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MANUFACTURE OF MOSAIC SCREENS SUCH AS ARE
UTILIZED IN TELEVISION TRANSMISSION TUBES
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FIG. 1

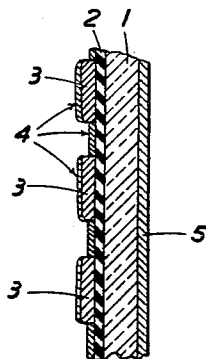
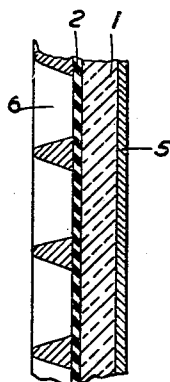


FIG. 2

7
→
Evaporated
Metal.



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1

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MANUFACTURE OF MOSAIC SCREENS SUCH AS ARE UTILIZED IN TELEVISION TRANSMISSION TUBES

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4 Claims. (Cl. 117—210)

This invention relates to mosaic electrodes such as are utilised in television pick-up tubes and to a method of producing such electrodes.

A known form of mosaic screen utilised in television pick-up tubes comprises a sheet of dielectric material, such as glass or mica, to one side of which is applied a multiplicity of discrete photo-electrically sensitised conductive elements. Said elements are applied by evaporating a metal, such as antimony or silver, on to the dielectric sheet through the interstices of a fine mesh mounted to function as a stencil in front of the sheet. It has been found that, in practice, the degree of insulation between the discrete conductive elements is important, especially when the mosaic screen is intended for use in a television pick-up tube adapted to operate with cathode potential stabilisation and that there is an optimum value of conductivity between the elements. It is known that the sensitisation of the discrete conductive elements is usually effected by exposing the conductive elements to caesium vapour and then to oxygen, and the degree of insulation may be modified in practice by removing the stencil mesh prior to the admission of caesium vapour, so that the caesium and, later, the oxygen have access not only to the conductive elements but to the areas of the dielectric sheet exposed between them. In one method, the exposure to caesium vapour is continued until the insulation has become lower than eventually required and then the subsequent exposure to oxygen, which tends to restore the insulation, is continued until the photo-sensitivity and definition of the mosaic screen have maximum values. However, this method has the disadvantage of being highly critical, especially as regards the excess of caesium deposited, and it is found that if too great an excess of caesium is allowed to be present on the mosaic screen, the mosaic screen tends to have poor definition and produce "fuzzy" pictures, whereas if the exposure to caesium is insufficient the mosaic screen, if it is utilised in a cathode potential stabilised tube, manifests an effect which is termed the photographic effect due to excessive insulation between the conductive elements.

The object of the present invention is to mitigate the above-mentioned disadvantages.

According to the present invention, a method of manufacturing a mosaic electrode comprises the steps of coating one surface of a dielectric support with a caesium resistant film of metal oxide (as hereinafter defined), mounting a stencil mesh in front of the coated surface of said support, depositing metal through said stencil to provide a multiplicity of conductive elements on said coating, removing the stencil mesh, and thereafter exposing the conductive elements and the parts of the coating between said elements to caesium to sensitize said elements.

According to an aspect of the present invention there is provided a mosaic electrode such as is utilised in television pick-up tubes, comprising a support of dielectric material, a coating of a magnesium oxide applied to said

2

support, a multiplicity of discrete conductive elements deposited on said coating, and a photo-electrically sensitising deposit comprising caesium and oxygen on said conductive elements and extending over areas of said coating exposed between said elements.

Where reference is made herein to a caesium resistant metal oxide, it is to be understood to mean a metal oxide which is not reduced by caesium, at least to any appreciable extent.

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 drawing, in which:

Figure 1 illustrates in diagrammatic cross-sectional view a fragment of a mosaic electrode according to one example of the invention, and

Figure 2 illustrates a stage in the process of manufacturing the electrode illustrated in Figure 1.

Referring to the drawing, the mosaic electrode illustrated comprises a dielectric support which is in the form of a thin transparent sheet, for example of glass or mica, having a thickness of, say, between 0.001 and 0.004 inch. One surface of the sheet 1 has applied to it a thin substantially transparent coating of magnesium oxide 2, and a multiplicity of minute discrete conductive elements, the so-called mosaic elements, are deposited on the outer surface of the coating 2, three such elements denoted by the reference 3 being visible in the drawing. The elements 3 are photo-electrically sensitised with caesium and oxygen as hereinafter described and this has been denoted in the drawing by a thin film 4 which, it will be observed, extends not only over the elements 3 but over the areas of the magnesium oxide coating 2 which would otherwise be exposed between the elements 3. The other surface of the sheet 1 is provided with a continuous substantially transparent metallic coating 5 which constitutes the signal plate for the mosaic electrode in known manner, the mosaic electrode being intended for use in a television pick-up tube in which the optical image to be televised is projected through the signal plate 5, the sheet 1 and the magnesium oxide coating 2 on to the mosaic elements 3.

