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M. KNOLL

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CATHODE RAY TUBE

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Fig. 1

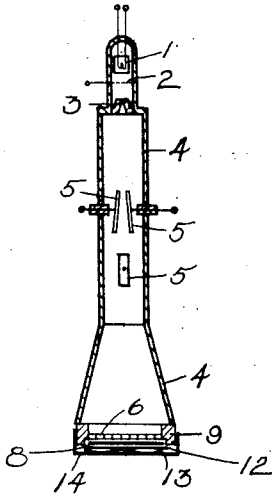


Fig. 2

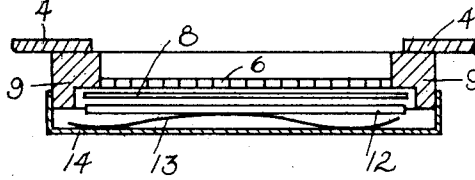


Fig. 3

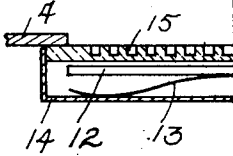


Fig. 4

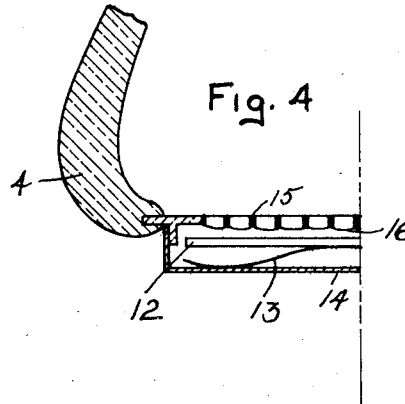
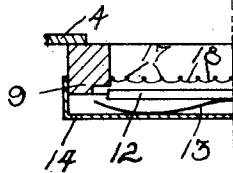


Fig. 5



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UNITED STATES PATENT OFFICE

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CATHODE RAY TUBE

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Application January 9, 1930, Serial No. 419,653
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6 Claims. (Cl. 250—27.5)

My invention relates to cathode ray tubes, in which temporally governed electron-rays or those governed according to their intensity, are generated and fall upon a lighting screen the surface of which reacts outwardly on the eye, or upon cells sensitive to light, or upon photographic layers and the like.

My invention relates especially to cathode ray oscillographs, tubes for electro-acoustic objects (tone-film) or those used in television or visual telegraphy.

The object of my invention relative to a cathode ray tube of the above described kind consists in providing in one place a light transmitting window situated in the path of the electrons, said window on the vacuum side being coated with a phosphorescent layer and shutting off the cathode ray tube against the atmosphere. The thickness of this window is constructed in such a way that with regard to the exciting voltage the electron-rays are completely absorbed in the transparent window while, on the other hand, only a trifling fraction of the light rays are absorbed.

On account of these trifling losses by absorption and the consequently resulting greater intensity of light rays oscillating from the lighting layer, a new result is attained namely, occurrences of so short a duration can be made visible in the open space or photographed whereas up to now this was only possible in the interior of the vacuum.

Operating inside the vacuum is, of course, very inconvenient and the obviation of this practice signifies great technical progress. Among other things it has for example, made it possible to seal the vacuum vessel off from the pump.

Another object of my invention consists in providing means for protecting the transparent window against the outer air pressure.

Other objects and advantages will appear in the following specification and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawing, forming part of this application, in which

Fig. 1 is a plan view through the cathode ray oscillograph.

Fig. 2 is a vertical section of the base containing a form of the transparent window with its supporting structure on an enlarged scale.

Fig. 3 is a vertical section showing one half of another form of the transparent window with its supporting structure.

Fig. 4 shows a further modification of construction of the transparent window with its supporting structure.

Fig. 5 shows also a further form of the transparent window with its supporting structure.

As regards Fig. 1:

The illustrated apparatus consists of the cathode tube 4, in the top of which the hot cathode 1 is arranged, and at the bottom of which is the anode 3. The hot cathode 1 is connected with the H. T. side of a transformer. The anode 3 is joined to the metal tube 4. Pairs of deflecting plates 5 are positioned within the metal tube 4. The deflecting of the cathode rays depends upon the alteration in the voltage and upon time.

The base of the cathode oscillograph contains the arrangement for recording and making visible. This alteration in the electric phenomena is indicated by the movement of the spot of the cathode rays.

With regard to Fig. 2, the number 8 indicates the light transmitting window coated with a phosphorescent layer on the vacuum side. The window partly rests upon the supporting structure 6, which may consist of high-edged profiles or of a plate with a great many holes. The holes may for instance be made by boring (drilling) or by corroding into a metal plate a great number of fine apertures. The transparent window 8 can either be placed upon the supporting structure and hermetically fastened with putty or melted together, in the latter case the plate should be suitably made of a material with a similar coefficient of expansion like, for instance, glass made of chromium-nickel-iron-alloy.

