

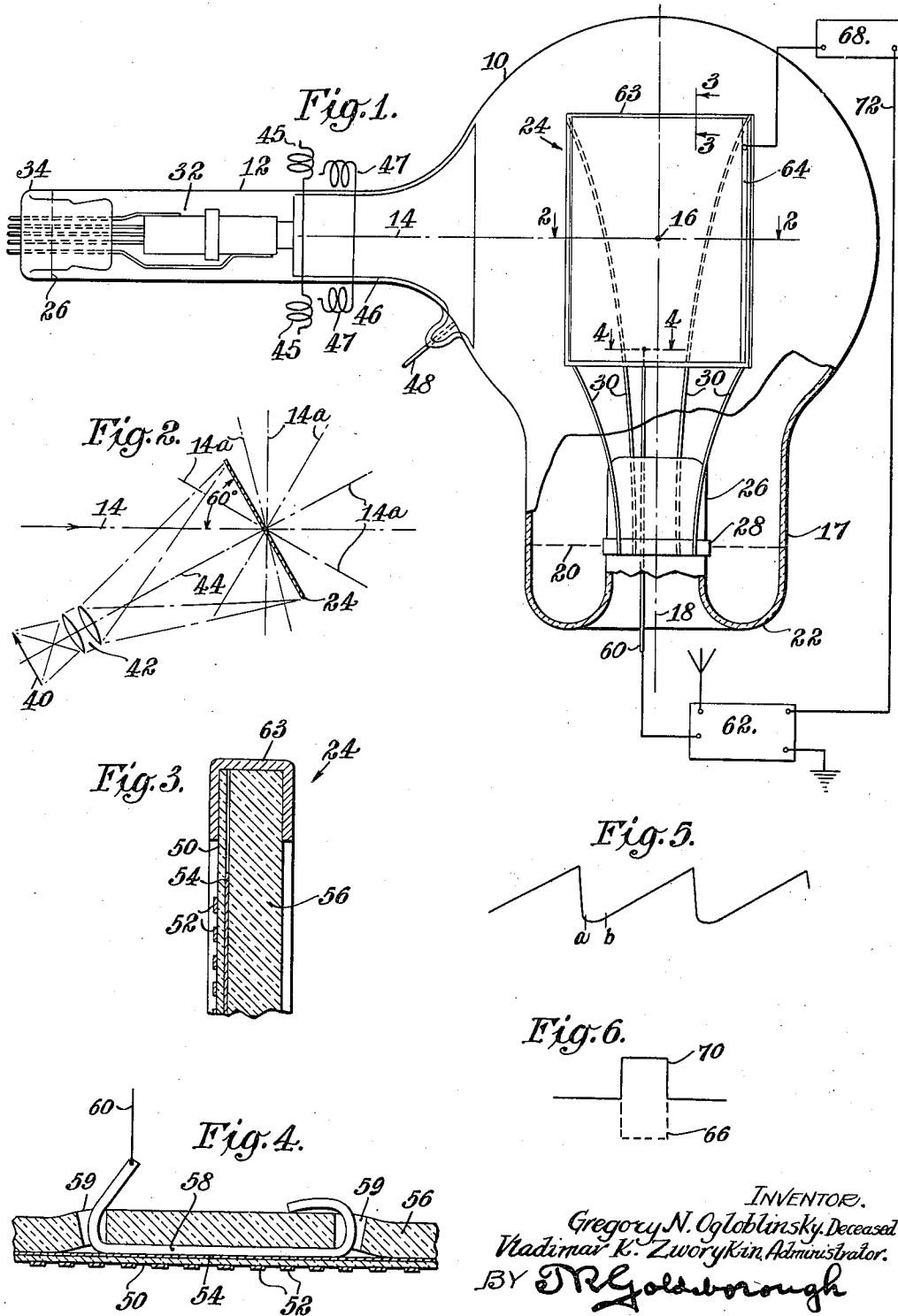
May 2, 1939.

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2,156,769

CATHODE RAY DEVICE

Filed Feb. 28, 1935



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UNITED STATES PATENT OFFICE

2,156,769

CATHODE RAY DEVICE

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Application February 28, 1935, Serial No. 8,667

5 Claims. (Cl. 250—153)

The invention relates to cathode ray devices and it has particular relation to cathode ray tubes of the mosaic electrode type that are utilized in television transmitters.

