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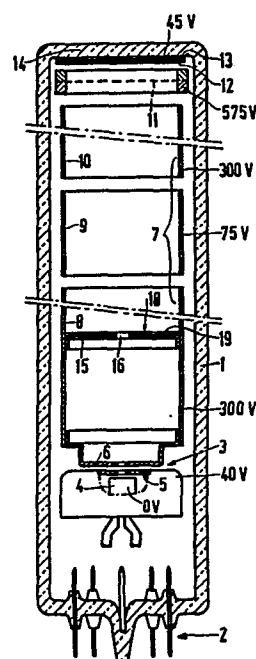
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⑤④ **Television camera tube.**

⑤⑦ Television camera tube comprising in an evacuated envelope (1) a target (12, 13) consisting of a signal layer (13) having thereon a photoconductive layer (12), for recording the information of the image to be recorded, an electron gun (3) for generating an electron beam for scanning the target and a diaphragm (15) between said electron gun (3) and the target (12, 13) for limiting the electron beam. If in such a tube a surface layer (19) on the diaphragm (15) on the side facing the target (12, 13) consists substantially of a metal or an alloy of metals from the group of gold and platinum, local charging of the surface of the diaphragm (15) and hence deflection and focussing defects are prevented.



"Television camera tube"

The invention relates to a television camera tube comprising in an evacuated envelope a target consisting of a signal layer having thereon a photoconductive layer for recording the information of the scene to be recorded, an
5 electron gun for generating an electron beam for scanning the target, and a diaphragm between said electron gun and the target to limit the electron beam.

Such a television camera tube is known from European Patent Application 81200991.8/48510. The diaphragm
10 in the tube described in said Patent Application has the shape of a hemisphere having a central aperture. However, the diaphragm may also be a flat plate having a central aperture or a truncated cone having a central aperture in the top surface.

15 Such a television camera tube is generally known and is sometimes termed a vidicon. The operation of a vidicon is as follows. An electron beam of a sufficient current strength scans the free surface of the photoconductive layer of the target according to a given raster under
20 the influence of deflection fields and brings said surface pointwise to the potential of the cathode, which is termed zero volts. Between two successive scans the potential of each point of the free surface of the photoconductive layer increases under the influence of a positive potential which
25 is applied to the signal layer and under the influence of photoconduction which is generated in the photoconductive layer by an optical image projected thereon. Each point, or more exactly each elementary surface element, of the photoconductive layer, together with the underlying signal layer
30 constitutes a capacitor. The capacitor is fully charged periodically by the scanning electron beam for which more charge is necessary according as more light is incident on

the relevant point. The current which consequently flows through the connection of the signal layer comprises as a function of time the information of the projected image. The current strength of the electron beam must be sufficient-
5 ly large to provide elementary capacitors, which as a result of large light strength are considerably discharged, with sufficient charge. As soon as the potential at a given point of the free surface of the photosensitive layer has reduced to zero volts, the electrons of the electron beam can no
10 longer reach said point. Their speed becomes zero and they are then accelerated in the reverse direction and constitute the so-called return beam. Said return beam also experiences the influence of the deflection fields and scans the surface of the diaphragm facing the photoconductive layer. A part of
15 the secondary electrons generated on the diaphragm have substantially the same kinetic energy as the electrons of the return beam and constitute a secondary beam which together with the original (primary) electron beam scans the photoconductive layer but in a place differing from the primary
20 beam because the secondary beam passes through the deflection fields in another place. As a result of this an interference signal is formed which becomes visible in the picture to be displayed.

In order to prevent the detrimental effect
25 of the return beam, it is suggested in German Patent Application 2230528 (laid open to public inspection) to cause the surface of the diaphragm facing the photoconductive layer, in so far as it is not present in the immediate proximity of the axis of the tube, to enclose an acute angle with the
30 direction of said axis. This is preferably realized by giving the diaphragm the shape of a truncated cone in which the aperture is provided in the top surface. As a result of this the secondary beam has a main direction which is not directed towards the target because a very large part of the generated
35 secondary electrons have a direction which coincides in the same manner with the direction of the primary electrons and with the normal to the surface of the diaphragm as

is the case for the reflection of light rays (the angle of incidence is equal to the angle of reflection).

