

Conklin et al.

[11] 3,873,872

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[54] PYROELECTRIC VIDICON

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[57] **ABSTRACT**

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[51] Int. Cl. ... H01j 29/02, H01j 31/38, H01j 31/45

[58] **Field of Search** 313/390, 383, 476, 384,
313/369, 388; 250/332

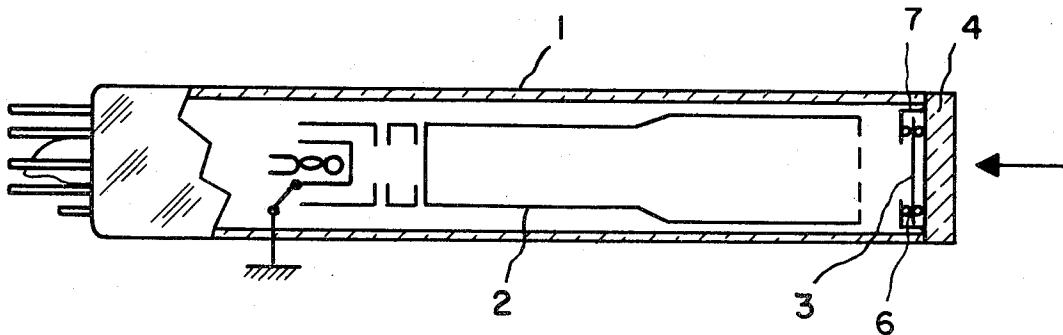
A strain free electrically-conductive support for a target of a pyroelectric vidicon employs several metal bodies which are liquid at the ambient temperature to provide a floating mounting for the target. The metal body is a eutectic of indium and gallium which is liquid at the ambient temperature and has a very low vapor pressure in vacuum even at higher operating temperatures.

[56] **References Cited**

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5 Claims, 3 Drawing Figures



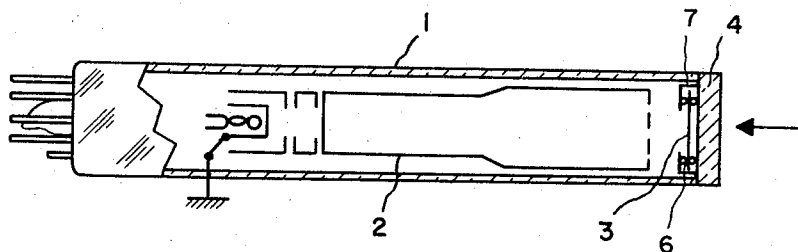


Fig. 1

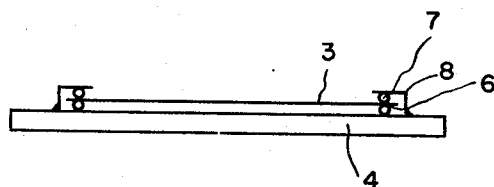


Fig. 2

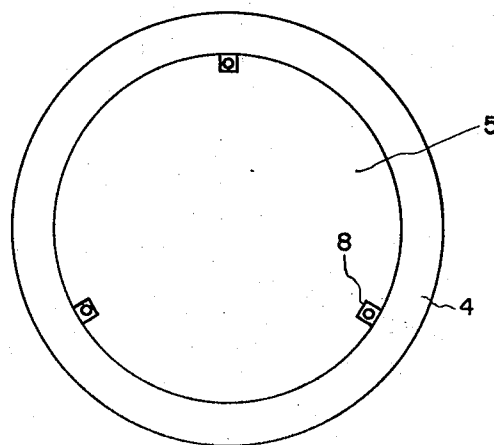


Fig. 3

PYROELECTRIC VIDICON

The invention relates to a television camera tube for converting a thermal image into an electronic signal, and in particular to a camera tube employing a target which converts a thermal image projected onto one side into a charge image on the opposite side which is scanned by an electron beam and is periodically reduced to cathode potential. Such a tube is more commonly referred to as a pyroelectric vidicon, and will be referred to as such hereinafter.

During development of a pyroelectric vidicon it was found that the material used for the target, tri-glycine sulfate (TGS), was piezoelectric as well as pyroelectric. Consequently, this target was extremely sensitive to strain. This strain manifested itself most severely if the material was held in any rigid manner.

It is an object of this invention to provide a strainfree mounting for the target of a pyroelectric vidicon.

Another object of this invention is to provide a method of mounting the target of a pyroelectric vidicon to substantially eliminate strain in the target.

These and further objects of the invention will appear as the specification progresses.

