

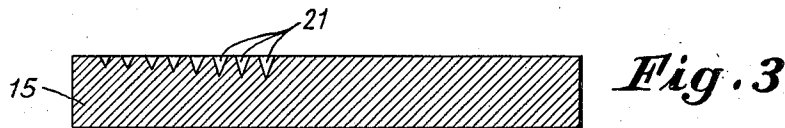
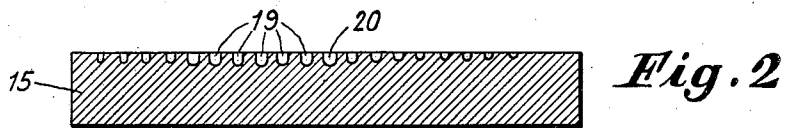
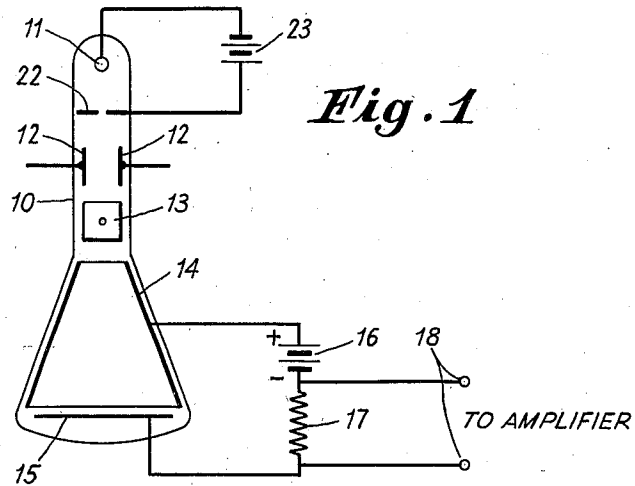
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CATHODE RAY TUBE

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CATHODE RAY TUBE

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5 Claims. (Cl. 250—150)

This invention relates to electric signalling, and in particular, to facsimile and television transmission systems utilizing cathode ray tubes.

In certain types of transmission it is desirable to scan a still picture or sign either for testing purposes, advertising, or for purposes of identification. For example, in a television transmitting station it is desirable at the end of a program to identify the station transmitting. This identification would comprise the call letters of the station and might include some symbol used as a trade-mark by the station. Such a symbol or picture may well be a half-tone picture.

Instead of using the studio scanner for scanning a picture surface of this sort, this invention teaches the use of a special scanner which makes use of the different secondary emission properties of two or more materials. According to this invention, the picture support is made of one material while the picture proper engraved, embossed or raised thereon is made of another material.

A cathode ray scans the picture area and depending upon whether the ray impinges an elemental area of the support or the picture proper, more or less electrons will be released in accordance with the secondary emission properties of the materials making up the support and the picture.

An electrode serves to capture the released electrons, and these electrons serve in turn to produce a voltage representative of the elemental area scan, which voltage may then be amplified by conventional means and used appropriately for transmission.

Accordingly, it is one of the objects of our invention to provide an improved method and means to transmit electro-optical effects.

Another object of our invention is to provide an improved method of transmitting half-tone pictures.

Another object of our invention is to provide an improved cathode ray method of transmitting pictures electrically.

A still further object of our invention is to provide an improved screened picture transmitting plate for use in cathode ray tube scanners.

Other and ancillary objects will appear upon reading the description and claims taken together with the drawing in which:

Fig. 1 shows schematically one embodiment of our invention with certain of the associated circuit connections; and

Figs. 2 and 3 show cross-sections of half-tone plates prepared in accordance with our invention.

Referring now to the drawing, our invention will be described in detail.

In Fig. 1 a cathode ray tube 10 is shown comprising a glass bulb designed partially as cylinder and as frustum of a cone. Within the glass bulb a cathode 11 is arranged equipped with a conventional electron optical arrangement for accelerating and for concentrating the electrons and which is not shown in the drawing since such arrangements are well known. Furthermore, in the glass bulb 10 two pairs of deflecting plates 12 and 13 are arranged as well as an electrode having the shape of a frustum of a cone and which may, for instance, be designed as wall layer.

Item 15 designates a metal screen arranged at the lower end of the tube parts formed as cone frustum. The cathode rays emanating from the cathode 11 are deflected in such manner by means of the deflecting plates 12, 13 which have saw-tooth shaped scanning voltages of different frequencies applied thereto, so that the focused point of the cathode rays traces lines on the screen 15 which are closely adjacent each other, in the manner well known for cathode ray type image scanners for television purposes.

As shown in Fig. 2, the screen 15 may consist of a metal plate formed of aluminum for instance, on which the half-tone image is arranged in accordance with the half-tone screening method for instance, by photographic means. The half-tone image then consists, for instance of a constant number of screened points for each surface unit of the plate 15 to be scanned whereby the respective size of the screened elements depends on the tone value of the respective elemental area of the image. That is to say, the size of the recessed area is proportional to the density of the elemental area of the picture. In a manner similar to that employed in the making of printing plates, the metal plate 15 can be subjected to an etching process such that for each screen element a depression 20 is produced in the metal plate. These depressions will then be filled in with a secondary emission material 19 such as carbon, for instance, whose value of secondary emission is smaller than that of aluminum, and the metal plate 15 is then mounted in the cathode ray tube. When the cathode ray moves across the plate 15, it causes at each surface element of this screen an emission of secondary electrons which depends upon the size of the screen elements.