German published Patent Application 24 34 139 suggests a different solution. It is suggested to provide a flat diaphragm on the side of the target with a layer of a material having a low secondary emission coefficient. Chromium is suggested as being particularly suitable since the air soon forms an oxide skin on it. As is known from German Patent Specification 587,386, chromium oxide is a very good suppressor of secondary emission.

In the tubes having the above-described flat, curved or conical diaphragms, however, the following problem occurs. In a very non-uniformly illuminated target, for example, one picture half predominantly light and the other half predominately dark, an undesired deflection of the scanning electron beam occurs as a result of which the image is locally distorted. Local disturbance of the focussing is also often observed in such a non-uniformly illuminated target, as a result of which locally an unsharp or sharper picture is obtained. This is not in favour of a uniform quality of the picture.

It is therefore an object of the invention to provide a television camera tube in which said undesired local deflection and focussing defects do not occur.

According to the invention, a television camera tube of the type mentioned in the opening paragraph is characterised in that the surface of the diaphragm on its side facing the target consists substantially of a metal or an alloy of metals from the group of gold and platinum.

After providing, for example, a $2\text{ }\mu\text{m}$ thick layer of gold on the side of the target on a diaphragm of 80% Ni - 20% Cr, the above-mentioned undesired local deflection and focussing defects no longer occurred. A layer thicker than $2\text{ }\mu\text{m}$ is unnecessarily expensive. A layer thinner than $0.1\text{ }\mu\text{m}$ presents problems because during the life of the tube the small quantity of gold diffuses at least partly into the underlying diaphragm and hence disappears as a result of

which the charge effects can still occur.

Platinum, although more difficult to provide than gold, is also a suitable material. Of course alloys which mainly comprise gold and/ or platinum are also suitable.

5 Looking back it is assumed that the following explanation can be given for the local deflection and focussing defects no longer occurring. In a substantially uniformly illuminated target, the intensity of the return beam is constant during the whole scanning period. When scanning a
10 very non-uniformly illuminated target, the intensity of the return target beam varies in accordance with the picture contents. In the case of metal diaphragms, in particular when manufactured from a material comprising chromium, the surface is generally coated with a thin oxide skin. In many cases
15 this prevents secondary emission from occurring, as a result of which the known return beam effects are avoided. However, said oxide skin is charged locally by an electron bombardment with the return beam so that the potential of the surface locally differs from the potential of the voltage source
20 to which the diaphragm is connected. As a result of the variable intensity of the return beam potential, variations may hence occur on the diaphragm surface facing the target as a result of which local electric interference fields are formed. When said fields form a bipole field, a deflection
25 defect takes place, in multipolar fields a focussing defect occurs.

Coating the diaphragm may be carried out by means of vapour deposition or electrolytically. Sputtering is also possible although the possibility of gas inclusions
30 in this process is greater.

The invention will now be described in greater detail, by way of example, with reference to a drawing, in which

Figure 1 is a longitudinal sectional view of
35 a first type of television camera tube and

Figure 2 is a longitudinal sectional view of a second type of television camera tube.