5 In a tube of the general type to which the invention pertains, there is mounted a mosaic target constituted by a conductive "signal plate" which carries a sheet of insulation and on the sheet are disposed an infinitely large number
10 of tiny photosensitive particles. Each photosensitive particle constitutes one electrode of a capacitor, the "signal plate," common to all of the particles, constituting the other electrode. When an optical image is focused on the photo-
15 sensitive particles, each of them acquires a charge proportional to the intensity of the illumination and its duration.

In order to translate the charges into a train of electrical impulses sequentially representing
20 elemental portions of the optical image, an electron gun is also mounted in the tube and is so directed toward the photosensitive particles that it may be caused to scan them rapidly from side to side and simultaneously relatively slowly from
25 top to bottom.

For deflecting the cathode ray, either electromagnetic or electrostatic forces may be utilized. It is customary to make use of potentials or currents which are fluctuating in character and
30 which, if applied to an oscillograph, would exhibit a wave shape analogous to the teeth of a saw. The potentials and currents are so chosen that the ray in its scanning moves more slowly in one direction across the mosaic target than
35 it returns to the starting edge.

Unfortunately, it has heretofore been impossible to obtain a saw-tooth wave having the desired sharpness. In other words, at one edge of the screen the ray would not start back im-
40 mediately, but would slow down somewhat and would pick up speed in the opposite direction relatively slowly. For this reason one edge of the received picture would be brighter than the other edge.

45 It is accordingly one object of the invention to provide an improved cathode ray tube of the type under discussion which, when utilized in a television transmitter, will not give rise to a received picture having an unpleasantly bright
50 edge.

Among other defects of prior art devices of the type under discussion may be mentioned the fact that the signal plate acquired spurious charges during operation, and the further fact
55 that it has been difficult to provide a sufficiently

thin sheet of insulating material between the photosensitive particles and the signal plate. A still further and more specific object of my invention, therefore, is to overcome these disadvantages and to provide a target that shall be more efficient.

The foregoing objects and other objects ancillary thereto are accomplished in short as follows:

An extremely thin sheet of mica is coated on one side with a chemically neutral metal, such as platinum. This may be accomplished through
10 use of any well-known platinizing liquid. The other side of the sheet is coated with silver in any well-known way and the silver coating is thereafter scribed in two directions at right
15 angles to each other in order to provide an extremely large number of minute metallic squares. These minute metallic squares are each later photosensitized. Obviously the mica sheet, which has a thickness of approximately one thou-
20 sandth of an inch, is too thin to be self-supporting, and supporting means of some kind must be provided. For this purpose, a plate of material, such as nickel or tantalum could be utilized, but the presence of large masses of metal in
25 the tube renders the operation of de-gassing more difficult. Therefore, in accordance with the invention, there is provided a supporting plate of relatively thick mica and it is clamped to the prepared plate by a metallic binding.
30

Further, in accordance with the invention, a tube blank is used comprising a spherical bulb portion, a neck portion extending radially out-
35 wardly therefrom to accommodate and support the electron gun, and a cylindrical extension extending radially outwardly from the bulb portion with its longitudinal axis perpendicular to the axis of the neck portion. In assembling the parts, the end of the cylindrical portion referred to is removed or opened, if not already
40 so, and the screen, assembled on a press, is inserted through this portion into the spherical portion of the tube and the parts are sealed together to close the end of the cylindrical extension.
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Further, in accordance with the invention, an electrical connection is made to the metallic layer of the screen by interposing a strip of metallic material between the two sheets of mica and
50 clamping the latter together at their edges.

The invention resides in the improved construction of the character hereinafter described and claimed.

For the purpose of illustrating the invention, 55

an embodiment thereof is shown in the drawing, wherein

Fig. 1 is a simplified, elevational view, partly broken away, of a television transmitting tube constructed in accordance with and embodying my invention;

Fig. 2 is a simplified diagrammatic view, partly in section, the section being taken on the line 2—2 in Fig. 1;

Fig. 3 is an enlarged, fragmentary, sectional view, the section being taken on the line 3—3 in Fig. 1;

Fig. 4 is an enlarged, fragmentary, sectional view, the section being taken on the line 4—4 in Fig. 1; and

Figs. 5 and 6 are graphical illustrations of the operating action in Fig. 1.

