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(19)

(54) TELEVISION CAMERA TUBE

(71) We, N. V. PHILIPS' GLOEILAMPENFABRIEKEN, a limited liability Company, organised and established under the laws of the Kingdom of the Netherlands, of Emmasingel 29, Eindhoven, the Netherlands

do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a camera tube comprising an entrance window, a cylindrical tube, a photo-sensitive target, and an electron gun, provided with a mesh electrode, for generating an electron beam which scans the target.

In camera tubes of this kind picture disturbances occur which become manifest in a picture to be formed as a pattern of, for example, annular regions containing more or less signal. This is a very disturbing phenomenon, notably in pictures with a comparatively low light level.

The invention is based on the recognition of the fact that this disturbing phenomenon is caused by electric charging phenomena on a wall portion of the camera tube near the transition between the entrance window and the cylinder tube. The electric charging is caused by electrons which are disposed by the mesh electrode or by secondary electrons generated on the mesh electrode. During the scanning motion of the electron beam across the target, local charge variations occur which give rise, *via* capactive coupling, to the said disturbance. In camera tubes in which the target is mounted only after the entrance window has been connected to the cylindrical tube to form a cup-like tube, a part of the tube wall adjoining the target is always unintentionally covered more or less with target material. This forms a local resistance layer, so that the relevant disturbance does not occur at this area.

According to the present invention there is provided a camera tube comprising a cylindrical tube, an entrance window connected to the cylindrical tube by means of a seal, as herein defined, and an electron gun, provided with a mesh electrode arranged opposite a target, for generating an electron beam which scans the target, wherein a surface potential stabilising material is provided on or by a portion of the tube extending in the longitudinal direction from the connection of the window to the tube and at least as far as the mesh electrode, the surface potential stabilising material having a secondary emission coefficient at the most equal to 1 as long as the surface potential of the material is lower than the mesh potential or being resistive but sufficiently electrically conductive so as in either case to reduce any varying electric charging phenomena which may occur on the wall portion of the tube between the seal and the mesh electrode, due to electrons dispersed by or generated on the mesh electrode.

In this specification, the term "seal" is defined as being a type including a sealing material between the window and the cylindrical tube, said material being different to that of said window and tube. Direct fusion seals (i.e. without an intermediate sealing material) are not intended to be included.

The present invention will now be described, by way of example, with reference to the single figure of the accompanying drawing, which figure is a diagrammatic longitudinal sectional view of a camera tube comprising a seal and a slightly electrically conductive surface stabilizing layer on the tube wall near the seal.

A camera tube 1 as shown comprises an entrance window 2 with a target 4 and a cylindrical tube 6 which is connected to the entrance window by way of a seal 8. Opposite the target there is arranged a mesh electrode 10 which forms part of an electron

gun 12 which furthermore comprises a filament 14, a control grid 16, a first anode 18 and an end anode 19. In a tube base 20 there are provided a pumping stem 22 and passage pins 24 for supplying the necessary power to the various electrodes and the filament of the electron gun.

A target for a camera tube of this kind usually comprises a signal electrode 26 and a photo-sensitive layer 28. The signal electrode 26 is connected *via* an electrical path 30 which in this case preferably extends *via* the seal, to a signal pick-up circuit which includes a signal resistor 32 and a signal capacitor 34. The signal electrode preferably consists of a layer of tin oxide or indium oxide or a mixture thereof which combines suitable electrical conductivity with low light absorption. The photosensitive material of the target may consist of photoconductive material, such as antimony trisulphide or lead monoxide, as well as of, for example, piezoelectric material such as TGS for infrared-sensitive camera tubes. The material of the seal 8 whereby the entrance window 2, already provided with a target, is connected to the cylindrical tube 6, consists, for example, of an indium alloy or an other suitable sealing material. Usually, the signal electrode 26 will be in contact with the material of the seal, but this need not always be so. An electrically resistive cover layer 36, acting as the surface potential stabilizing material, is provided on the inner surface of the cylinder wall as from the seal, if the material of the seal 8 is electrically insulating, over the seal as far as the signal electrode. This cover layer 36 extends as far as the mesh electrode. Electrical contact between the cover layer 36 and the mesh electrode 10 should be carefully avoided. This is because the mesh electrode 10 carries a potential other than that of the target during operation. In order to minimize the contribution to the parasitic capacitance relative to the mesh electrode, it is desirable to minimize the electric conductivity of the electrically resistive cover layer 36, *i.e.* to make it just high enough to ensure an adequate potential-stabilizing effect. A cover layer 36 of this kind may consist, for example, of carbon, tin oxide, tungsten oxide etc., but can also be formed of a material, usually semiconductive which is used to form the photosensitive layer of the target.

