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PHOTOELECTRIC PLATE FOR TELEVISION TUBES

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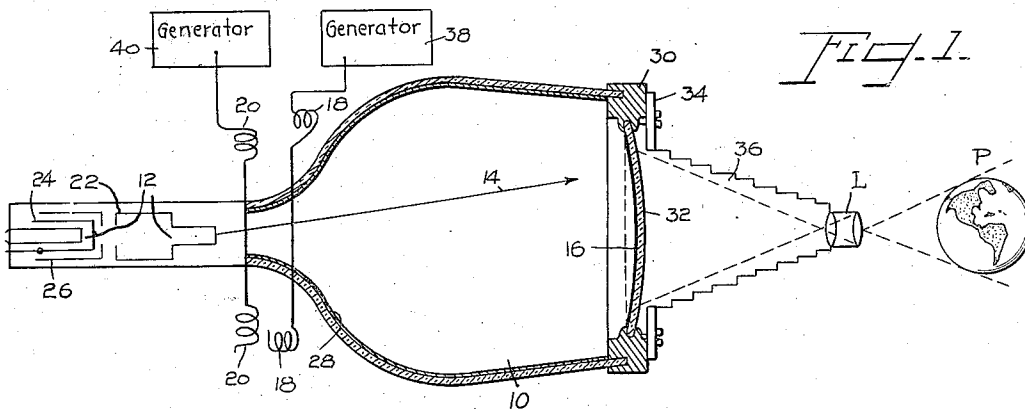


Fig. 2

Fig. 3

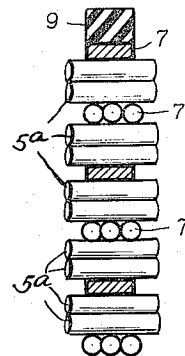
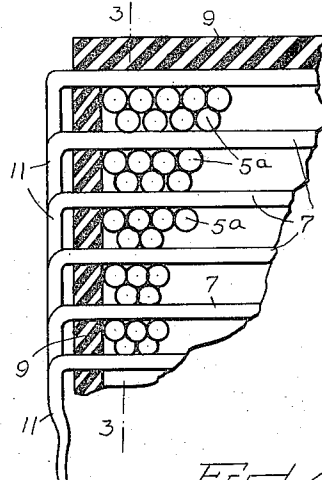
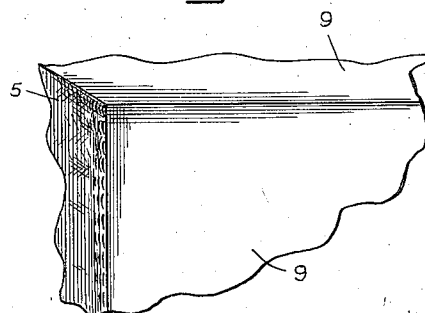


Fig. 4



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## UNITED STATES PATENT OFFICE

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PHOTOELECTRIC PLATE FOR TELEVISION  
TUBE

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5 Claims. (Cl. 250—27.5)

My invention relates to television and more particularly to improvements in television transmitting and receiving devices, of the type in which the scanning step is performed by means of a cathode-ray beam.

With the foregoing in mind, the chief object of the present invention is to provide a television system by which all the disadvantages and shortcomings of prior devices may be avoided and which comprises the construction of an entirely novel cathode-ray apparatus including as its main feature a light-sensitive screen located intermediate the electron gun and the lens or lens system so as to receive continuously and simultaneously the picture light on one of its surfaces and the scanning beam on the opposite surface, the lens and the electron gun being axially in line with the center of the light-sensitive screen.

Another object of my invention is to provide a novel light-sensitive structure formed of suitable particles or globules of a conductive metal sensitized by means of a coat of potassium or other photo-sensitive material and insulated each from the other, in combination with an insulated grid of parallel or meshed wires disposed adjacent to or embedded in said layer of sensitized particles, thereby permitting the picture light or the electronic beam, or both, to strike effectively upon any of the opposite surfaces of the screen.

Another object of my invention is to provide a cathode chamber in which the electronic beam or pencil may be deflected in perfect synchronism with the electronic beam at the receiver end of the television system by virtue of the fact that the length and angle of incidence of the electronic beams are exactly the same in the transmitting and receiving cathode chambers at any instant.

Other objects and advantages of the invention will become apparent from the following description and appended claims taken in connection with the accompanying drawing, in which:

Figure 1 is a sectional diagrammatic view of a cathode ray transmitting apparatus comprising an electron gun, a cathode chamber, a light-sensitive screen, a focussing plate adjacent to said screen and a camera or optical chamber, embodying the present invention.

