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TARGET STRUCTURE FOR IMAGE ORTHICON TUBE HAVING A MAGNESIUM
OXIDE FILM ADJACENT TO A CHROMIUM COATED COLLECTOR SCREEN
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Fig. 1

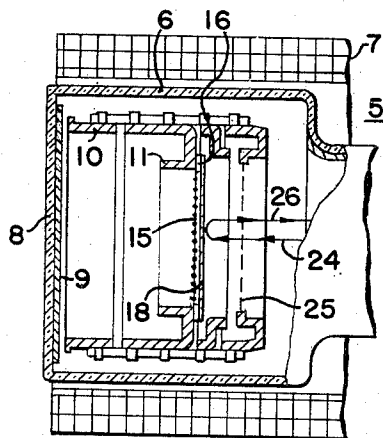
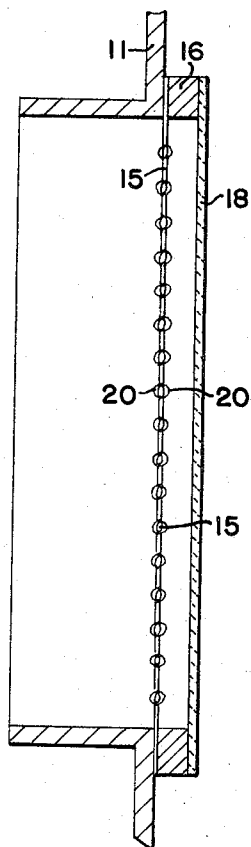


Fig. 2



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TARGET STRUCTURE FOR IMAGE ORTHICON TUBE HAVING A MAGNESIUM OXIDE FILM ADJACENT TO A CHROMIUM COATED COLLECTOR SCREEN

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The present invention relates to cathode ray tubes and more particularly to cathode ray tubes of the image orthicon type having a planar charge-storing target and an associated mesh collector electrode, together with a photo-cathode at the forward end of the tube. As is known, the face of the target is scanned by an electron beam generated in a suitable electron gun element in the rear end of the tube.

The charge storing target and the associated mesh electrode extend in parallel relation to each other transversely across the axis of the tube, as is understood, and in image orthicon tubes are relatively close together. Present thin film target image orthicon tubes must have a target mesh or mesh electrode spacing of at least .006 inch or more because the mesh wrinkles during the baking of the tube, which is carried out at relatively high temperatures (375° C.). The wrinkles are sufficient to break the thin film target when the spacing is less than the above distance. Thus thin film tubes of the image orthicon type are not presently made with spacing less than approximately .006 inch. Glass target tubes are made with spacing of .002 inch, but in these the strength of the glass is sufficient to withstand the forces of the wrinkled copper mesh. This mesh is relatively fine and may be approximately 750 mesh in the image orthicon tube of present structure.

It is therefore an object of this invention to provide an improved target structure which permits the thin-film target to be placed closer to the mesh electrode without having the target broken during processing by the wrinkled or sagged mesh.

It is a further object of this invention to provide an improved target structure of the thin-film type for image orthicon tubes which permits the thin film target to be placed close to the mesh with spacings of .002 inch without damage during the manufacturing process.

To do this the 750 mesh electrode in the image orthicon tube is maintained tight during the bake-out process at 375° C. or higher and this allows the thin film target to be placed closer to the mesh without having the targets broken as the mesh does not then wrinkle or sag. Further in accordance with the invention the mesh is coated on opposite sides by a layer of metal, such as chromium, which serves to space the film target from the mesh electrode and maintain the spacing to a desired relatively-close degree. This results in added desirable features in the operating characteristics in the thin-film image orthicon.

The mesh electrode, generally of copper, is processed to receive a chromium layer on both sides by evaporation. The chromium coated meshes are then more taut during the processing of the tubes including the baking to the high degree referred to. The exact reason for tautness is not known exactly but there are three possibilities for this action and in any case the result would be beneficial.

