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MOSAIC ELECTRODE STRUCTURE

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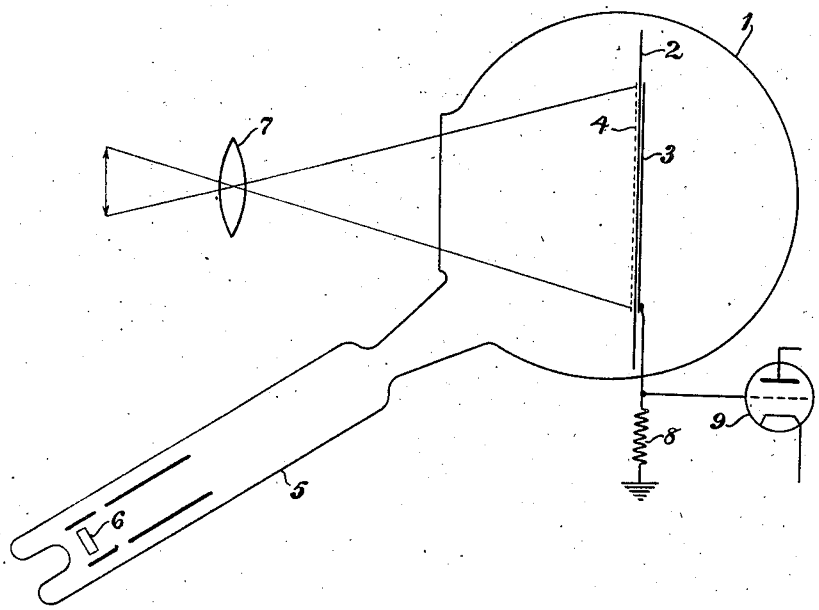

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MOSAIC ELECTRODE STRUCTURE

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This invention relates to mosaic electrode structures for use in cathode ray television and similar apparatus. The invention is concerned with the kind of mosaic structure in which a multiplicity of mutually insulated metallic elements are formed on the surface of an insulating carrier or base plate.

In television transmitting systems use is sometimes made of a cathode ray tube transmitting apparatus comprising a mosaic electrode structure consisting of a multiplicity of mutually insulated photo-sensitive elements upon which an image of an object for transmission is projected the individual elements acquiring electrostatic charges according to the intensity of the incident light image and the elements are periodically restored to a datum value on being scanned by a cathode ray beam, or in some cases by a light beam, restoration of the elements to the datum potential generating in a conductive signal plate associated with the mosaic electrode picture signals suitable for transmission.

In other forms of cathode ray television transmitting tubes an electron image of an object for transmission is projected onto a mosaic structure, which in this case is not rendered photo-sensitive, the electron image releasing secondary electrons on impact with the mosaic screen, the release of secondary electrons causing the elements of the screen to acquire electrostatic charges which are periodically restored to a datum value by scanning with a suitable scanning beam.

Heretofore in the manufacture of mosaic electrode structures it has usually been the practice to coat a supporting base plate, usually of mica, with a layer of silver, and to heat the base plate with the silver layer to a sufficient degree to cause the silver to aggregate and assume a globular formation, the globules so formed affording a multiplicity of minute insulated elements which, when used in the first-mentioned type of cathode ray tube, are rendered photo-sensitive. The manufacture of mosaic electrode structures in this manner is fully referred to in the specification of British Patent No. 407,521.

The process of making mosaic electrode structures as heretofore adopted has necessitated heat treatment of the silver layer in order to cause aggregation into minute globules.

It is the object of the present invention to provide an improved method of making mosaic electrode structures in which the necessity for heating the electrode for the production of the mosaic formation is avoided.

According to the present invention a method of making a mosaic electrode structure is provided in which a suitable metal is applied to an insulating base-plate or support in a sufficiently thin layer that the particles of metal deposited on the base-plate are adequately insulated from one another whilst a sufficient number of particles is applied to the surface as effectively to constitute a mosaic electrode without the necessity of heating the metallic layer to cause aggregation into minute globules. The metal employed for coating the base-plate, which is preferably a sheet of mica, will in most cases be silver since this metal is found to be particularly suitable for use in the invention and can be readily oxidised when it is desired to prepare a photo-sensitive mosaic electrode since the silver-oxide has great affinity for the usual photo-sensitive material employed, namely, caesium.

It is practically impossible to measure in linear dimensions the thickness of the layer which is sufficient to afford the elements without the insulation between the elements being reduced to a degree lower than that considered necessary in practice. However, in the following specific description of the invention an indication will be given of the manner of forming a sufficiently thin layer for use in accordance with the invention.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying diagrammatic drawing which illustrates one form of cathode ray television transmitting tube in which a photo-sensitive mosaic electrode in accordance with the invention can be employed.

The television transmitting tube shown in the drawing comprises an evacuated envelope **1** in which there is suspended in known manner a mica support or base-plate **2** having on one side a conductive signal plate **3** and on the other side a mosaic structure indicated by the dotted line **4**. In a tubular portion **5** of the envelope there is provided a cathode **6** associated with other electrodes in known manner which serves to focus a beam of electrons emanating from the cathode **6** for the purpose of scanning the mosaic screen **4**, the beam being deflected in known manner by suitable coils or electrostatic deflection plates. In the form of apparatus shown in the drawing the mosaic structure is rendered photo-sensitive and on projecting an optical image onto the mosaic structure through a suitable optical system indicated at **7**, the elements of the mosaic structure emit photo-electrons causing the elements to become electrostatically charged and these charges are periodically restored to a datum potential by scanning with the electron beam, restoration of the elements to the datum potential generating in the signal plate **3** picture signals which are developed across a resistance **8** and are fed to an amplifier for amplification prior to transmission, the first valve of the amplifier being indicated at **9**. In the manufacture of the electrode structure **4**, a layer of silver is usually applied to the support **2** and the support is subsequently heated to cause the silver to assume a globular formation, as stated above. In accordance with the present invention a sufficiently thin layer of a suitable metal, preferably silver, is applied to the mica support **2**, the thinness of the layer being such that the particles of the metal are adequately insulated from one another and are sufficient in number so as to function effectively as a mosaic structure.

