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H. H. GEFFCKEN ET AL

2,015,520

LIGHT SENSITIVE TUBE

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Fig. 1

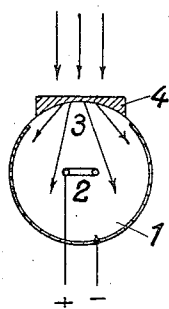


Fig. 2

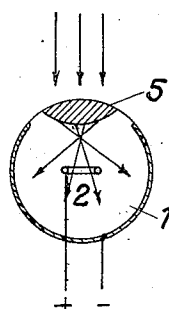


Fig. 3

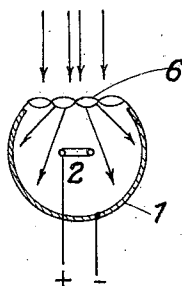


Fig. 4

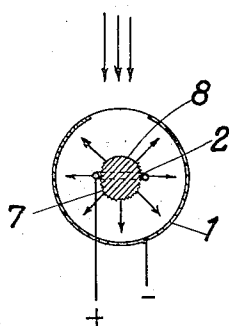
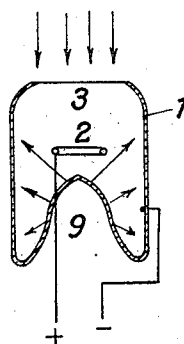


Fig. 5



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LIGHT-SENSITIVE TUBE

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4 Claims. (Cl. 250—27.5)

This invention relates to light-sensitive tubes of the kind in which variations of an electric current are produced by variations in illumination and in which the light-sensitive part is constituted by a comparatively large surface. This is for instance the case with the usual selenium and photo-electric tubes. The invention consists in this that tubes of the kind referred to are provided with a light-dispersing member which is firmly built therein, which light-dispersing member distributes the incident light as uniformly as possible on the light-sensitive layer. It has been found that in this way a substantial increase in the performance and in the life of such tubes is obtained.

The light-dispersing member according to the invention which member is firmly connected with the tube may be provided either on the inside or on the outside of the latter. It is often of special advantage to provide the said member in the interior of the tube in order to obtain a very intensive uniform distribution of light over the whole light-sensitive surface also in the case of tubes which, with the exception of a comparatively small inlet opening for the light, are coated practically over the whole inner surface with a light-sensitive coating. The dispersing member may in some cases be itself coated with a light-sensitive layer.

Various forms of construction according to the invention are illustrated by way of example in the accompanying drawing, which for the sake of simplicity has been shown as being photo-electric tubes of the kind proposed by Elster and Geitel, it being of course understood that the invention is also applicable to selenium cells or the like.

The invention will become more apparent from the following detailed description taken in reference to the accompanying drawing, in which are shown several photoelectric tube constructions embodying the principle of the invention.

Figure 1 shows a photoelectric tube with a dispersing lens structurally combined therewith.

Figure 2 is a similar embodiment to Figure 1 using a concentrating lens.

Figure 3 shows another form in accordance with the invention illustrating a plurality of lens elements structurally combined with the tube vessel for uniformly distributing the incoming beam over the light sensitive layer.

Figure 4 illustrates a further embodiment of the invention comprising a dispersing member disposed inside the tube.

Figure 5 illustrates another mode of execution

of the invention comprising a dispersing member forming a re-entrant portion of the tube.

Similar numbers identify or denote similar parts throughout the different views of the drawing.

Figure 1 illustrates a photo-electric tube in cross section in which the parts of the inner wall of the vessel 1, which are covered with the light-sensitive layer, have been indicated in section lines. 2 is the anode which is arranged in the usual way. On the window 3 which is provided for the inlet of the light, there is firmly cemented the dispersing lens 4. The light which falls upon the tube in the direction of the arrows is in consequence thereof dispersed and distributed over the whole light-sensitive surface.

In the form of construction illustrated in Figure 2, the same result is obtained by this that the glass vessel 1 is provided at the window intended for the inlet of the light, with a lens-like thickened part 5, when the lens thus produced has a sufficiently short focal length.