In accordance with the invention, the target of a pyroelectric vidicon is mounted so that it essentially floats on a liquid support. This is accomplished by using gallium, which is a liquid at ambient temperature, and its vapor pressure is less than 10^{-11} torr at 50°C .

The target of a pyroelectric vidicon is mounted at one end of a glass envelope having a window which is transparent to infra-red radiation which permits a thermal image to be projected on the surface of the target adjacent the window. The opposite side of the target is scanned by an electron beam which periodically reduces the potential of that surface to cathode potential. Between scans, a charge image is stored in the target, and reducing the target to cathode potential results in an electrical signal which can be derived from the target and which corresponds to the charge image.

In order to effect an electrical connection to the target, a metal conductor is deposited on the window in the form of a thin annular metal layer, for example chromium. On this thin annular metal layer, three, or more, bodies, usually spheres, of a metal which adheres to the annular metal layer are provided. If chromium is used for the metal layer, the metal spheres may consist of indium because indium adheres readily to chromium by wetting.

The metal spheres which are crushed are then alloyed with another metal which forms a eutectic which is liquid at the ambient temperature. If the metal sphere is indium, pure gallium in the form of a sphere is placed in contact with the indium after the indium sphere is crushed, the gallium forming a eutectic with the indium which has a melting point of approximately 16°C . The target is then placed on the spheres and is supported by liquid contact insuring a floating mounting.

The invention will be described with reference to the accompanying drawing in which:

FIG. 1 is a sectional view of a pyroelectric vidicon;

FIG. 2 shows a plan view of the target of the pyroelectric vidicon viewed through the window; and,

FIG. 3 shows a side view of the target mounted on the window of a pyroelectric vidicon.

In FIG. 1 an envelope 1 of glass, for example, houses an electron gun 2 for producing an electron beam. The

electron beam produced by the gun is directed towards that end of the envelope where a camera target 3 of pyroelectric material, such as tri-glycine sulfate is mounted. The beam is deflected by conventional means, not shown, in order to make it strike any desired point of the target.

The end of the envelope is sealed off by means of a plate 4 transparent to infra-red radiation (arrow) coming from an object being observed. This plate is covered on its internal face with a layer of electrically conductive material 5.

The target 3 which consists of tri-glycine sulfate (TGS) is not only thermally responsive, i.e. pyroelectric, but also piezoelectric. Consequently, it is desirable to avoid any strain which would generate a piezoelectric voltage, and hence a spurious signal.

To that end, the target 3 is mounted on a liquid support as shown in FIGS. 2 and 3. The window 4 is provided with a thin annular chromium layer leaving a non-deposited circular area 5 in the center.

Three small spheres of indium 6, spaced 120° apart, are pressed with a blunt tool onto the chromium layer. The indium adheres to the chromium layer by a wetting action much the same as a conventional indium seal. Next, pure gallium is placed in contact with the pressed indium. The gallium dissolves the indium forming a eutectic which has a melting point of 16°C . The TGS target 3 with its electrode facing the gallium is positioned evenly on the three gallium-indium spheres.

Next, three small spheres 7 of indium, likewise spaced 120° apart and above the gallium-indium eutectic, are placed on the target and pressed with a blunt tool. Gallium is placed in contact with the indium so that a eutectic is formed which flows around the edge of the electrode as shown in FIG. 2. The target thus is clamped between the eutectic mixtures on either side which forms tab 8 as shown in FIG. 3.

Adhesion to the gallium-indium spheres is realized. Since the eutectic is liquid, the target 1 literally floats. The spheres remain liquid up to normal operating temperatures, i.e. ambient.

What is claimed is:

1. A television camera tube comprising an envelope having a window at one end which is transparent to infra-red radiation, a pyroelectric target element disposed to receive on one surface thereof a thermal image and produce on an opposite surface a charge image corresponding to said thermal image, means within said envelope including a cathode for producing an electron beam, means to scan the surface of said target having the charge image with said electron beam to periodically reduce areas of said surface to cathode potential, and means to support said target free of strain on said window, said latter means comprising an annular layer of a first electrically conductive metal which adheres to said window and a plurality of spaced metal bodies on opposite sides of said target each constituted of a second metal which adheres to said first metal and a third metal which forms a eutectic with the second metal having a melting point below about 16°C , said eutectic flowing around the edge of said target whereby said target is floatingly supported by said metal bodies.

2. A television camera tube as claimed in claim 1 in which the metal bodies are spheres.

3. A television camera tube as claimed in claim 1 in which the spheres are a eutectic of indium and gallium.

4. A television camera tube as claimed in claim 3 in which the target is triglycine sulfate.

5. A television camera tube as claimed in claim 4 in which the first metal layer is chromium.

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