Figure 2 is a schematic view greatly enlarged of a corner of the light-sensitive screen embodying one of the preferred forms of this invention formed of a bank of very short lengths of insulated thin wire disposed in double rows horizontally, every pair of rows being separated from the adjacent pairs by means of insulated wires or thin ribbons extended transversely of the rows of

wires from one edge to the opposite edge of the screen and with their free ends electrically connected together. Only a few photocathodes are shown but, as will be readily understood, the size of the wires can be so reduced that several thousands would be required to fill the space of one square inch.

Figure 3 is a sectional view taken on line 3—3 of Fig. 2 showing the manner in which the short wires lie between the transverse long wires or metallic ribbons.

Figure 4 is a perspective fragmentary view of a multiple unit wire cable made by following the principle of the telephone subscribers' multiple unit wire cables, from which relatively thin slices may be cut with a cross section similar to that illustrated in Figure 2.

According to my invention, the energy of the charges will be many times greater for a given frequency than has been possible of attainment by any of the other methods requiring intermittent projection of the object light as well as intermittent scanning. In consequence, the outstandingly important feature of this invention, that of having both steps, the scanning and light projection, performed simultaneously and continuously upon the opposite sides of the light-sensitive screen, represents an enormous advantage in television not only on account of the perfect definition of detail or resolving power which is thus made possible but also because of the complete synchronization which can only be accomplished by having the electronic beam at both ends function exactly with the same angle of incidence at any instant, as provided by this invention, besides the unique feature of providing changeable mounts for any kind of optical devices furnished with image-forming lenses of the largest light gathering power and constructed of very large dimensions, whereby more light can be utilized.

All the positive charges being stored in the photocathodes between succeeding explorations are acted upon by the negative current carried by the electronic beam with the result that electromagnetic radiation is developed, the short radio waves being instantly picked up by the conductive member disposed adjacent to or interlaced with the photocathodes in the form of a grid or screen of parallel, crossed or meshed wires, or a perforated plate, or transverse members interposed between rows of photocathodes, as will be described more in detail hereafter, for their amplification and transmission in the usual manner.

At the receiver end, a similar cathode chamber is provided but instead of the relatively thin light-

sensitive screen, a receiving surface is located at the opposite end of the chamber facing the electron gun, formed of an equal number of wire "cathodes" having exactly the same arrangement as those in the sending end but instead of these cathodes being made of very short lengths of sensitized wire they really consist of the bare ends of a great number of long insulated wires packed in the fashion of the well known telephone subscribers' multiple unit wire cables, the other end of each wire being connected to the corresponding cell of a glow panel for the re-composition and visual reproduction of the transmitted picture. It will be obvious that the size of the wires and gun at the receiver end may differ from the size of the corresponding wires and gun at the sending end, according to voltage requirements, but the relative position of the gun with respect to the receiving "screen" or surface and the number and disposition of the mosaic elements should preferably be the same at both ends.

Now, with particular reference to Figure 1, the numeral 10 indicates a cathode chamber made of glass or other suitable material, exhausted to a high degree of vacuum in the manner known in the art; the electron gun 12 serves to develop a beam of electrons 14 for scanning the inside surface of a light-sensitive screen structure 16; a pair of electromagnetic coils 18, operates to deflect the electronic beam horizontally and a second pair of electro-magnetic coils 20, deflects the beam vertically; first anode 22, cathode 24 and control electrode or grid 26 are parts of the electron gun 12 and operate in the usual manner; the second anode 28 takes the usual form of a silvering on the inside wall of chamber 10; an air tight frame 30 seals the open end of the vacuum chamber 10 and carries the image plate 32 adjacent to or supporting the light sensitive mosaic 16; an adjustable frame 34 secures the motion picture camera 36 which is furnished with an objective lens L. The object P is shown in the form of the earth to suggest the practical unlimited possibilities of the transmitting apparatus embodying my invention.

In operation, the light coming from the object to be telegraphed is focussed on the image plate 32 by the objective L and projected onto the light sensitive mosaic 16. The signals developed in the mosaic by the action of the electronic beam upon the positive charges in the photocathodes will pass through the terminal conductor 7 (Fig. 2), toward the amplifiers and other units of the system, to be placed upon a high frequency carrier for transmission in the usual manner.

