July 15, 1958 H. CASSMAN 2,843,774

LIGHT ABSORBENT SURFACES

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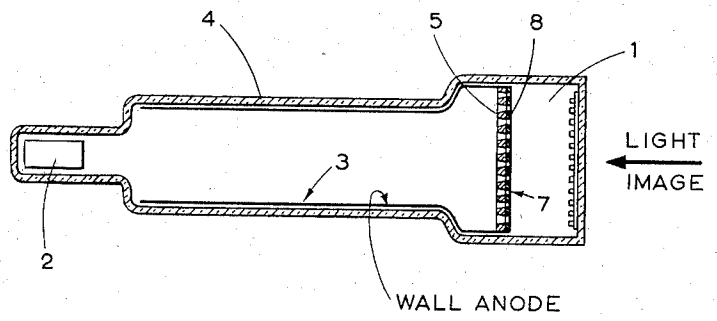


FIG. 1.

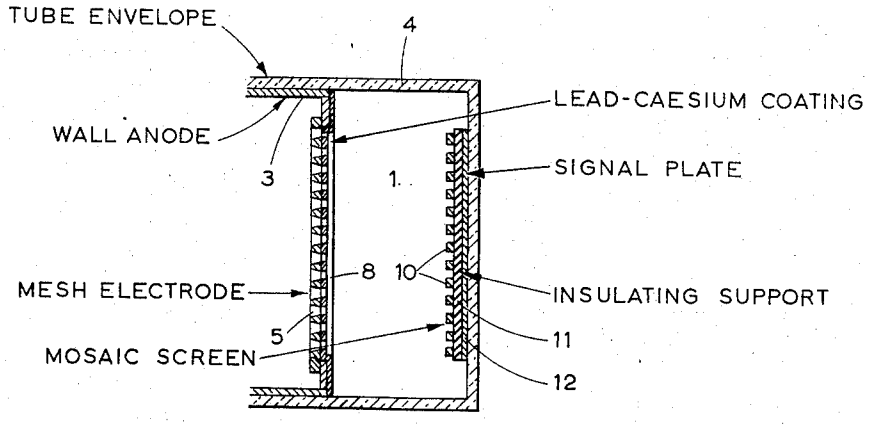


FIG. 2.

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LIGHT ABSORBENT SURFACES

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5 Claims. (Cl. 313—66)

This invention relates to light absorbent surfaces in electron discharge devices, especially television pick-up tubes.

In electron discharge devices having photo-electrically sensitive surfaces, there is frequently a surface which is liable to reflect unwanted light on to the sensitive surface and so interfere with operation of the device, and for this reason it is desirable to render the surface light absorbent. For example in a television pick-up tube having a photo-sensitive mosaic screen on a light transmitting support, it is often desirable to mount a mesh electrode in front of the scanned surface of the mosaic screen. The mesh electrode is, however, liable to reflect light from the image to be televised on to the mosaic screen in and out-of-focus condition, and so produce "fogging" on the screen. Such a mesh electrode may be for example an ion trap mesh electrode or a stabilising electrode, where the pick-up tube is of the kind which operates with cathode potential stabilisation and of the construction described, for example, in page 383 et seq. in the Journal of the Institution of Electrical Engineers, volume, 97, part III, No. 50. However, the treatment of such a mesh electrode in a television pick-up tube so as to render it black is associated with many difficulties and the conventional methods of blackening a surface, for example by means of carbon- or platinum-black, are found to be unsuitable. Such substances are liable to contaminate the photo-sensitive surface and sometimes the electron gun, and moreover they tend to weaken the mesh which is necessarily of a delicate structure.

The object of the present invention is to reduce difficulties such as referred to in the preceding paragraph.

A further object of the present invention is to provide an intensely black coating which is suitable for application in electron discharge devices, especially such as have photo-electrically sensitive electrodes.

A further object of the present invention is to provide an electron discharge device having a caesiated photo-electrically sensitive target and a further member, such as a metal mesh electrode, extended before said target, and having a black light absorbent coating comprising lead and caesium.

According to one practical form of the invention a relatively thick coating of lead, of the order of 1000 A. (approximately 300 atomic layers) is applied to the member to be blackened. Such a coating of lead is substantially black of itself and further blackening is produced on exposure to an alkali metal, which is preferably caesium, so that an intensely black coating is obtained. Since, a coating comprising lead and caesium has been found to have no appreciable deleterious effect on a photo-electrically sensitive surface such as might be employed in a television pick-up tube, or a thermionic cathode in the same tube, and the light absorbent character of the coating is not harmed by baking such as is likely to be required in the manufacture of an electron discharge device.

