the provision of an improved grid structure for electron discharge tubes.

Still another object of the present invention is the provision of a grid for electron discharge tubes which will be more readily constructed, while at the same time being sturdier than previously known grid structures.

Still another object of the present invention is the provision of a grid structure for electron discharge tubes in which space is at a premium, said grid still being able to absorb large mechanical shocks without change in electrical characteristics of the tube into which it has been placed.

The present invention particularly relates to an improved form and method of manufacture of a half grid structure. Half grids are usually used in electron tubes where space is at a premium, or where, for circuit reasons as in high frequency push-pull oscillators, it is desirable to use a common cathode with separate grids and plates on opposed sides of the cathode, such as the presently known type 6J6 tube. In prior practice of which I am aware, the practice has been, to wind a regular two side rod grid, and then to burn off the unwanted half of the grid laterals with a high electric current. Alternatively, it has been known to wind a four side rod grid such that two side rods are placed close together along each side of the grid, and thereafter cut apart between the closely adjacent side rods, thus providing two separate grids. I have discovered that either of the previously known types of half grids have several serious disadvantages. When using grid lathes of the type heretofore known, which employ the swaging method of fastening laterals to the side rods, it was very difficult to make acceptable half grids because the laterals of each half grid include a large number of short pieces which can very easily pull out of the swaged parts of the side rods due to the small amount of side rod material actually pressing against the lateral wires. Furthermore, the resistance to bowing of the side rods in the plane of grids as previously constructed is seriously reduced. This is due, in large part, to the fact that the constituent parts of the grid have been in-

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creased from two side rods and a length of lateral wire wound around them, to as many parts as there are laterals in addition to the two side rods. Thus considered as mechanical construction elements, the grids as manufactured by previously known methods are very flimsy.

In accordance with an aspect of the present invention, it is proposed to manufacture half grids by winding a regular two side rod grid of the kind normally used in radio tubes and then pressing the laterals on one side of the grid in upon the other side. After all of the laterals have been pressed into the same plane, the form or shape may be varied as desired to suit the required conformation. Grids so constructed have all of the space advantages of a conventional half grid with the mechanical rigidity of the full wound grid. It has been found by actual test that grids so constructed have a considerable improvement in strength over previously known types of half grids.

The present invention will be more fully understood by reference to the following detailed description, which is accompanied by a drawing in which

Fig. 1 illustrates in elevational view an electron discharge tube employing the present invention, while

Fig. 2 is a horizontal sectional view taken along the lines 2-2 of Fig. 1,

Fig. 3 illustrates in end view a grid as it is taken from the grid winding machine before being bent into shape according to the present invention, while

Fig. 4 is a side view of the grid shown in Fig. 3.

Fig. 5 is an end view similar to Fig. 3 showing the way in which the grid laterals are all bent to occupy a single plane at one side of the support rods and over a considerable distance therebetween, while

Fig. 6 is a modified form of the invention, utilizing a formed half grid.

In Fig. 1, there is shown an electron discharge tube which includes an evacuated vitreous casing 10. Within the casing or envelope 10 there is provided a mount structure 11. Between insulating spacers 12 and 14 and supported in proper relative position thereby are arranged a substantially central cathode 16, a pair of half grids 18 and 20, one on each side of cathode 16, and anodes 22 and 24 individual to the half grids 18 and 20, all together forming mount 11. Cathode 16 is coated on its exterior surface with an electron emissive material (not shown) and,

within its hollow interior, is provided with a heating wire 26, by means of which the cathode 16 is heated to operating temperature, whereby electrons are emitted from the coating on the cathode. The cathode, both ends of the heater wire 26, each grid 18 and 20, and each plate 22 and 24 are connected to terminal pins 30 passing through the glass header base of the envelope 10, and by means of which circuit connections may be made to the interior elements of the tube.

Grids 18 and 20 are constructed by first winding, as shown in Figs. 3 and 4, a lateral wire 32 about a pair of support rods 33 and 34. A conventional manner of constructing such a grid is by forming a series of spaced notches along the lateral wires 33 and 34, winding the lateral wire 32 in said notches, and then peening over the notches to hold the lateral wire 32 in place. After the grid as shown in Figs. 3 and 4 is wound it is placed in a forming press, and pressed into the shape shown in the end view in Fig. 5. It will be seen that the grid lateral wire 32 at the lower side of Fig. 3 has been, in Fig. 5, pressed through between the support rods 33 and 34 to form a single grid lattice along plane G—G. It will be seen that there is now provided a grid having all of its active lateral wires in a single plane, G—G at one side of the plane in which support rods 33 and 34 lie. The lateral wire 32 instead of being a large number of separate pieces, as in previous practice, actually wraps substantially completely about the support rods 33 and 34, whereby a very rigid structure is formed.