It has been found, as a result of experiment, that with a certain thickness of coating a critical condition is reached. At this thickness the superficial specific resistance of a silver layer jumps suddenly from an unmeasurably high value to a comparatively low value (e. g., 10^{-3} to 10^{-6} Ω/cm.^{2}), the latter value depending greatly on the surface condition of the base-plate. At this critical value the film of metal applied to the surface is either substantially continuous or discontinuous, it being appreciated that a discontinuous film is one that is required for the purpose of the present invention. In most cases the insulating support plate will be made of mica and by using this material or some other form of transparent insulating plate, the correct amount of metal to be applied to the base-plate can be readily ascertained. With such a base-plate it is found that when the transparency of the base-plate is reduced by the metallic coating to approximately 70–80% of its original value, a coating of silver sufficiently thin for the purpose in view will be provided. The silver is preferably applied to the surface by evaporating the silver thereon in vacuo. The transparency of the mica can be readily ascertained by projecting light through the mica onto a photo-cell and connecting the photo-cell to a microammeter. The reading of the microammeter is noted when light is projected through the untreated mica base-plate and when during treatment the reading of the microammeter has fallen to approximately 70–80% of its original value a coating of the required thinness will have been applied to the mica.

If necessary, the support can be weighed before and after the evaporating process and the amount, by weight of silver, necessary for the layer, can be ascertained, and for the manufacture of subsequent electrodes one or more tungsten or other suitable filaments or coils may be plated with the required weight of silver, the tungsten coils being then used for the manufacture of further electrodes the silver deposited on the tungsten filaments or coils being evaporated onto the support transparent or otherwise by heating the filaments.

It may be mentioned that the critical thickness of layer above mentioned, for silver, occurs when the transparency of the metal film to transmitted light is approximately 70–80%, and hence, providing this critical value is not reached, mosaic electrodes can be constructed sufficient for practical purposes without the necessity of heating the layer to cause aggregation, as has heretofore been considered necessary.

For the purpose of obtaining a layer of uniform thickness the apparatus described in the specification of British Patent No. 480,946 may be used.

When the required amount of silver necessary to form the thin layer has been determined in the manner described above, the mosaic electrodes can be manufactured in situ within the evacuated envelope **1**. For the production of a photo-sensitive mosaic screen the usual steps of oxidising the layer and admitting caesium to sensitise the screen may be adopted. If desired, after sensitising, an additional thin layer of silver may be deposited, as referred to in the specification of British Patent No. 480,946.

Where the invention is applied to the type of television transmitting tube in which an electron image is projected onto a mosaic structure, the step of sensitising the mosaic screen will of course be omitted.

It will be appreciated that the degree of insulation necessary between the elements of the mosaic structure depends upon the conditions under which the apparatus is operated. The specific description for the production of a mosaic electrode in accordance with the invention has been given on the assumption that the structure will be applied to a television transmitting tube in which 25 picture frames per second are scanned. In this case, the insulation between the elements is such that there is substantially no leakage of charge from one element to the other in a frame period, i. e., 1/25 of a second.

I claim:

1. A method of fabricating a mosaic electrode structure having an insulating base member and a signal plate on one side thereof which comprises the steps of ascertaining the light conductivity of the base, applying a suitable substantially non-photoelectric metal to the insulating base plate surface opposite the signal plate as a layer of non-contiguous particles of the metal, and continuing the application of the metal to the insulating base plate until the light conductivity of the base and layer of particles is reduced in the order of 20 to 30 percent of the original light conductivity of the base so that a mosaic surface of substantially non-contiguous and electrically isolated metal particles functioning as a multiplicity of condenser elements in cooperation with the signal plate.

2. A method of fabricating a mosaic electrode structure having an insulating base member and a signal plate on one side thereof which comprises the steps of determining the light conductivity of the base member, evaporating metallic silver onto the insulating base surface opposite the signal plate as a layer of discrete non-contiguous particles of the evaporated silver, the particles being electrically insulated one from the other, and continuing the application of the evaporated silver to the insulating base member until the light conductivity of the base member with the layer of particles is reduced by 20 to 30 percent of the original light conductivity of the base member so that a sufficient number of metallic particles are applied to constitute effectively a mosaic electrode wherein the receptive particles thereof are substantially non-contiguous and electrically isolated one from the other.

3. A method of fabricating a mosaic electrode structure having a light conductive insulating base member which comprises the steps of ascertaining the light transparency of the base member, applying a suitable substantially non-photoelectric metal to the surface of the insulating

base member as a thin layer of individual electrically isolated non-contiguous particles of the metal, the particles being electrically insulated one from the other, continuing the application of the metal to the insulating base member until the light transparency of the base member with the deposited metal particles is reduced to 70 to 80 percent of the original light transparency of the base member, at which time a sufficient number of metallic particles are applied to constitute effectively a mosaic electrode wherein the receptive particles thereof are substantially non-contiguous and electrically isolated one from the other.

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