While it is preferred to employ lead in accordance with the invention, one or more of the substances tin, germanium and silicon can be substituted for lead in the light absorbent coating.

In order that the invention may be clearly understood and readily carried into effect, the invention will be described with reference to the accompanying drawing, in which:

Figure 1 illustrates diagrammatically one example of the present invention applied to a television pick-up tube.

Figure 2 is a detail view, to an enlarged scale, of part of Figure 1.

Referring to the drawing, the tube illustrated is of the same general construction as that described in page 383 et seq. of the Journal of the Institution of Electrical Engineers, volume 97, part III, No. 50. The tube comprises target **1**, an electron gun **2** for producing a beam of electrons for scanning the target **1**, and a wall anode **3**, all enclosed in an evacuated glass envelope **4**. As shown in Figure 2, the target **1** comprises a photo-electrically sensitive mosaic screen consisting in known manner of a multiplicity of discrete conductive elements **10** on a transparent insulating support **11**, the elements comprising for example bismuth, silver, oxygen and caesium or antimony and caesium and a transparent conductive signal plate **12** being provided on the other side of said support. The gun **2** includes a coated thermionic cathode, also in known manner. A mesh member **5** is mounted to function as a mesh electrode at the end of the wall anode **3** nearer the target **1** and the mesh electrode, which is merely shown diagrammatically in the drawing, comprises a fine filamentary structure disposed in a plane parallel to the target. The function and operation of the mesh electrode **5** is not material to the present invention and the electrode **5** may or may not be in electrical connection with the wall anode, depending on the potential to be applied. However, in the illustrated example, the electrode **5** is shown in electrical connection with the wall anode **3** and its main function is to prevent positive ions formed in residual gas along the path of the electron beam from being attracted to the target **1**. Since in operation of the tube a light image is projected on to the target **1** in the direction indicated by the arrow **6**, there is a liability for the surface **7** of the mesh electrode to reflect light on to the target in an out-of-focus condition. To reduce this liability the surface **7** is blackened by a light absorbent coating **8** comprising lead and caesium.

In order to produce the coating, a fairly thick coating of lead is evaporated on the surface **7** of the mesh electrode **5** at any convenient time during the manufacture of the tube, but prior to the photo-sensitisation of the mosaic elements of the target **1** with caesium, since as will hereinafter appear the normal photo-sensitisation of the target with caesium can be used for exposing the lead coating to caesium. The evaporation of the lead on to the mesh electrode **5** is however, preferably effected before the mesh is mounted in the tube **4**. The thickness of the lead coating may be, for example, of the order of 1000 A. and this coating of itself produces substantial blackening of the surface **7** of the mesh electrode. Subsequently, as aforesaid, the coating is exposed to caesium during the normal photo-sensitisation of the elements of the target **1**, the mesh electrode being of course now mounted in the tube **4**, and on exposure of the lead coating to caesium further blackening is produced. Further processing of the tube is thereafter effected in the normal manner including baking the tube at a temperature of the order of 150° to 170° C., such processing having no appreciable effect on the light absorbed character of the black coating **8**.

The invention may also be applied to the blackening of other mesh members mounted in front of the target

of a television pick-up tube, such for example as a stabilising electrode. The invention can also be applied to other electron discharge devices, for example photo-electric cells and, as aforesaid, the light absorbent coating may comprise other substances which blacken on exposure to caesium instead of lead and other alkali metals instead of caesium.

What I claim is:

1. An electron discharge device including a metal member having a black coating applied to a surface of said member and comprising alkali metal and a substance selected from the group consisting of lead, tin, germanium and silicon.

2. An electron discharge device which comprises a photo-electrically sensitive target and a further member having a black light-absorbent coating applied to a surface of said member and comprising caesium and a substance selected from the group consisting of lead, tin, germanium and silicon.

3. An electron discharge device comprising a caesiated photo-electrically sensitive target and a metal member having a black light-absorbent coating applied to a surface of said member and comprising lead and caesium.

4. A television pick-up tube having a photo-electrically sensitive target sensitised by an alkali metal and a metal mesh electrode extended in front of said target, the surface of said electrode facing said target having a black light-absorbent coating comprising alkali metal and a substance selected from the group consisting of lead, tin, germanium and silicon.

5. A television pick-up tube having a caesiated photo-electrically sensitive target and having a metal mesh electrode extended in front of said target, the surface of said electrode facing said target having a black light-absorbent coating comprising lead and caesium.

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