

"CATHODE RAY TUBE"

The present invention relates to a cathode ray tube.

A cathode ray tube, in this case a television camera tube, is known from United States Patent Specification 3,783,326. This known cathode ray tube comprises an evacuated glass envelope having a
- 5 tubular envelope portion, within which envelope portion means to generate an electron beam and an annular metal getter holder are accommodated. The getter holder of the tube described in this known specification is connected to the electron gun, so that the getter holder during operation of the tube has the same electric potential
10 as the last electrode of the electron gun. The connection of the getter holder to the electron gun has, besides this restriction, the disadvantage that during the inductive heating of the getter (getter holder with contents) parts of the gun are also undesirably heated, for example, by inductive stray fields or via thermal conductivity
15 from the getter to the gun.

It is the object of the invention to provide a cathode ray tube in which the getter holder is assembled in a tubular envelope portion of the tube so as to be thermally independent of the electron gun and can be provided with any desired electric potential.

20 According to the present invention there is provided a cathode . ray tube comprising an evacuated glass envelope having a tubular envelope portion within which a supporting edge is formed by a substantially stepwise reduction of the internal transverse dimension of the tubular envelope portion, means to generate an electron beam
25 located in a part of the envelope having the reduced internal transverse dimension, adjacent a closed end thereof, an annular metal getter holder of smaller outside dimension than the internal transverse dimension of the tubular envelope portion in which it is located, and a supporting member for the getter holder, the supporting member
30 comprising means for suspending the getter holder from the supporting edge so that it is spaced from the inner surface of the tubular envelope portion, said means providing a thermal resistance between the getter holder and said supporting edge.

The advantage of such a construction is that the getter holder is assembled in the tubular envelope portion so as to be mechanically and thermally independent of the electron gun. In such a construction, the getter can be inductively heated rapidly and effectively. When a non-evaporating getter is used, inductive heating is necessary to activate the gettering material provided in the getter holder. When an evaporating getter is used, such a heating is necessary to evaporate the gettering material from the getter holder.

According to an embodiment of the invention, the supporting member consists at least substantially of an interrupted ring. Due to the interruption in the ring, excessive heating of the ring during the inductive heating of the getter is prevented. Excessive heating of the annular supporting member may be undesirable due to the direct contact thereof with the glass tube envelope.

According to a further embodiment of the invention the supporting member comprises an interrupted inner ring and an interrupted outer ring, the inner ring supporting the getter holder and being connected to the outer ring in a restricted number of places along its circumference, the outer ring bearing on the supporting edge formed in the tubular envelope portion. By connecting the inner ring to the outer ring in a restricted number of places, the heat transfer via conduction from the getter to the outer ring is restricted. Heat transfer via conduction can furthermore be restricted by means of a construction in which the inner ring of the supporting member has axially extending strips, which strips support the getter holder.

In the case of a non-rotationally symmetrical supporting construction, disturbances of the electric field lines in the tube may occur. Electron-optically, such disturbances may lead to undesired effects. In order to restrict such field disturbances, the getter holder may be placed between two axially spaced rings,

which rings during operation of the tube are at the same electric potential, so that the getter holder is situated in a substantially field-free space. The annular supporting member may form a first of these two rings, while the strips which support the getter holder extend to beyond the getter holder and terminate into a plate-shaped interrupted ring which forms the second of the said two rings.

The overall supporting construction for the getter holder can simply be manufactured from sheet material and is excellently suitable for mass production.

An embodiment of the invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, of which:

Figure 1 is a diagrammatic sectional view of a television camera tube in which a getter is mounted,

Figure 2 shows a detail of the tube shown in Figure 1,

Figure 3 shows a part of the supporting construction for the getter shown in Figure 2, and

Figure 4 shows another part of the supporting construction shown in Figure 2.

The television camera tube shown in Figure 1, in which details which are not essential for the understanding of the invention are not shown, comprises a glass envelope 1 which is sealed at one end by means of a glass window 2 having a photosensitive layer 3. An electron gun 4 is present in the tube, to which gun the desired electric voltages can be supplied via a number of leadthrough pins 5. The inner wall of the envelope 1 is covered with a thin layer of nickel which forms a first wall electrode 6 and a second wall electrode 7 to focus the electron beam generated by the electron gun 4. The tube furthermore comprises a gauze electrode 8 and a diaphragm 9 having an aperture 10 through which the electron beam passes before landing on the photosensitive layer 3. The window 2, the gauze electrode 8 and the diaphragm 9 each bear on supporting edges which are provided in the inner wall of the envelope and which have been formed by a stepwise reduction of the inside

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diameter of the tube. Such supporting edges are obtained by vacuum deforming and pressing a glass tube on a profiled metal mandril at a temperature at which the glass is somewhat soft so that the inner wall of the glass tube is profiled in accordance with the shape of the mandril. In this manner the envelope 1 is obtained the inside dimensions of which are extremely accurate both in the radial and in the axial direction. A tube obtained in this manner and having supporting surfaces for the window and certain electrodes is disclosed in Netherlands Patent Application 7807756.

In particular in the case of a cathode ray tube of comparatively small dimensions, for example a television camera tube, the accommodation of a getter in the tube may present problems in connection with the disturbance of the electric field lines in the tube, the possibility of inductive heating of the getter, and the connection of the getter in the tube.