The television camera tube shown in the lon-

gitudinal sectional view of figure 1 comprises an evacuated glass envelope 1 having connection pins 2, an electron gun 3 with a cathode 4, a grid 5, an anode 6, a focussing lens 7 consisting of the cylindrical electrodes 8, 9 and 10, a gauze-shaped electrode 11 and a photoconductive layer 12 which is provided on a transparent conductive signal layer 13, which signal layer 13 is provided on the window 14 of the tube. The signal layer 13 and the photoconductive layer 12 together constitute the target. Instead of a photoconductive layer, of course, a pyroelectric layer may be used. A flat diaphragm 15 having an aperture 16 limiting the cross-section of the electron beam generated by the electron gun 3 is present in the cylindrical electrode 8. As a result of this aberrations of the electron beam caused by the focussing lens 7 are reduced and the electron beam scans the photosensitive layer 12 with a very small spot. Said scanning occurs under the influence of deflection coils which are not shown around the envelope. The supports of the electrodes in the tube and their connection to connection pins 2 are not shown either. Perpendicular landing of the electron beam on the photoconductive layer 12 takes place under the influence of the electric field between the cylindrical electrode 10 and the gauze-shaped electrode 11. The return beam which is indicated by an arrow 18 and which returns from the photoconductive layer 12 and is formed by electrons which could no longer reach said layer 12 also scans a diaphragm 15 under the influence of the deflection coils. As a result of a 2 μ m thick gold layer 19 on the diaphragm 15, which layer 19 extends up to the electrode 8, it is prevented that local surface landing on the diaphragm 15 occurs as a result of which the deflection and focussing defects arise.

Figure 2 is a longitudinal sectional view through another type of television camera tube according to the invention. This tube comprises a glass envelope 21 which at one end is sealed by means of a glass window 22 having a target 23. In the tube is present an electron gun 24 to which the desired electrical voltages can be applied via a number

of lead-through pins 25. The inner wall of the envelope 21 is coated with a thin nickel layer 26 by means of a known process, for example, electroless nickel plating. The tube furthermore comprises a gauze electrode 27 and a curved diaphragm 28 having an aperture 29 through which an electron beam generated by the electron gun 24 passes before landing on the photoconductive layer 23. The nickel layer 26 is interrupted in the proximity of the gauze electrode 27 and the diaphragm 28 in the circumferential direction so that said layer 26 is separated in three parts. Each of these parts forms a wall electrode which contributes to the formation of a spot of the electron beam on the target 23 which is desired as regards shape and dimensions. On its side facing the target 23, the diaphragm 28 is coated with a $1\mu\text{m}$ thick layer 30 of platinum so as to prevent local charging by the return beam. Interruptions 31 and 32 in the layer 26 are provided on steps 33 and 34, respectively. The gauze 27 and the diaphragm 28 are secured to steps 35 and 36 by means of indium balls 37.

Of course the invention is not restricted to camera tubes having a flat or curved diaphragm but it may also be used in tubes having a conical diaphragm and having different types of targets. For the operation of the tubes the voltages indicated in figure 1 may be used.

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1. A television camera tube comprising in an evacuated envelope a target consisting of a signal layer having thereon a photoconductive layer for recording the information of the image to be recorded, an electron gun
5 for generating an electron beam for scanning the target, and a diaphragm between said electron gun and the target for limiting the electron beam, characterised in that the surface of the diaphragm on its side facing the target consists substantially of a metal or an alloy of metals from
10 the group of gold and platinum.

2. A television camera tube as claimed in Claim 1, characterised in that on its side facing the target the diaphragm is coated with a $0.1\text{ }\mu\text{m}$ to a few μm thick layer of gold.