If within a surface element of the plate, a plate element having a very large dimension is

situated the secondary emission of this surface element is substantially determined by the material of the plate 15. If however, the ray impinges on a surface element almost completely filled by the secondary emissive material 19, a quantity of secondary electrons is produced determined by the material with which the depressions of the screen are filled in. The secondary electrons produced on the screen move towards the electrode 14 by the action of the accelerating voltage source designated by 16 in Figure 1, since this voltage source produces a field between the screen 15 and electrode 14 which accelerates the secondary electrons. From the electrode 14 current flows across the voltage source 16 to the plate 15 and returns to a resistor 17 at which the image signals corresponding to the respective tone value of the elemental areas of the image can be derived. A suitable conventional amplifier may be connected to the terminals 18 for raising the generated signals to an appropriate level.

The plate 15 may also be designed in the manner shown in Fig. 3. Here the recessed elements consist of approximately cone-shaped depressions whereby the depth of the individual cones is different and depends on the tone value of the respective place of the image, while the base of the individual cones has approximately the same size for all elements. A screen so designed likewise possesses the property of emitting secondary electrons depending on the individual places of the image, since in fact, the cathode ray impinges on the walls of the cone-shaped depressions at different angles in accordance with the depth of the cone. Therefore in such a plate it is not necessary to use a material whose secondary emission property is different from that of the plate metal proper.

A screen according to Fig. 3 may be produced for instance in accordance with an engraving process for instance in such manner that the image is at first divided into zones having the same half-tone, whereafter within each zone, cone shaped depressions having a definite depth corresponding to the tone value are worked in by mechanical means or through an etching process.

Finally, a screen of the type to be used in accordance with the invention may also be produced by carrying out a division of the image in accordance with zones having the same gray value and by arranging within each zone for instance with mechanical means, a number of depressions per surface unit of the plate, said number depending upon the density of the elemental area of the picture. This can be done in a manner similar to that known from copper etchings. As in the case of the depressions mentioned in connection with Fig. 2, these depressions are filled in with a material having a property of emitting secondary electrons different from that of the plate.

Having now described our invention, what we claim is:

1. A cathode ray tube comprising an envelope, means for producing a focused beam of electrons within the envelope, means for deflecting the produced focused beam of electrons, a planar electrode of predetermined specific electron emissivity, said electrode having isolated minute recessed portions forming a half-tone picture, the areas in the plane of the surface of the electrode of said recessed portions corresponding to the

density of elemental areas of the half-tone, and means to collect secondary electrons emitted from the unrecessed and recessed portions of the electrode under the impact of the deflected focused beam.

2. In combination, means for producing a focused beam of electrons, a target electrode of predetermined specific secondary electron emissivity, said electrode having isolated minute recessed portions forming a half-tone picture, the areas in the plane of the surface of the electrode of said recessed portions corresponding to the density of elemental areas of the half-tone, means for deflecting the focused beam to scan the electrode and the isolated recessed portions to cause secondary electrons to be emitted from the target and the recessed portions, and means to collect the emitted secondary electrons.

3. A cathode ray tube comprising an envelope, means for producing a focused beam of electrons within the envelope, a planar metallic electrode of predetermined specific secondary electron emissivity and isolated minute recessed portions forming a half-tone picture, the areas in the plane of the surface of the electrode of said recessed portions corresponding to the density of elemental areas of the half-tone, a secondary electron emissive material filling for each of the said recessed portions, said secondary electron emissive material having a specific emissivity different from the predetermined specific emissivity of the metallic electrode, means for deflecting and projecting toward the electrode the produced focused beam of electrons and electrode means to collect secondary electrons emitted from the filling material and the electrode under the impact of the deflected focused beam.

4. An electron device comprising an envelope, an electron gun for producing a beam of focused electrons positioned within the envelope, a metallic target electrode of predetermined specific secondary electron emissivity positioned in register with the electron gun, a half-tone picture formed of material with a specific secondary electron emissivity different from that of the target electrode imbedded in the target electrode, the areas in the plane of said electrode of said material corresponding to the density of the elemental areas of the picture, means intermediate the gun and electrode for scanning the target electrode and the half-tone picture therein by the focused beam of electrons, and electrode means intermediate the target and means for scanning for collecting secondary electrons emitted from the imbedded half-tone picture and the target electrode under the impact of the deflected focused beam of electrons.

5. A cathode ray tube comprising an envelope, means for producing a focused beam of electrons within the envelope, means for deflecting the produced focused beam of electrons, a planar electrode of predetermined specific electron emissivity, said electrode having isolated minute conically recessed portions forming a half-tone picture, the depth of said portions corresponding to the density of the elemental areas of the picture, and means to collect secondary electrons emitted from the unrecessed and recessed portions of the electrode under the impact of the deflected focused beam.

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