The supporting structure 6 is strongly joined to support 9. The support may be provided with a groove (not shown) in which a refrigerating or cooling medium may circulate. The support 9 is hermetically tightly joined to the casing. When photographing the pictures appearing upon the light transmitting window, a photographic plate or a film strip 12 will serve, which are held in position by a spring 13. By means of the case lid 14 the photographic layer is shut off tightly against the light.

Fig. 3 shows a supporting structure where the light transmitting window has been constructed from the supporting plate 15 itself the latter in this case consisting of glass.

Fig. 4 depicts a supporting structure where upon a trellised arrangement made of high edged profiles the light transmitting window has been welded in a concave form.

The trellised arrangement 15 is welded directly into the glass casing of vacuum tube 4.

Fig. 5 finally shows a cross section of the wires of a metal netting 17, which serves as a support for the concavely welded light transmitting window 18.

5 With regard to such cathode ray tubes where a relatively small hole or a narrow crevice suffices to allow the appearance of light rays coming from the phosphorescent layer the construction of a thin transparent plate is of course possible according to the invention even without the existence of a supporting structure.

10 Although I have described some embodiments of my invention, it will be obvious to those skilled in the art that various modifications may be made as regards the details of construction and in design and proportion of the several parts without departing from the principles herein set forth.

What I claim is:

1. A cathode ray device for photographing
20 oscillographs, comprising an evacuated tube, an anode and a cathode mounted at one end of said tube and adapted to emit a stream of electrons, pairs of deflecting plates within said tube for directing said stream of electrons, an even, thin
25 window mounted in the other end of said tube and positioned in the path of said electron rays and having a phosphorescent layer coating on its vacuum side, said window being permeable to light rays only, whereby electron rays are excluded and all but a negligible amount of light
30 rays can pass therethrough, and means to strengthen the window to prevent its collapse because of outside pressure.

2. A cathode ray device for photographing
35 oscillographs, comprising an evacuated tube, an anode and a cathode mounted within one end of said tube and adapted to emit a stream of electrons, pairs of deflecting plates within said tube for directing said stream of electrons, an even,
40 thin window mounted in the other end of said tube and positioned in the path of said electron rays and having a phosphorescent layer coating on its vacuum side, said window being permeable to light rays only, whereby electron rays are excluded and all but a negligible amount of light
45 rays can pass therethrough, and a screen-work the meshes of which have projections for supporting the window from outside pressure.

3. A cathode ray device for photographing
50 oscillographs, comprising an evacuated tube, an anode and a cathode mounted within one end of said tube and adapted to emit a stream of electrons, pairs of deflecting plates within said tube for directing said stream of electrons, an even,
55 thin window mounted at the other end of said tube and arranged in the path of said electron rays to close said other end of the tube from the atmosphere and having a phosphorescent layer coating on its vacuum side, said window being permeable to light rays only, whereby electron
60 rays are excluded and all but a negligible amount of light rays can pass therethrough, and a meshed screen-work to strengthen the window, the parts

of the window between the meshes of said screen-work being arched to support the window from outside pressure.

4. A cathode ray device for photographing
5 oscillographs, comprising an evacuated tube, an anode and a cathode mounted within one end of said tube and adapted to emit a stream of electrons, pairs of deflecting plates within said tube for directing said stream of electrons, an even, thin window mounted in the other end of
10 said tube and positioned in the path of said electron rays and having a phosphorescent layer coating on its vacuum side, said window being permeable to light rays only, whereby electron rays are excluded and all but a negligible amount
15 of light rays can pass therethrough, and a meshed screen-work having high-edged profiles for strengthening the window, the parts of the window between the meshes of the screen being arched for resisting outside air pressure.

5. A cathode ray device for photographing
20 oscillographs, comprising an evacuated tube, an anode and a cathode arranged within and at one end of said tube and positioned to emit a stream of electrons, deflecting plates within said tube
25 for deflecting the stream of electrons, a level glass window at one end of the tube to close the same from the atmosphere and positioned in the path of said electron rays and having a phosphorescent layer coating on its vacuum side,
30 the thickness of the glass window being reduced in numerous places to such an extent that said window is permeable to light rays only, whereby electron rays are excluded and all but a negligible
35 amount of light rays can pass therethrough, means for strengthening said window to prevent its collapse by the outside air pressure, a photographic casing containing a photographic reproducing layer for the production of a picture,
40 and means for retaining said casing with its production layer against the outside of said light permeable window.

6. A cathode ray device for photographing
45 oscillographs, comprising an evacuated tube, an anode and a cathode mounted at one end of said tube and adapted to emit a stream of electrons, pairs of deflecting plates within said tube for directing said stream of electrons, an even, thin window mounted in the other end of said
50 tube and positioned in the path of said electron rays and having a phosphorescent layer coating on its vacuum side, said window being permeable to light rays only, whereby electron rays are excluded and all but a negligible amount of light
55 rays can pass therethrough, means to strengthen the window to prevent its collapse because of outside pressure, a photographic casing containing a photographic reproducing layer for the production of a picture, and means for retaining
60 said casing with its production layer against the outside of said light permeable window.

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