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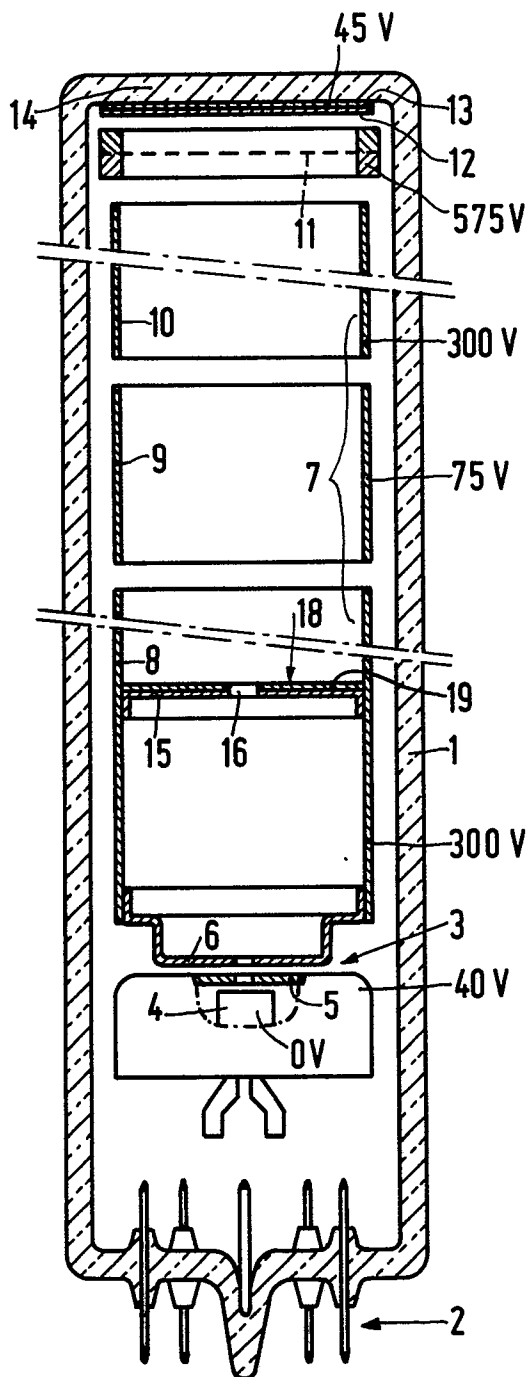


FIG. 1

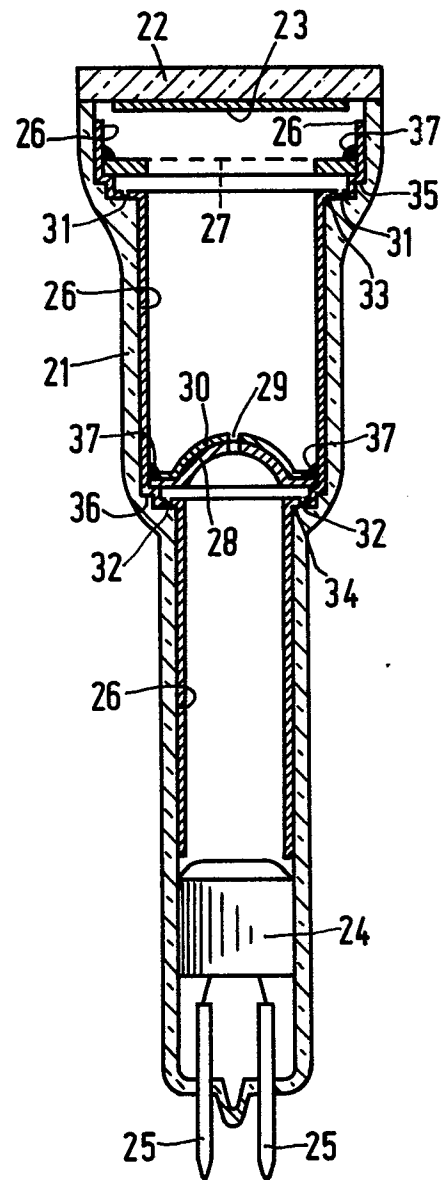


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

0164141

Application number

EP 85 20 0643

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,Y	DE-A-2 434 139 (ENGLISH ELECTRIC VALVE) * Page 3, lines 8-14; figures *	1	H 01 J 31/38 H 01 J 29/84 H 01 J 29/02
Y	FR-A-1 410 693 (HITACHI K.K.) * Page 4, left-hand column, lines 18-26 *	1	
A	US-A-3 990 038 (A.S. JENSEN et al.) * Column 6, lines 1-21 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 01 J 29/00 H 01 J 31/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16-08-1985	Examiner ANTHONY R.G.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			