With reference to Fig. 1, the improved electron tube or device is made from a blank of transparent quartz glass comprising a spherical bulbous portion 10, a neck portion 12 extending radially outwardly therefrom with its longitudinal axis 14 passing through the center 16 of the bulbous portion, and a cylindrical extension 17 extending radially outwardly from the bulbous portion with its longitudinal axis 18 also passing through the center 16 of the bulbous portion and perpendicular to the axis 14 of the neck portion of the blank.

The end of the extension 17 of the tube blank is closed, and this is broken off or separated along the line 20 to provide a press 22 from which a screen 24 is supported within the spherical bulbous portion of the tube. For this purpose, the press 22 is shaped to provide a reentrant part 26 about which is placed a band 28 from which supporting wires 30 extend to the respective corners of the screen 24. After the screen is secured to the press 22, it is inserted into the bulbous portion 10 of the tube through the open end of the extension 17, after which the press is sealed to the extension 17 along the line 20.

Suitable means, in the form of an electron gun 32 for developing a ray of electrons, is mounted on a press 34 and inserted into the neck portion 12 of the tube, after which the press is sealed to the open end of the neck portion along the line 36. After this assembly, the gun 32 is in position with its axis coincident with the axis 14. The ray of electrons from the gun 32, when it is uninfluenced by a deflecting field or fields, is therefore normally coincident with the axis 14.

The axes 14 and 18 are perpendicular to each other, as shown in Fig. 1, and each extends through the center 16 of the spherical bulbous portion 10 of the tube.

The screen 24 is disposed in a plane perpendicular to the plane generated by rotation of the axis 14 about the axis 18, as illustrated in Fig. 2 by the broken lines 14a, representative of the axis 14 in different positions thereof as the same is rotated about the axis 18 in either direction to generate the plane to which the screen 24 is perpendicular.

The screen 24, furthermore, is disposed in a plane at an acute angle of 60°, as represented in Fig. 2, to the plane defined by the axes 14 and 18.

In operation of the tube, an image of the object 40 is projected onto the photosensitive surface of the screen 24 by a suitable optical system 42 whose axis 44 is perpendicular to the screen and extend substantially through the center thereof.

The ray of electrons is deflected horizontally at a relatively high rate by coils 45 and is simulta-

neously deflected vertically at a relatively low rate by coils 47 to scan a rectangular area of the screen 24, over which area an image of the object 40 is projected. A specific means and method for so deflecting the ray for this purpose is disclosed in the copending application of Gregory N. Ogloblinsky, Serial No 635,534, filed September 30, 1932.

The tube is provided on the inner surface thereof, and within the neck portion 12, with an electrode in the form of a conductive coating 46 from which a connection 48 extends through the wall of the tube. This electrode is maintained at a potential positive with respect to the potential of the usual anode part of the gun 32, and operates to accelerate the electrons toward the screen and to bring the ray to a good focus at the surface thereof. This electrode is also effective to remove secondary electrons.

The screen 24, as more clearly shown in Fig. 3, comprises a relatively thin sheet 50 of mica provided on one side thereof with a great number of minute, metallic, closely-spaced, photosensitive elements 52, and on its other side with a layer 54 of conducting material such as platinum. Satisfactory results have been obtained by making the thickness of the mica sheet 50 about .001 inch. The conducting layer is just thick enough to be opaque and to have the required conductivity. Against that side of the mica sheet 50 which is provided with the metallic layer 54, is placed a second, relatively thick sheet 56 of mica which acts as a support and imparts rigidity to the screen. The mica sheet 56 completely covers the metallic layer 54 as represented in Fig. 3, and is for this reason effective as a shield to prevent stray electrons from collecting on the screen over the metallized surface thereof and causing undesirable charges to collect on this surface.

The front surface of the mica sheet 50 may be provided with the minute metallic elements 52 by first placing on this surface a relatively thin metallic layer, and then ruling through this layer along two sets of parallel lines, the lines of one set being perpendicular to those of the other, as disclosed in the copending application of Harley A. Iams, Serial No. 663,451, filed March 30, 1933.

For the purpose of making a connection to the metallized surface of the screen 24, a strip 58 of conductive material such as nickel is interposed between this surface and the mica sheet 56, and its ends extend through slots 59 in the sheet and are bent over upon the outside surface thereof, as shown in Fig. 4. A connection 60 to the strip 58 passes through the re-entrant part 26 of the press 22, as shown in Fig. 1, and supplies picture signals to the usual amplifier and transmitter 62. A U-shape metallic strip 63 extends around the edge of the screen 24, and operates to clamp the mica sheets 50 and 56 together at their edges. It is proposed to bulge the metallic strip 58 slightly before it is placed in position between the mica sheets so that when the latter are clamped together this strip is flattened out somewhat to tension the same whereby a better contact is made with the adjacent metallized surface of the mica sheet 50.

