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ELECTRIC DISCHARGE TUBE

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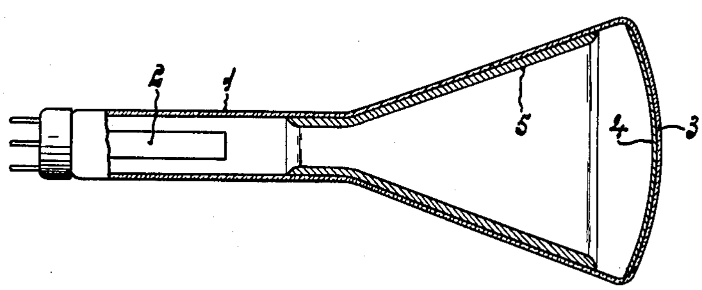

INVENTORS
JAN PEPER
JOHANNES DE GIER
BY Fred M. Vogel
AGENT

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ELECTRIC DISCHARGE TUBE

Johannes de Gier and Jan Peper, Eindhoven, Netherlands, assignors to Hartford National Bank and Trust Company, Hartford, Conn., as trustee

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7 Claims. (Cl. 313—85)

This invention relates to electric discharge tubes having an envelope consisting at least in part of glass provided internally with a conductive layer. Furthermore the invention concerns a method of manufacturing such tubes.

In many electric discharge tubes comprising a glass envelope, a conductive layer, which may consist of very different materials in accordance with its function, is provided on the inner side of the glass wall. Carbon layers are extensively used, the starting material often being that commercially available as "Aquadag."

However, the use of a carbon layer suffers from many disadvantages, the most serious of them being that the layer must be fired for a considerable time in order to free it from absorbed and adsorbed gases and from the binding material used. Therefore, carbon has, for example, been replaced by oxides of chromium or nickel which occlude smaller quantities of gas. These oxides, however, still require the use of a binder. Moreover, they suffer from the disadvantage of being comparatively poor conductors of electricity.

Furthermore, it has been proposed to employ metals, for example aluminium, which is easy to apply by vaporisation. Vaporisation of metal requires a comparatively high gas pressure in the discharge tube to obtain a non-reflecting surface as is very desirable in many types of discharge tubes. This high pressure has a limitation, however, in that the metal cannot be vaporized after the tube has been completely finished, since the gas pressure in a finished tube must be very low. Moreover, a high gas pressure has the drawback that the vaporising metal is scattered and therefore no shielding means can be provided with a view to leaving free given parts of the wall of the tube or of the electrode system.

A reflecting surface is particularly disadvantageous in cathode-ray tubes comprising a luminescent screen, since the screen in use emits light in the direction of the cathode which is reflected by the reflecting metal layer on the wall and produces a general diffuse illumination detracting from the intensity contrast of the image. However, a high gas pressure is troublesome during vaporisation, since it prohibits the use of shielding means, for example for leaving free the window through which the image is viewed. Consequently it is necessary either to vaporise the metal through a gaseous atmosphere or to provide a reflecting layer.

The present invention has for its object to provide an improved method of manufacturing and an improved electric discharge tube.

According to the invention, an electric discharge tube comprising an envelope at least in part of glass and internally at least in part provided with a metal layer of low reflection produced by vaporisation, is characterized in that the layer consists of an alloy or a mixture of nickel and chromium, use being preferably made of an alloy or a mixture containing 80% to 90% of nickel and 20% to 10% of chromium.

The chromium-nickel alloy or the chromium-nickel

mixture used according to the invention may easily be vaporized, for example, from a filament by heating the latter in a gaseous atmosphere at a pressure below 50.10^{-5} mms. of mercury, the layer being such as to provide only little reflection.

The electrical conductivity of an alloy or mixture layer even if thin, is considerable. Thus, a layer 40 A. to 100 A. thick has a resistance of only 10,000 to 1,000 ohms, measured between two copper strips 1 cm. long and spaced apart by a distance of 1 cm. Such a layer absorbs approximately 20% to 40% of the light. This fact may be used to advantage when such a layer is used in a cathode ray tube; in such tubes it is frequently desirable to have a layer absorbing of from 20% to 40% of the light between the luminous screen and its glass support, since, as is well known, such a light-absorbing layer increases the intensity contrast of an image produced on the screen. Both layers can now be applied in one operation, an additional advantage being that the layer has a very uniform light absorption throughout the visible part of the spectrum.

The low resistance of a wall layer absorbing of from 20% to 40% of the light is furthermore advantageous, since the screen will then not become charged.

If the electrical conductivity of the layer on that part of a cathode-ray tube, not acting as a window, is deemed too low or if the layer is provided in a tube without a luminescent screen, more metal may be applied by vaporisation. If the window is to be covered with a layer having an absorption of from 20% to 40% and the remainder of the wall with a thicker layer (consequently having a greater absorption), shielding means may be provided after the first phase of vaporisation to prevent more metal depositing on the window portion. Since vaporisation may take place at very low gas pressures it is possible to obtain a sharply defined demarcation between two parts of the layer.

Naturally, it is also possible to leave the window portion entirely free from a layer.

The use of a chromium-nickel alloy or chromium-nickel mixture has the additional advantage that the layer adheres tenaciously to the glass wall, an advantage further promoted by the low gas pressure during vaporisation. Furthermore, the alloy or mixture absorbs and adsorbs only small quantities of gas.

The invention is illustrated in the accompanying drawing in which a cathode-ray tube is represented schematically. The tube is indicated herein by **1**, the electrode system by **2**, the image window by **3** and the luminescent layer thereon by **4**, with **5** is denominated the chromium-nickel wall layer.

What we claim is:

1. An electric discharge tube comprising an envelope having a glass portion, and a low-reflecting metal layer deposited on the inner surface of said glass portion, said metal layer consisting of a mixture of nickel and chromium and being produced by vaporization.

2. An electric discharge tube comprising an envelope having a glass portion, and a low-reflecting metal layer deposited on the inner surface of said glass portion, said metal layer consisting of a mixture of 80 to 90% of nickel and 20 to 10% of chromium and being produced by vaporization.

3. An electric discharge tube as claimed in claim 2 in which the metal layer has a thickness between about 40 and 100 A.

4. A cathode-ray tube comprising an envelope constituted at least in part by glass and having a window, a low-reflecting metal layer deposited on the inner surface of the glass portions and the window, said metal layer consisting of a mixture of 80 to 90% of nickel and 20 to 10% of chromium and being produced by va-

porization, and a luminescent screen deposited on the portion of the metal layer covering the window.

5. A cathode-ray tube as claimed in claim 4 in which the metal layer covering the window has a thickness between about 40 and 100 A., and the remainder of the metal layer has a greater thickness.

6. A method of making an electric discharge tube having an envelope constituted partially of glass and a low-reflecting metal layer thereon, which comprises the steps of exhausting the envelope to a pressure below 50×10^{-5} mms. of mercury, and vaporizing chromium and nickel from a heated filament onto the glass portion of the envelope to form the metal layer.

7. A method of making a cathode-ray tube having a glass envelope including a window and a low-reflecting metal layer thereon, which comprises the steps of exhausting the envelope to a pressure below 50×10^{-5} mms. of mercury, vaporizing chromium and nickel from a

heated filament onto the glass envelope including the window to form a metal layer thereon having a thickness between 40 and 100 A., introducing a shielding member inside the envelope to protect the window from being covered with additional metal, and thereafter vaporizing further metal to increase the thickness of the metal layer on the unshielded portions of the envelope.

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