In the form of construction illustrated in Figure 3 the same effect is again obtained by this that the window for the inlet of the light is provided with a number of papillary glass protuberances 6 directed inwards and outwards, each one of which acts as a small lens. An arrangement with such a number of lens-like glass protuberances thus has often the advantage that the distribution of the incident light upon the whole of the light-sensitive surface in the interior of the tube is more uniform than in the case of an arrangement with one single lens member, as shown in Fig. 2.

Almost perfect uniform distribution of light although involving great loss of light is obtained if the window 3 is made of milk glass.

Figures 4 and 5 show two forms of construction according to the invention in which the dispersing member is provided in the interior of the tube, the same being mechanically connected with the anode in Fig. 4 and with the carrier of the light-sensitive layer in Fig. 5. The first constructional form can be easily produced from a technical point of view and is therefore very cheap, whilst the second one is very stable and therefore it can be used with advantage in those cases where it is not possible to avoid mechanical vibrations of the tube (talking films and the like). In Fig. 4 the dispersing member 7 consists of a glass bead which is for instance provided with flutings with the exception of the polished surface 8 which faces the opening 3 for the inlet of the light. The wire loop 2 which acts as the anode 55

is placed round the said glass bead. In Fig. 5 the dispersing member according to the invention consists of a conical re-entrant portion 9 of the vessel 1 of the tube, which re-entrant portion is coated with the light-sensitive layer like the adjacent parts of the wall of the tube. In this form of construction the dispersing member also permits of obtaining at the same time an increase in the total effective light-sensitive surface, since the light falling in the direction of the arrows is distributed over a larger surface before any further reflection, owing to the inclination of the conical surface 9. Instead of covering the re-entrant portion with a light-sensitive layer, the same may be mirrored on the inside or on the outside or may be made such as to produce a diffused reflection. By suitably changing the form of the cone 9 (by giving different curvature to the surface) any desired distribution of the reflected rays may be obtained.

The increase in the life and load capacity of the tube according to the present invention can be explained as follows: The illuminated parts of the light-sensitive layer are subjected to a change or to an electric disintegration to a greater extent the more intensive the illumination per unit surface of the light-sensitive layer. If only a small portion of the total light-sensitive layer is subjected to illumination, the portion in question is rendered non-sensitive after a comparatively short period of time and in consequence thereof the tubes become more or less useless. However if according to the invention the incident light is distributed by means of the dispersion members of the character above referred to as uniformly as possible over the whole light-sensitive surface a premature ageing of the individual points is avoided. The ageing of the light-sensitive tube takes place uniformly at all points. Naturally the ageing takes place substantially slower since the distribution of light secured according to the invention over the individual points

of the whole of the surface is subjected to a small load. For the same reason the tube may if desired be used for a higher total load.

What we claim is:

1. A light-sensitive tube comprising a vessel, said vessel containing a light-sensitive layer, an anode therein and a light-dispersing member secured in the interior of said vessel for uniformly distributing the light over said light-sensitive layer, said dispersing member being carried by the anode of said tube.

2. A photoelectric tube comprising an envelope, a window therein for passing controlling light rays, a cathode consisting of a coating of light sensitive substance covering substantially the entire inner surface of said envelope excepting said window, a cooperating anode within said envelope and dispersing means structurally incorporated in said tube for uniformly distributing incident light rays over said cathode.

3. A photoelectric tube comprising an envelope, a window therein for passing controlling light rays, a cathode consisting of a thin coating of light sensitive substance covering substantially the entire inner surface of said envelope excepting said window, an anode disposed in cooperative relationship to said cathode, and dispersing means structurally incorporated in said window for uniformly distributing incident light rays over said cathode.

4. A photoelectric tube comprising an envelope, a window therein for passing controlling light rays, a thin coating of light sensitive substance covering substantially the entire inner wall of said envelope excepting said window, an anode disposed in cooperative relationship to said cathode, and dispersing means structurally combined with said anode for uniformly distributing incident light rays over the entire surface of said cathode.

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