June 8, 1943. S. J. KOCH 2,321,149

COATING OF THERMIONIC CATHODES

Filed Aug. 28, 1941

Fig. 1

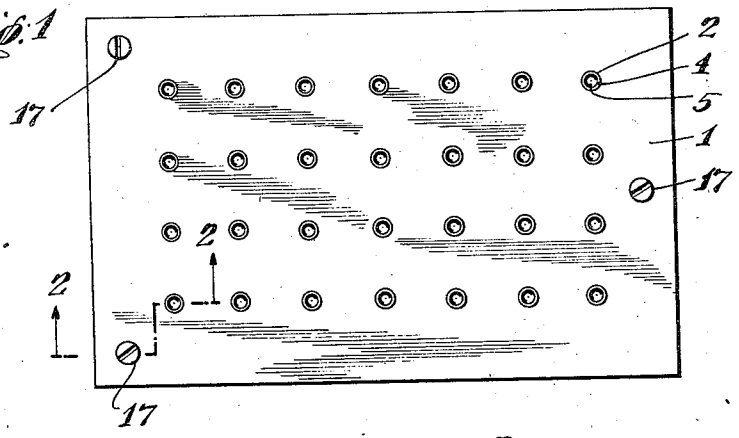


Fig. 2

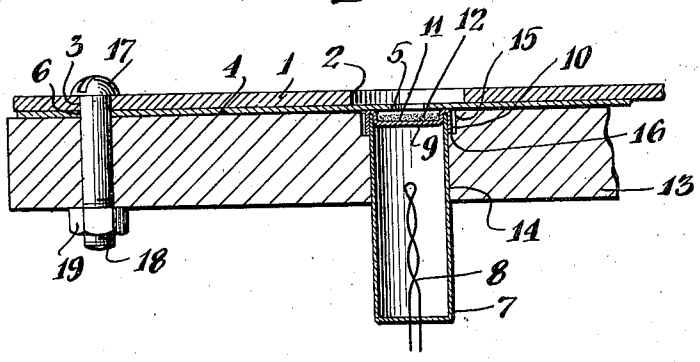
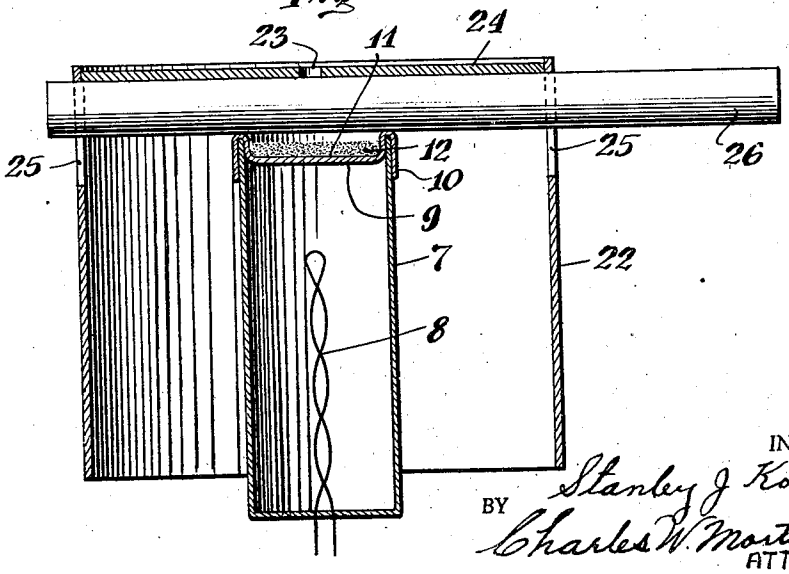


Fig. 3



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COATING OF THERMIONIC CATHODES

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7 Claims. (Cl. 117—48)

This invention relates to thermionic cathodes. It relates more particularly to cathodes of the type that are to be used in cathode-ray tubes where a metal cathode is used and coated with material that has the characteristic of emitting electrons at a high rate when heated.

Heretofore, when tubes have been coated with electron emissive materials to increase the electron emission, the coatings have been so applied that troubles have arisen due to the fact that the coatings have not been confined to the areas where it is desired that they should be located, but accidentally adhere to other surfaces.

By the present invention, cathodes are coated very rapidly and safely with electron-emitting material in such a manner that the material is applied to areas where the coating is desired, with the result that the cathodes operate more satisfactorily. Also, when such cathodes are used in electron-ray tubes, they can be located accurately with respect to the gun elements such as the control grid, resulting in better performance.

In carrying out this invention a large number of cathodes that are to be coated with electron-emissive material may be placed in position and the desired predetermined portions quickly coated while the cathodes are assembled without accidentally coating other portions thereof.

The invention will be understood from the description in connection with the accompanying drawing, in which:

Fig. 1 is a plan view of a plate used in coating a plurality of cathodes at one time;

Fig. 2 is a section on an enlarged scale along the line 2—2 of Fig. 1 showing a portion of the plate and one of the cathodes in place to be coated; and

Fig. 3 shows how one of the coated cathodes can be accurately located with respect to a control grid.

