

Dec. 28, 1943.

E. PIETSCHACK

2,337,569

METHOD OF PRODUCING MOSAIC ELECTRODES

Filed May 14, 1940

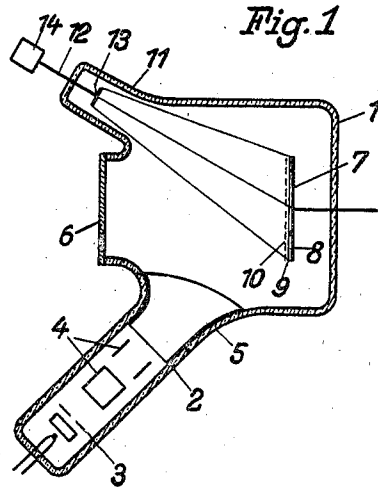


Fig. 2

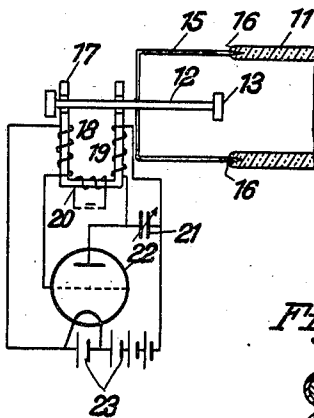


Fig. 3

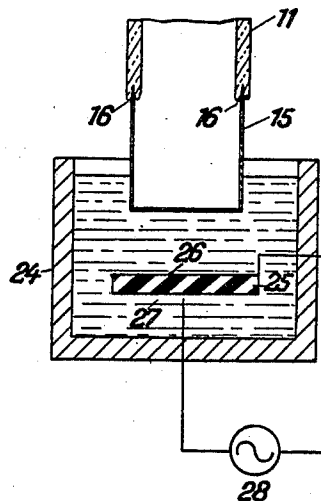
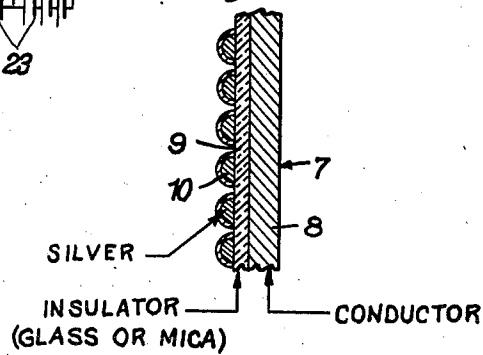


Fig. 4.



Inventor:
ERNST PIETSCHACK

BY *Charles D. Hartman*
ATTORNEY

UNITED STATES PATENT OFFICE

2,337,569

METHOD OF PRODUCING MOSAIC
ELECTRODESErnst Pietschack, Berlin-Charlottenburg, Ger-
many; vested in the Alien Property CustodianApplication May 14, 1940, Serial No. 335,125
In Germany May 20, 1939

6 Claims. (Cl. 250—167)

The invention relates to a method of producing electrodes having a multiplicity of photoelectric elements upon an insulating or half conducting carrier, as for example are required in television pick-up tubes of the charge storage type.

It has been suggested to make electrodes of this type by applying a continuous metal layer, as for example of silver upon a carrier with insulating qualities as for example glass or mica. This layer is heated to a comparatively high temperature so that it breaks up into separate metal particles. This mosaic is then sensitized in the manner known from the art of making phototubes. The silver layer has been made very thin, as for example 0.1 micron or less, and it has been heated up to 500° C. in an atmosphere containing oxygen.

It is an object of the invention to avoid the necessity of heating the electrode to so high a temperature. It is a further object to avoid the detrimental influence of the heating process on the insulating material of the carrier. It is a further object to produce a mosaic in which the single elements are well insulated from one another and are all of nearly the same size. A further object is to provide a method of breaking up the coherent metal layer into small particles within a closed metal receptacle at room temperatures, and to use this method particularly as a step in the process of making a light-sensitive mosaic electrode for television tubes.

According to the invention the metal layer is treated with supersonic waves. The treatment is carried out at comparatively low temperatures, in some cases even at room temperature.

The method of exposing the metal layer to the influence of the supersonic waves can be carried out as a step in the process of making photo-sensitive electrodes. The silver layer produced upon an insulating carrier or insulating layer is broken up by means of supersonic waves and the mosaic layer is then oxidized. An active metal may be evaporated upon the mosaic and a heavy metal may be applied afterwards in order to reach the highest light sensitivity. According to the invention it is also possible to activate the continuous metal layer and to break up the continuous photoelectric cathode into individual photoelectric elements under the influence of supersonic waves. This latter method has the advantage that the single light-sensitive elements are very well insulated from each other, whereas in the methods as hitherto used the caesium applied during the activation covers also

the space between the elements and lowers the insulation properties of the space.

Other aspects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing,

Fig. 1 shows a cross section of a television tube of the storage type with a device for carrying out the method of the invention.

Fig. 2 shows a section through a magnetostrictive supersonic wave generator.

Fig. 3 a section through a piezoelectric supersonic wave generator.