If, instead of having a planar grid such as shown in Fig. 5, it is desired to have a semi-circular grid, the wound structure shown in Figs. 3 and 4 may be deformed as shown in the end view in Fig. 6. Here again, it will be noted that the grid lateral wire is still all in one piece and wraps substantially completely about the support rods 33 and 34. Thus, the full mechanical rigidity of the ordinary full wound grid is retained while at the same time, obtaining the desired space advantages of a half grid. Extensive shock tests have indicated that these apparent advantages are in fact attained in practice.

What is claimed is:

1. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so as to lie in a single surface at one side of said support rods, said surface being for the major part of the distance between said support rods, a single plane.

2. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so as to lie in a single surface at one side of said support rods, said surface being a portion of a cylinder having its center to one side of the plane in which said support rods lie.

3. An electron discharge device including within an evacuated casing, a cathode, an anode at one side of said cathode, and a grid between said cathode and said anode, said grid including a number of support rods and a single length of lateral wire space wound about said support rods, said lateral wire being doubled back around said support rods and deformed to have major

portions lying in a single surface at one side of the plane occupied by said support rods.

4. An electron discharge device including within an evacuated casing, a cathode, an anode at one side of said cathode, and a grid between said cathode and said anode, said grid including a number of support rods and a single length of lateral wire space wound about said support rods and secured to said rods, said lateral wire being deformed so that every length of lateral wire between said rods lies in a single surface at one side of the plane occupied by said support rods.

5. The method of manufacturing a half grid for use in electron discharge devices which includes winding in generally cylindrical conformation, a helix of grid lateral wire about a pair of spaced parallel support rods, said lateral wire being secured to said support rods at its points of contact therewith, and thereafter deforming said grid lateral wire from said generally cylindrical conformation, so that all wire lengths between said support rods lie in a single surface at one side of the plane occupied by said support rods.

6. The method of manufacturing a half grid for use in electron discharge devices which includes winding in generally cylindrical conformation, a helix of grid lateral wire about a pair of spaced parallel support rods, said lateral wire being secured to said support rods at its points of contact therewith, and thereafter deforming said grid lateral wire from said generally cylindrical conformation, so that all wire lengths between said support rods lie in a single plane at one side of said support rods for a major part of the distance between said support rods.

7. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so that the lengths of wire between said support rods lie in a single surface.

8. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so that every length of wire between said support rods lies in a single surface at one side of the plane in which said support rods lie.

9. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being doubled back about said support rods so that every length of wire between said rods lies in the same single surface.

10. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being doubled back about said support rods so that every length of wire between said rods lies in the same single surface at one side of the plane in which said support rods lie.

11. An electron discharge device including within an evacuated casing, a cathode, an anode at one side of said cathode, and a grid between said cathode and said anode, said grid including a number of support rods and a single length of lateral wire space wound about said support rods, said lateral wire being doubled back around said support rods and deformed to have major portions lying in a single surface.

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12. The method of manufacturing a half grid for use in electron discharge devices which includes winding in generally cylindrical conformation, a helix of grid lateral wire about a pair of spaced parallel support rods, said lateral wire being secured to said support rods at its points of contact therewith, and thereafter deforming said grid lateral wire from said generally cylindrical conformation, so that all of the wire lengths between said support rods lie in a single surface.

13. A half grid for electron discharge devices including a number of support rods and a single continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so that every length of wire between said support rods lies for a substantial distance in a single surface.

14. A half grid for electron discharge devices including a number of support rods and a sin-

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gle continuous length of lateral wire wound about said support rods and secured to said rods, said lateral wire being formed so that every length of wire between said support rods lies for a substantial distance in a single surface at one side of the plane in which said support rods lie.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,128,280	Arnold -----	Feb. 16, 1915
1,630,443	McCullough -----	May 31, 1927
1,688,991	Schwerin -----	Oct. 23, 1928
1,958,349	Robinson -----	May 8, 1934

FOREIGN PATENTS

Number	Country	Date
310,903	Great Britain -----	Apr. 24, 1929
428,478	Great Britain -----	May 14, 1935
550,435	Great Britain -----	Jan. 7, 1943