An important feature of the present invention resides in the novel type of apertured screen or "pick-up" used in combination with the light sensitive mosaic for the purpose of picking up the image impulses or short radio waves developed in the photocathodes. This construction permits the simultaneous action of the object light on one side of the mosaic and of the electronic beam on the opposite side. As the mosaic surface is positively charged, the electrons flowing through the meshed wires will reach all the photocathodes, and the electro-magnetic radiation will be discharged through the wire screen. The mosaic may be formed of a bank of short thin wires lying side by side in cord-wood fashion and firmly adhered to each other by means of their own insulating coating or with the aid of a suitable adhesive filler. Said bank of short wires may be sliced from a continuous cable comprising a great number of extremely fine insulated wires dis-

posed in a manner similar to that used to build up the telephone subscribers' multiple unit wire cables. Any convenient method may be followed to cut the slices, as for example by using a cutter similar to those used in petrology to cut rock in slices as thin as a piece of paper for microscopical examination. The thin mosaic is then attached to the image plate (32) with the insulated apertured screen adjacent or attached to any of its surfaces. In case the image plate is of concave shape, then the mosaic and its associated conductive screen should be previously shaped, jointly or severally, so as to exactly fit the concave plate.

Figure 4 illustrates a fragment of a squared cable comprising a great number of extremely fine insulated wires 5 firmly packed and adhering to each other, from which the thin slices may be cut off for the preparation of the mosaic structures. This view is also greatly enlarged.

Instead of the short wires forming the mosaic just described, a colloidal deposit of potassium hydride containing minute particles or globules of silver may be formed over one surface of the apertured screen or wire cloth and treated in any suitable manner so as to form a layer of minute photo-cathodes; or else, the colloidal deposit may be formed directly over the glass surface of the image plate 32 by following the practice customary in the highly developed photographic art. The apertured metallic sieve may then be placed over the photoelectric layer of potassium, unless it is preferred to use instead of the sieve or screen a series of fine threads of silver deposited within parallel or crossed grooves ruled over the surface of plate 32 and insulated from the photoelectric layer. Instead of silver any other metal or alloy may be used and as a photoelectric material caesium or other alkali metal may be employed too. It should be understood that the insulation of the apertured conductive screen must be made of a non light-sensitive material.

In Figures 2 and 3 a modified form of mosaic structure is shown in which the short fine wires are disposed in double rows 5a, each pair of rows being separated from the adjacent pairs by groups of wires or thin metallic ribbons 7 extended transversally from one edge to the opposite edge of the mosaic. These transverse members are insulated along their lengths except at their free ends 11 which are bare and connected one to the other in succession so as to form a conductive passage properly insulated as a whole for the image current. The narrow clearances between the transverse members 7 may be filled with any suitable insulating hard material 9 which also constitutes a reinforcing frame for the mosaic. The mosaic structures may also be sliced from a cable-like piece in a manner similar to that described in connection with Figure 4, the only difference being that the wires are disposed in double rows separated by transverse members as shown in Figures 2 and 3, while the mosaic cut from the cable illustrated in Figure 4 is formed of short fine wires only, the conductive screen structure being attached later as a separate member.

These short fine wires forming the mosaic according to my present invention may be made from silver wire or any other metal or alloy having good conductive properties. The mosaic surfaces, formed of the bare ends of said wires, may be covered with potassium or any other photoelectric material in order to render them, or any one of them, sensitive to light.

Various modifications and changes may be made in the apparatus described without depart-

ing from the spirit of the invention and, therefore, my invention should be interpreted as including such changes or modifications with no other limitations than those derived from the scope of the appended claims.

What I claim as my invention is:

1. A photoelectric plate for use in television apparatus, comprising a plurality of wires disposed in double rows, a terminal conductor disposed adjacent to and between the said double rows of wires, and dielectric means interposed between the terminal conductor and the wires, the ends of the latter carrying a photoelectric material.

2. A photoelectric plate as claimed in claim 1, in which the said wires are disposed in rows and the said terminal conductor comprises a plurality of branches disposed adjacent each double pair of rows of said wires.

3. A photoelectric plate for use in television apparatus, consisting of a dielectric material, a plu-

rality of conductors carried by said material, said conductors being insulated from one another, a plurality of conductor ends being exposed and extending beyond the front surface of the plate and being provided with photoelectric material, and a terminal conductor mounted on the dielectric plate between said conductors.

4. The plate claimed in claim 3 in which said conductors are disposed in spaced apart rows and said terminal conductor comprises a plurality of branches extending between the said spaced rows of the conductors.

5. The plate claimed in claim 3, in which said conductors are disposed in a plurality of double rows spaced apart from each other and said terminal conductor comprises a plurality of extensions mounted between the said spaced apart double rows.

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