Fig. 4 is a cross section of a portion of the television tube of Fig. 1.

In the embodiment shown in the drawing an activated continuous photoelectric cathode shall be broken up into photoelectric elements by means of supersonic waves. The arrangement shown in Fig. 1 includes a receptacle 1, as, for example, of glass, having an extension 2 containing an electron gun 3, deflecting electrodes 4 and a focussing electrode 5. The receptacle includes furthermore a plane window 6 opposite a mosaic cathode 7 upon which the optical image of the scene is produced. The mosaic electrode 7, which is shown in greater detail in Fig. 4, consists of a metallic signal plate 8, an insulating or semi-conducting dielectric layer 9 and the mosaic layer 10. The receptacle contains an extension 11 in which the supersonic generator is arranged opposite the photoelectric cathode. The generator of Fig. 2 is a generator of the magnetostrictive type. It consists of a metal rod 12 of ferromagnetic material, a plate 13 for radiating the waves, and the supersonic wave exciter 14.

The method is, for example, carried out as follows: The photoelectric cathode is activated in the manner known in the art of making phototubes, as, for example, by evaporating a continuous silver layer upon the dielectric layer and oxidizing the silver layer. Upon the layer of silver oxide produced in this manner a continuous layer of caesium is evaporated in such a thickness that a maximal photoelectric effect is produced. The receptacle 1 is then filled with an inert gas. It may be preferable to produce a high pressure within the tube. Then the supersonic wave generator situated in the extension 11 is excited so that the supersonic waves hit the cathode plate and the continuous photoelectric cathode is broken up into individual elements of

desired size. The inert gas is then exhausted and the extension 11 is removed from the tube.

A supersonic wave generator similar to that of Fig. 1 is shown in Fig. 2 on a larger scale. The metal rod 12 has plates at its ends so that the waves are better radiated from the ends. The rod is fitted into a metal cap 15 and this metal cap is fused to the extension 11 at the edge 16 thereof. A magnetic yoke 17 surrounds the outer part of the rod. The yoke carries a coil 20 fed from a source of direct current, and also a grid circuit coil 18 and an anode coil 19.

The coil 19 and the condenser 21 are arranged in the anode circuit of an oscillator tube 22. The coil 18 is connected between the grid and the cathode of the tube 22. The anode voltage is derived from a battery 23. The rod 12 is excited by the electrical circuit to make longitudinal vibrations. It is arranged in such a manner that the point of connection with the metal cap 15 is situated at a nodal point of vibration.

Another type of generator is represented in Fig. 3. This generator is of the so-called piezoelectric type. A piezoelectric crystal 25, as for example of quartz, is situated between two electrodes 26 and 27 within a receptacle 24 filled with oil. An alternating current is applied from a source 28 to the two electrodes. The vibrations produced by the crystal and imparted to the oil excite the metal cap 15 and are radiated in the direction of the photoelectric cathode. The supersonic waves can also be applied to the photoelectric cathode 7 by means of a solid wave-conductor, as, for example, through the supporting elements of the electrode.

In a similar manner the metal layer upon the dielectric layer can be broken up before the cathode is sensitized. The method is simplified in this case by introducing the plate carrying the silver layer into a fluid medium, as, for example, the oil bath of a piezoelectric generator.

The mosaic electrodes produced in accordance with the invention are broken up into very small elements so that even in case a very small cross section of the cathode ray is used in the tube, still sufficient photoelectric elements are scanned simultaneously as are necessary for producing an image transmission of good quality.

What I claim is:

1. The method of breaking up a continuous metallic layer into small particles including the steps of applying the metallic layer to an insulating carrier, generating supersonic mechanical waves, and exposing said layer to said supersonic waves.

2. The method of breaking up a photosensitive layer into small particles including the steps of producing a photosensitive layer on a carrier plate, generating supersonic mechanical waves, and exposing said layer to said supersonic waves.

3. The method of breaking up a photoelectric layer into small particles including the steps of producing a photoelectric layer on a carrier plate, generating supersonic mechanical waves, and directing said supersonic waves onto said layer at room temperature until a mosaic electrode of evenly distributed photoelectric elements is produced on said carrier.

4. The method of breaking up a photoelectric layer into small particles including the steps of producing the photoelectric layer on a carrier plate, generating supersonic waves, and directing said supersonic waves onto said layer at room temperature within an atmosphere of an inert gas until a mosaic electrode of evenly distributed photoelectric elements is produced on said carrier.

5. The method of producing a mosaic electrode within a gas tight receptacle including the steps of introducing a carrier plate into said receptacle, photosensitizing said plate to form a photosensitive layer thereon, filling said receptacle with an inert gas, placing a supersonic wave generator opposite said plate, exciting said generator to produce supersonic waves in said gas, thereby to break up said photosensitive layer into small particles.

6. The method of producing a mosaic electrode for a charge storage tube including the steps of applying a metallic layer to a carrier plate, exposing said metallic layer to supersonic mechanical waves, and sensitizing the metal particles produced under the influence of said supersonic waves.

ERNST PIETSCHACK.