In the drawing, reference character 1 indicates a plate which may be of metal having a number of holes 2 and bolt holes 3 therethrough. A thin plate 4, of springy metal with smaller holes 5 concentric with the holes 2 and with holes 6 concentric with the holes 3, is slightly bent or cupped so that its central portion will first strike any flat surface upon which it is laid.

A cathode 7, which may be made of metal such as nickel, for example, is provided with a heater 8, of tungsten, for example, that may be insulated with ceramic insulation in the well known way. A cap 9 is provided for the cathode 7, and has a flange 10 by means of which the cap is securely attached to the cathode. The cap 9 is provided on its outer side with a pan-shaped or central depressed portion 11 to which the electron-emissive material 12 is to be applied.

A thick plate 13 (Fig. 2) is provided with holes 14 equal in number to the holes 2 or 4 to accommodate cathodes 7, and with countersunk holes 15 to accommodate the flanges 10 and provide ledges 16 upon which the edges of these flanges rest to support the cathodes 7 accurately and securely in place. The plate 13 is also provided with holes 17 aligned with the bolt holes 3 and 6 in the plates 1 and 4 to accommodate the bolts 18 having nuts 19.

In applying the electron-emissive material to the cathodes 7, a number of rows of the cathodes are assembled with several cathodes in each row in any convenient way so that the number of cathodes equals the number of holes 2 in the plate 1. The cathodes are assembled in an upright position in the holes 14 of the plate 13 with the edges of the flanges 10 of the caps 9 resting upon the ledges 16. The plates 4 and 1 are placed upon these cathodes with the holes 5 and 2 in alignment with the cathodes, the bolts 7 are inserted and the nuts tightened. The electron-emissive material, mixed with any suitable binder, is then sprayed upon the plate 1, whereupon the material passes through the holes 2 and 5 and enters the pan-shaped central portions 9 of the cathodes until the same have been filled sufficiently. In this way the electron-emissive material is applied uniformly to each cathode in the form of discs without any of this material accidentally coating any undesired portion of the cap 8 such as the rim 10.

In Fig. 3 is shown an advantage of applying the electron-emissive materials in accordance with this invention. In this figure, reference character 22 indicates a grid control for a cathode-ray tube having an aperture 23 for the electron beam in the end 24 of the grid control. A pair of openings 25 is provided diametrically opposite each other through the grid control 22 adjacent the end 24. A spacing bar 26 of a thickness equal to the desired distance from the rim of the cap 8 to the end 24 of the grid control 22 is shown extending through diametrical holes 25 in the grid 22. The cathode 7 is inserted into the control grid 22 until the rim of the cap 9 contacts with the spacing bar 26. The grid 22 and cathode 7 are then fixed in position with respect to each other in the known way and the spacing bar 26 is then removed.

Among the advantages of having the electron-emissive material properly applied without irreg-

ular spots around are that the electron-emissive material can be properly located with respect to the apertures 23 of the control grids; and also, by means of the spacing bar 26, each of the cathodes can be located at the exact desired position from the apertures 23, as no portion of the electron-emissive material would accidentally lodge upon the rim of the cap 9 and cause a variation in the position in which the cathodes 7 are located by means of the spacing bar 26 with respect to the apertures 23.

What is claimed is:

1. The method of coating the end of a cathode, which comprises locating the end of said cathode in a circular recess in the upper surface of a thick plate, said recess being coaxial with a hole of smaller diameter through said plate, and applying coating material to said cathode in a downward direction through a hole of smaller diameter in another plate.

2. The method of coating the end of a cathode, which comprises locating the end of said cathode in a recess around a hole in a plate, and applying coating material to it in a downward direction through a hole in another plate while shielding the rim of said end from the coating material.

3. The method of coating the end of a cathode, which comprises locating a cathode having a depression in the end thereof in a recess around a hole in a plate, and applying coating material to said depression through a hole in another plate while confining the outer surface area of said coating on said cathode below the upper edge of the depressed area of said depression.

4. The method of coating the end of a cathode having a central depression in said end, which comprises locating the end of said cathode in a circular recess in the upper surface of a thick plate, said recess being coaxial with a hole of smaller diameter through said plate, and applying coating material to said cathode in a downward direction through a hole of smaller diameter in another plate.

5. The method of coating the end of a cathode having a central depression in said end, which comprises locating the end of said cathode in a recess around a hole in a plate, applying coating material to it in a downward direction through a hole in another plate, and confining said coating material to said depression.

6. The method of coating the end of a cathode having a central depression in said end, which comprises locating the end of said cathode in a recess around a hole in a plate, applying coating material to it in a downward direction through a hole in another plate, confining said coating material to said depression, and preventing it from reaching the rim around said depression.

7. The method of coating the end of a cathode having a central depression in said end, which comprises locating the end of said cathode in a recess around a hole in a plate, spraying coating material upon it in a downward direction through a hole in another plate, confining said coating material to said depression, and preventing it from reaching the rim around said depression.

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