An embodiment of a construction to support the getter in the tube which meets these problems is shown in Figures 1 and 2. The getter supporting construction in the tube shown in Figure 1 is shown in detail in Figure 2. An extra supporting edge 11 in the inner wall of the envelope 1 has been obtained by vacuum deforming a calibrated glass tube on to a profiled mandril. A supporting member 12 in the form of a ring having a central aperture 13 bears on the said supporting edge. The supporting member 12 is connected to the wall electrode 7 by means of indium balls 14 and comprises an outer ring 15 and an inner ring 16, as is shown in detail in Figure 3 which is a plan view of the supporting member 12. The annular supporting member 12 has an interruption 17. The outer ring 15 has three projecting supporting surfaces 18 which bear on the supporting edge 11. Furthermore, the inner ring 16 is separated from the outer ring 15 by a slot 20 and is connected to the outer ring 15 only in a restricted number of places 19 situated between the supporting surfaces 18. The supporting member 12 is manufactured from sheet material. A number of strips 21 (Figure 2) extending in the axial

direction are welded to the inner ring 16. The strips 21 have radially extending projections 22 between which a getter holder 23 is fixed. The getter holder 23 consists of an annular metal channel in which an evaporable gettering material in the form of a powder mixture 24 of barium-aluminium (BaAl_4) and nickel in the weight ratio of approximately 1:1 has been compressed. The barium is evaporated from the powder mixture 24 by inductive heating and deposits as a thin layer of gettering metal on internal surface parts of the tube. In the arrangement of the getter holder 23 shown in Figures 1 and 2, the barium evaporates in the direction of the electron gun 4 so that no barium can deposit on the photosensitive layer 3. During the inductive heating of the getter holder 23 and the gettering material 24, the supporting construction of the getter holder may not be heated excessively, in particular not in those places where the supporting construction contacts the glass wall of the envelope 1. The measures taken for that purpose may be recognized in Figure 3. The direct heating of the supporting member 12 by inductive currents is mainly counteracted by giving the inner ring 16 and the outer ring 15 interruptions 17. Heat transfer by conduction from getter (23, 24) to the outer ring 15, in particular to the supporting surfaces 18, is counteracted as much as possible by creating a long thermal path and a large thermal resistance between getter holder 23 and supporting surfaces 18. This has been realized by a restricted number of connection places 19 between the inner ring 16 and the outer ring 15 which places are moreover situated between the supporting surfaces 18.

Disturbances of the electric field lines in the tube are restricted by placing the getter with its supporting construction in a substantially field-free space, if possible. In the present case the getter with its supporting construction is placed approximately halfway along the wall electrode 7 and is connected thereto electrically. Further measures to obtain or maintain

the desired variation of the field lines have been realized by a plate-shaped ring 25 having a central aperture 26. The ring 25 is connected to the metal strips 21. Figure 4 is a developed view of the ring 25 manufactured from sheet material and the strips 21 and projections 22 formed integral therewith. For the already mentioned reasons the ring 25 also has an interruption 27. The elongate apertures 28 and 29 in the strips 21 serve to obtain defined bending places.

Although the invention has been explained with reference to one embodiment, it is not restricted thereto. For example, it is also possible to connect the getter (23, 24) in the tube by means of only the construction shown in Figure 4. In that case the strips 21 are bent outwardly radially near the apertures 29 so that supporting surfaces 30 are obtained which may bear on the supporting edge 11. In this case, the supporting member 12 shown in Figure 3 is not necessary. Electron-optically, however, the supporting construction shown in Figure 2 satisfies stringent requirements, because therein the getter (23, 24) is situated between two rings 12 and 25 which are at the same electric potential.

**CLAIMS:**

1. A cathode ray tube comprising an evacuated glass envelope having a tubular envelope portion within which a supporting edge is formed by a substantially stepwise reduction of the internal transverse dimension of the tubular envelope portion, means to
5 generate an electron beam located in a part of the envelope having the reduced internal transverse dimension, adjacent a closed end thereof, an annular metal getter holder of smaller outside dimension than the internal transverse dimension of the tubular envelope portion in which it is located, and a supporting member for the getter holder,
10 the supporting member comprising means for suspending the getter holder from the supporting edge so that it is spaced from the inner surface of the tubular envelope portion, said means providing a thermal resistance between the getter holder and said supporting edge.
2. A cathode ray tube as claimed in Claim 1, wherein the supporting
15 member is formed at least substantially by an interrupted ring.
3. A cathode ray tube as claimed in Claim 1 or 2, wherein the supporting member comprises an inner interrupted ring and an outer interrupted ring, the inner ring supporting the getter holder and being connected to the outer ring in a restricted number of places
20 along its circumference, the outer ring bearing on the supporting edge formed in the tubular envelope portion.
4. A cathode ray tube as claimed in Claim 3, wherein the inner ring of the supporting member has axially extending strips, said strips supporting the getter holder.
- 25 5. A cathode ray tube as claimed in Claim 4, wherein the strips extend to beyond the getter holder and terminate into a plate-shaped interrupted ring.
6. A cathode ray tube as claimed in any one of the preceding Claims, wherein the supporting construction for the getter holder is
30 manufactured from sheet material.
7. A cathode ray tube as claimed in any one of the preceding Claims, wherein the tube is a television camera tube.



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8. A cathode ray tube substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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