As the cathode ray is deflected back and forth to scan the screen, it slows up at the end of the return lines. This causes one edge of the received picture to be brighter than the other edge. For the purpose of preventing this undesirable effect, it is proposed to provide the screen with a metal strip 64 on its front face and disposed

vertically, as shown, at an edge of the scanned area, so that it is in the path of the cathode ray at the end of each horizontal deflection thereof. That is, the apparatus is adjusted so that when the ray is at the end of a line and is about to be deflected back to scan the next line, as represented by the portion *ab* of the saw-tooth wave in Fig. 5, the metal strip 64 is being scanned to develop an impulse, represented at 66 in Fig. 6. This impulse is supplied to a suitable network 68 for adjusting its phase and amplitude so that it is substantially equal and opposite in polarity to the undesirable signal, represented at 70, which is developed at the time *ab* in Fig. 4. The impulses represented at 66 are supplied by a connection 72 to a stage of the picture-signal amplifier under conditions such that they are opposite in polarity to the impulses represented at 70. In this way, the undesirable impulses referred to are removed or compensated for.

From the foregoing it will be seen that there has been provided an improved construction adapted particularly for a television transmitting tube, and one which is relatively simple and rugged in construction, relatively easy to assemble, and in which a good electrical contact is made with the screen.

It will be understood that various modifications, within the conception of those skilled in the art, are possible without departing from the spirit of the invention or the scope of the claims.

The invention claimed is:

1. An electron device comprising a tube having a bulbous portion, a neck portion extending substantially radially outwardly from said bulbous portion with its longitudinal axis passing substantially through the center thereof, and an extension extending substantially radially outwardly from said bulbous portion with its longitudinal axis passing substantially through the center thereof and being substantially perpendicular to the longitudinal axis of said neck portion; a screen supported from said extension and disposed in said bulbous portion in a plane substantially perpendicular to the plane generated by rotation of the first-mentioned axis about the second-mentioned axis and at an acute angle to the plane defined substantially by said axes, and means disposed in the neck portion of said tube for developing a ray of electrons and directing the same at said screen with the ray normally substantially coincident with the axis of said neck portion.

2. In combination, an electron device comprising a tube having a bulbous portion, a neck portion extending substantially radially outwardly from said bulbous portion with its longitudinal

axis passing substantially through the center thereof, and an extension extending substantially radially outwardly from said bulbous portion with its longitudinal axis passing substantially through the center thereof and being substantially perpendicular to the longitudinal axis of said neck portion; a screen supported from said extension and disposed in said bulbous portion in a plane substantially perpendicular to the plane generated by rotation of the first-mentioned axis about the second-mentioned axis and at an acute angle to the plane defined substantially by said axes, means disposed in the neck portion of said tube for developing a ray of electrons and directing the same at said screen with the ray normally substantially coincident with the axis of said neck portion, and a lens system disposed on the same side of said screen as said means and with its axis substantially perpendicular to said screen.

3. In an electron tube, a screen for an electron device comprising two sheets of insulating material held together, one of said sheets being substantially thicker than the other, the inside surface of the thinner sheet being provided with a layer of conductive material, the outside surface of the thinner sheet being provided with photosensitive elements spaced and insulated from each other.

4. In an electron tube, a screen comprising two sheets of insulating material of differing thickness, a layer of conducting material between said sheets of insulating material, means for holding the two sheets of insulating material and the intermediate conducting layer together, and a coating of minute size photosensitive elements spaced and insulated from each other upon the outer surface of the thinner of the two sheets of insulating material.

5. In an electron tube, a screen comprising two sheets of insulating material, one of said sheets being substantially thicker than the other, a layer of conductive material covering the inner surface of the thinner of said two sheets of insulating material, a strip of flexible conducting material disposed intermediate said sheets and engaging said conducting layer to provide an electrical connection thereto, means for securing the two insulating sheets together, and a coating of minute size photosensitive particles spaced and insulated one from the other upon the outer surface of the thinner of said insulating sheet members.

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