The cover layer 36 in a further embodiment consists of a material whose secondary emission coefficient at the most equals 1, at least as long as the potential of the surface thereof is lower than the potential of the mesh electrode. During operation of the tube, the relevant wall portion is not charged, because at a secondary emission coefficient of less than 1 or at the most equal to 1 no charging in a positive sense can occur, *i.e.* in the direction of the mesh potential. The compromise between on the one hand a non-excessive, high value of the electric conductivity in view of the contribution to the capacitance and on the other hand a non-excessively low value in view of the stabilizing effect, is thus dispensed with. Conductivity and optimum effect can now be separately optimized.

The tube wall may consist at least at the area of the seal 8, of a sufficiently conductive glass or of a type of glass whose secondary emission satisfies the requirement to be imposed. In the case of a favourable compromise, the entire cylindrical portion of the housing can alternatively be made of a type of glass having one of the desired properties. The provision of a resistive layer can also be effectively used for camera tubes comprising a target which is mounted on a separate support, and for camera tubes comprising a target which is constructed as a disk of semiconductor material comprising a mosaic of p-n transitions which is mounted in the camera tube as such.

In a camera tube with auxiliary illumination as described, for example, camera tubes as disclosed in British Patent Specifications 1,494,874 and 1,508,059 in which selective excess illumination can occur due to reflection from the glass wall near the target, a resistive cover layer can have an additional function in that it can be used for locally reducing the reflection.

WHAT WE CLAIM IS:—

1. A camera tube comprising a cylindrical tube, an entrance window connected to the cylindrical tube by means of a seal, as herein defined, and an electron gun, provided with a mesh electrode arranged opposite a target, for generating an electron beam which scans the target, wherein a surface potential stabilising material is provided on or by a portion of the tube extending in the longitudinal direction from the connection of the window to the tube and at least as far as the mesh electrode, the surface potential stabilising material having a secondary emission coefficient at the most equal to 1 as long as the surface potential of the material is lower than the mesh potential or being resistive but sufficiently electrically conductive so as in either case to reduce any varying electric charging phenomena which may occur on the wall portion of the tube between the seal and the mesh electrode due to electrons dispersed by or generated on the mesh electrode.

2. A camera tube as claimed in Claim 1, wherein the surface potential stabilising material is provided on the inner wall of the cylindrical tube portion in the form of

a resistance layer, the said layer extending from the window-tube connection as far as the mesh electrode.

3. A camera tube as claimed in Claim 1, wherein the surface potential stabilising material is formed by a cover layer on the inner wall of the cylindrical tube portion.

4. A camera tube as claimed in Claim 1, 2 or 3, wherein a stabilising cover layer is in electrical contact with the target across the window-tube connection.

5. A camera tube as claimed in Claim 1, wherein at least the portion of the cylindrical tube between the seal and the mesh electrode, comprises a type of glass made of a surface potential stabilising material.

6. A camera tube as claimed in Claim 1, 2 or 3, wherein the target is arranged in the camera tube separately from the entrance window, the tube wall being provided with a surface potential stabilising layer over at least the portion which extends between the window-tube connection and the mesh electrode.

7. A camera tube substantially as herein described with reference to the accompanying drawing.

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1577145 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*