(1) The chromium has a smaller coefficient of thermal expansion than the iron mesh mounting ring at the outer edge of the mesh or of the copper mesh itself, and therefore does not expand so much during heating and maintaining some tension during the heating cycle.

(2) The Cr and Cu may alloy somewhat during the heating and may actually contract somewhat as they mix.

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This would give a tension to the mesh electrode and maintain tautness.

(3) The Cr and Cu alloy thus formed could have a smaller coefficient of expansion than the Cu alone, and thus expand less than pure Cu, giving some tension to the mesh electrode.

The invention will further be understood from the following description when considered with reference to the accompanying drawings, and its scope is pointed out in the appended claims.

In the drawing:

FIG. 1 is a cross sectional view in elevation, and partly broken away, of the forward end of an image orthicon tube showing the construction of electrode elements therein in accordance with the invention, and

FIG. 2 is an enlarged cross sectional view of a portion of the electrode structure of FIG. 1 showing further details of the invention.

Referring to the drawings, wherein like elements are indicated by the same reference characters in both figures, the image orthicon tube 5 is of the usual cylindrical construction and comprises a glass envelope 6 surrounded by the coil structure 7 and having a forward end with a window 8 included therein. A photo-cathode 9 is provided on the inner face of the window 8. Along the axis of the tube in rear of the photo-cathode 9 is a cylindrical accelerating electrode 10 and a target support electrode 11 in coaxial relation.

A fine (750) mesh collector electrode of copper in circular form is provided with an annular metal or iron mounting ring 16 which is mounted on the target support electrode 11 as shown more clearly in FIG. 2. For example, in this target structure in accordance with the invention, the mesh electrode 15 is placed in front of the thin film target electrode indicated at 18. This is a thin disk or film of magnesium oxide in contact with the mounting ring 16 and spaced from the mesh electrode 15 by a distance less than .006 inch and preferably .002 inch as herein referred to. This spacing is so close that during the manufacture and the bake-out process at 375° C., the collector electrode would sag and wrinkle into contact with the MgO target film 18 and cause it to break.

With the present construction, the copper mesh is chromium coated by evaporation on both sides as indicated in FIG. 2 where the chromium coating is shown on each of the wire meshes at 20 for the forward and rearward film of coatings on both sides of the mesh. The chromium coating may even contact the thin film target in some cases but due to the tautness of the coating it does not break the target. This kind of mesh has been heated to 375° C. in air and maintained tautness throughout the heating and cooling cycle. Thin film chromium-coated targets at .002 inch spacing have also been heated to 375° C. in air and have cooled and remained taut and spaced from the MgO film target which remained intact. In vacuum a chromium-coated copper mesh shown considerable more tautness than regular copper mesh and provided the desired close spacing in operation without damage to the thin film target.

Many uses for this type of target construction have been found, such as attaining close-spaced thin-film image orthicon target structures as described, keeping the target mesh from touching a glass target where used and thereby reducing blemishes on the glass, and also changing the resonant frequency of the mesh and thus possibly eliminating some microphonic problem.

Thus in an image orthicon tube of the thin film type, particularly one having a magnesium oxide film planar target, a close-spaced copper-mesh collector electrode, also in planar form and closely spaced therefrom, provided effective and improved operation and safety in manufacture with a chromium coating on the forward and rear

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faces of the mesh, the coating also being relatively thin. There are several possible reasons for this.

(1) Because the chromium coating has a smaller coefficient of thermal expansion than the copper mesh on which it is deposited, or

(2) The iron or like metal mounting ring for the copper mesh, whereby the chromium coating does not expand as much during the heating and thereby maintaining some tension during the heating cycle, or

(3) Because the copper and the chromium may alloy somewhat during the heating and may actually contract somewhat as they mix to provide the same tension to the mesh and therefore maintain tautness, or

(4) For the further reason that the copper and the chromium alloy thus formed may have a smaller coefficient of expansion than the copper alone and thus expand less than the pure copper to give the same tension to the mesh.