In manufacturing the electrode illustrated in Figure 1 the coating 2 is formed by evaporating a thin continuous film of magnesium on to the appropriate surface of the sheet 1. The quantity of magnesium required is small and in practice it has been found that satisfactory results are obtained if magnesium is deposited to a thickness such as to reduce the light transmission through the sheet 1 by between 50 and 60 per cent. The sheet 1 provided with a thin film of magnesium is then exposed to air to oxidise the magnesium, the film becoming effectively transparent as a result of oxidation, thus completing the formation of the coating 2. Before forming the coating 2 the signal plate 5 may be applied on the other side of the sheet 1, but the signal plate may if desired be applied at any other convenient time during the manufacturing process. After the sheet 1 has the coating 2 formed thereon the sheet is mounted in position in the envelope of the television pick-up tube for which it is intended, and the mosaic elements 3 are deposited on the coating 2 in any suitable manner, for example by evaporating one or more metals, say antimony, or bismuth and silver, through the interstices of a mesh mounted to function as a stencil in front of the exposed surface of the coating 2. This stage of the process is illustrated in Figure 2, a fragment of the stencil mesh being indicated by the reference 6 while the arrow 7 denotes the trajectory of the evaporated metal or metals. The stencil is then removed and mosaic elements 3 and those areas of the oxide coating 2 exposed between the elements 3 are exposed to caesium vapour. The caesium treatment, which is effected in a conventional manner, is

3

controlled by observing the photo-electric sensitivity of the mosaic screen, the treatment being discontinued after the sensitivity has passed a maximum value and decreased somewhat therefrom, the amount of caesium deposited being such that the conductivity between the conductive elements 3 is higher than is desirable in the completed electrode. During the exposure to caesium the electrode is baked in known manner at a temperature between 140 and 170° C. After cooling, the electrode is then exposed to oxygen while the pick-up tube in which it is mounted is connected in a television camera circuit and the exposure to oxygen is continued until the insulation between the mosaic elements has an optimum value as indicated by the photoelectric sensitivity and definition of the electrode being maxima. Observations of the photo-sensitivity and definition are made by observing a picture reproduced from signals generated by the camera when an optical image of contrasting intensities is focused on the mosaic electrode in the pick-up tube.

It is found that television pick-up tubes with mosaic electrodes manufactured as above-described are more stable in their performance than tubes manufactured by the method described in the second paragraph of the specification. The mechanism of the improvement is not clear but the presence of the magnesium oxide coating renders the performance of the electrode in some manner, apparently connected with the fact that the magnesium oxide is not reduced by caesium, less critical with regard to the amount of caesium deposited on the areas exposed between the elements 3. Provided that the amount of caesium deposited on the elements 3 prior to the final oxidation is such that the maximum of photo-electric sensitivity is passed, as described, there is less tendency for the mosaic electrode to cause "fuzziness" or to manifest the photographic effect in use. There is, moreover no substantial loss in photo-sensitivity due to the presence of the magnesium oxide coating.

The invention is not confined to the employment of a coating of magnesium oxide and the coating may be formed of oxides of other metals provided that the oxide used is not reduced by caesium. For example aluminium oxide and barium oxide may be used instead of magnesium oxide, and other refractory oxides may also be suitable.

What I claim is:

1. A mosaic electrode, such as is utilized in a television pick-up tube, comprising a sheet of dielectric material, a

4

coating of magnesium oxide applied to one surface of said sheet, a multiplicity of discrete conductive elements applied to said coating, and a photoelectrically sensitizing deposit of oxidised caesium on said conductive elements, said magnesium oxide coating protecting said sheet of dielectric material from said caesium.

2. A method of manufacturing a mosaic electrode such as utilized in television pick-up tubes, comprising the steps of coating one surface of a dielectric support with a caesium resistant metal oxide film, mounting a stencil mesh in front of the coated surface of said support, depositing metal through said stencil to provide a multiplicity of conductive elements on said coating, moving the stencil mesh away from said surface, and thereafter exposing the conductive elements and the parts of said coating between said elements to caesium and oxygen to sensitize said elements.

3. A method of manufacturing a mosaic electrode such as utilized in television pick-up tubes, comprising the steps of coating one surface of a dielectric support with a refractory oxide film, mounting a stencil mesh in front of the coated surface of said support, evaporating metal through said stencil mesh to deposit a multiplicity of conductive elements on said coating, moving the stencil mesh away from said surface, and thereafter exposing the conductive elements and the parts of said coating between said elements to caesium and oxygen to sensitize said elements.

4. A method of manufacturing a mosaic electrode such as utilized in television pick-up tubes, comprising the steps of coating one surface of a dielectric support with a film of metal oxide selected from the group consisting of magnesium oxide, aluminium oxide and barium oxide, mounting a stencil mesh in front of the coated surface of said support, evaporating metal through said stencil mesh to deposit a multiplicity of conductive elements on said coating, moving the stencil mesh away from said surface, and thereafter exposing the conductive elements and the parts of said coating between said elements to caesium and oxygen to sensitize said elements.

References Cited in the file of this patent

UNITED STATES PATENTS

2,171,224	Rose	Aug. 29, 1939
2,198,327	Bandringa et al.	Apr. 23, 1940
2,434,930	Johnson	Jan. 27, 1948