It will be noted that in accordance with the usual practice the face of the target 18 is scanned by an electron beam 24 which passes through a decelerating electrode or screen 25 to arrive at the surface of the target with a low velocity and after the scanning beam has effected the normal charge neutralization at the target surface, the remaining electrons of the beam are re-accelerated in the reverse direction, as indicated at 26 and returned through the mesh electrode 25 and the rearward portions of the tube (not shown). As in any tube structure of this type, and as is understood, the magnesium-oxide film target 18, the associated mesh electrode 15 and the photo-cathode 6 are all planar elements in spaced parallel relation along the axis of the tube. The magnesium oxide film target 18 and the associated mesh electrode 15 must be carefully spaced equally throughout and this is accomplished through the use of the mounting ring 16 which is of a thickness to provide the desired spacing between the two elements.

From the foregoing description it will be seen that the target structure of the present invention is particularly desirable for use in image orthicon tubes and the like for maintaining the mesh electrode in close spaced relation to the target electrode while at the same time remaining taut during the baking process whereby the target film is not broken as the mesh is not permitted to wrinkle or sag.

I claim:

1. A target structure for image-orthicon tubes and the like comprising in combination, a thin film target of planar construction, an associated mesh collector electrode of relatively fine-mesh copper positioned in front of the film target in close spaced relation thereto, an annular supporting ring for said copper mesh electrode connected with said electrode at the outer edge thereof, said supporting ring being of a different material than said copper mesh electrode and serving to space the film target therefrom, and a thin metallic coating on the front and rear faces of said copper mesh electrode to impart thereto a stiffness and tautness in manufacture, thereby to permit a closer spacing between said mesh electrode and the film target for improved operation.

2. A target structure for image-orthicon tubes and the like as defined in claim 1, wherein the thin film target is a

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magnesium oxide film, and wherein the metallic coating is on the front and rear faces of the copper mesh electrode is chromium.

3. In a cathode-ray tube of the image orthicon type, means providing a thin film planar target and associated mesh electrode of planar form, means for mounting and supporting said film target and mesh electrode coaxially of the tube in close spaced parallel relation to a distance less than .006 inch throughout the space between them, and means applied to said mesh electrode for changing the overall thermal expansion rate and preventing distortion of said electrode due to heat in manufacture to contact and damage said film target with said close spacing, whereby the efficiency of operation is improved.

4. In a cathode-ray tube of the image-orthicon type, the combination with magnesium oxide film target of planar circular disc form, said film target being subject to a bake-out process during manufacture, of an associated copper mesh collector electrode of similar planar circular disc form mounted in front of said target and in close spaced relation thereto uniformly less than .006 inch, thereby to improve the operating efficiency of said tube, and means for preventing deformation of the mesh electrode during said bake-out process into contact with said film target and thereby cause damage thereto, said last named means including a thin chromium coating on the front and rear surfaces of said mesh electrode.

5. In a cathode-ray tube of the image-orthicon type, the combination with a thin film target as defined in claim 4, wherein the copper mesh electrode is provided with an annular supporting ring at the periphery thereof of iron or like material having a similar degree of thermal expansion, and wherein the film target and the copper mesh electrode are spaced by said annular ring and mounted in fixed relation thereby in the tube structure.

6. A target structure for cathode-ray tubes of the image-orthicon type comprising a target of planar circular-disc construction having a thin magnesium oxide film, a planar circular-disc collector electrode of relatively fine wire mesh mounted in coaxial closely-spaced relation to and in front of said target to clear and maintain a substantially uniform minimum spacing therefrom for efficient operation, and means for preventing sagging and deforming of said mesh electrode into contact with said target film during heating in manufacture including a film coating on both sides of said mesh electrode of a material which imparts tautness to the wire mesh during said heating.

7. A target structure for cathode-ray tubes of the image-orthicon type as defined in claim 6, wherein the collector electrode is of copper mesh and wherein the film coating on said mesh is chromium.

References Cited

UNITED STATES PATENTS

2,922,907	1/1960	Hannam	313-68
3,155,859	11/1964	Koert	313-68
3,277,334	10/1966	Toohig et al.	313-67 X

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