

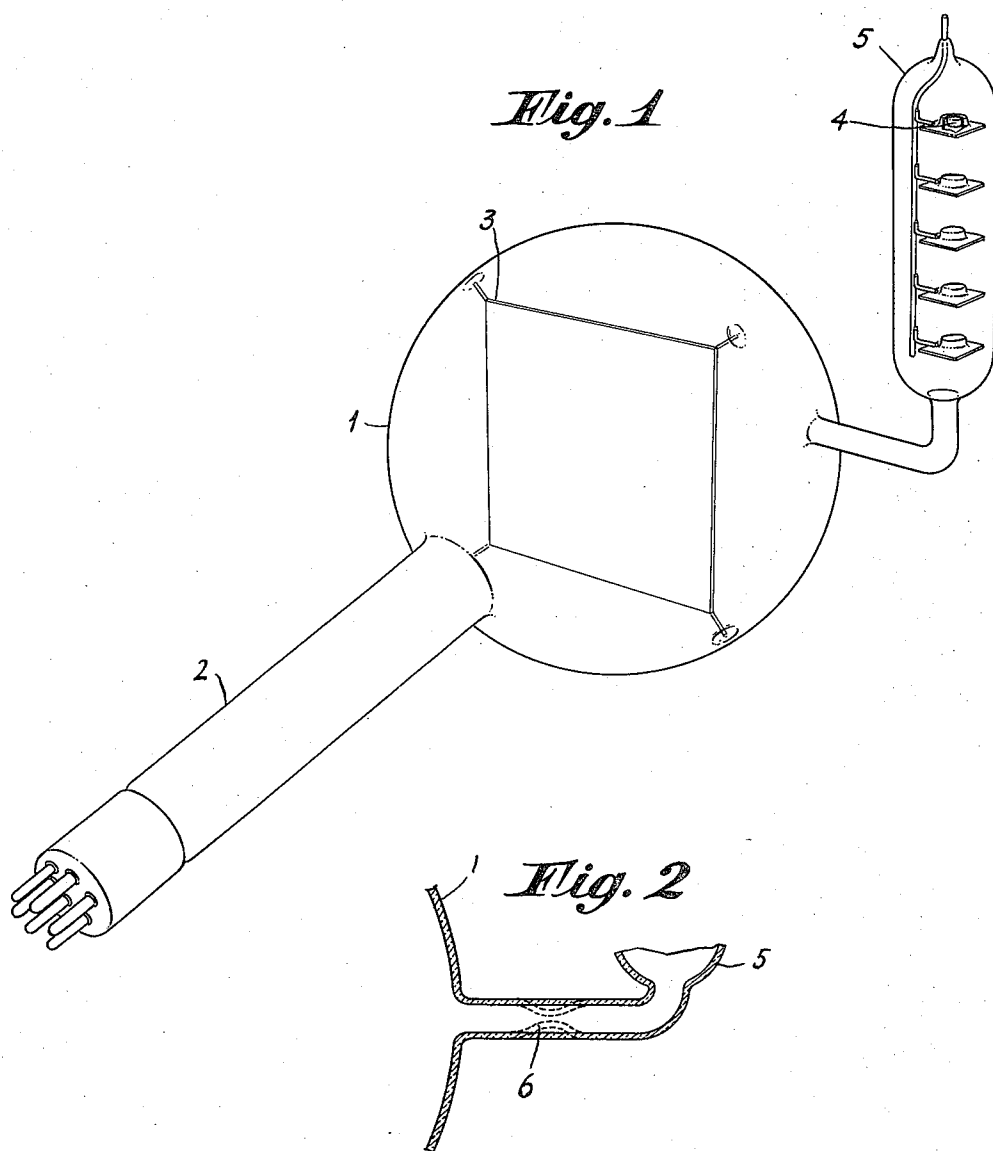
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GETTER

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GETTER

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5 Claims. (Cl. 250—27.5)

My invention relates to vaporization of metals, particularly to dispersion of predetermined quantities of active metals in electron discharge devices.

5 In the manufacture of the electron discharge devices and tubes chemically active metals, usually of the alkali or alkaline earth groups are introduced into the envelope of the device for various purposes such as reducing the pressure
10 of residual gases, activating cathodes, or sensitizing light responsive electrodes. A conventional method of introducing these charges of metals into the envelope is to place in the envelope before sealing a quantity of the solid compound
15 of a metal mixed with a reducing agent, commonly known as a "getter" and in pellet form, and then heating the getter to volatilize and liberate the active metals in the form of vapor. The amount of active metal vapor driven from
20 the pellet by heat is difficult to control, apparently because the reaction temperatures of the pellets may vary considerably among pellets, and the amount or degree of reduction of the metal compounds is uncontrollable. Different yields of
25 the active metals from different pellets result in the manufacture of tubes with non-uniform characteristics. For example, the light sensitivity of phototubes or iconoscopes varies materially with the quantity of sensitizing metals liberated in the
30 envelope. An excess of vapor is not desirable for various reasons, among them being condensation on insulating parts of the envelope which causes troublesome leakage currents.

It is an object of my invention to prepare getters of active metals for electron discharge devices which will liberate in said devices predetermined quantities of vapor from the active metals.

According to my invention getters for electron discharge devices are made of a mixture of chemically active metals and two reducing agents. One agent serves to lower the temperature at which reaction may start, and the second agent serves, apparently, to carry the reaction to completion. By completing the reaction, substantially all of
45 the active metal in the getter is liberated so that the products of reaction of similar getters are the same.

The characteristic features of my invention are set forth in the appended claims, and preferred
50 embodiments thereof are disclosed in the following specification and in the accompanying drawing in which Figure 1 shows an electron discharge device embodying a vapor producing agent made in accordance with my invention, and Figure 2
55 shows a detail of the device of Figure 1.

My invention is applicable to any type of electron discharge device, but for purpose of illustration a conventional iconoscope is shown in the drawing with an envelope 1 enclosing an electron gun structure in the neck portion 2 of the envelope, and a light responsive electron emitting electrode 3 in the bulbular portion of the envelope. Electrode 3 may comprise an insulating disc having on its rear surface a conductive plate or metallic deposit and on its forward
10 surface facing the electron gun a mosaic coating of discrete silver particles. The silver particles are usually glowd in oxygen to oxidize their surfaces, and are then sensitized to light. To sensitize the mosaic it has been found convenient
15 to space getters 4 containing active metals and preferably in pellet form in a tubulation 5 communicating at one end with the envelope. The pellets may if desired be supported in conventional getter caps. A high frequency coil lowered
20 over the tubulation may successively heat the pellets to a temperature at which the active metals in the pellets are liberated and driven into the envelope where they condense upon the silver particles of the mosaic. When a suitable number
25 of the pellets have been flashed to properly sensitize the mosaic, the tubulation may be tipped off at 6 by a gas flame near the bulb as shown in Figure 2. It is essential in the manufacture of such discharge tubes as shown in the drawing, that sufficient active metal be introduced
30 into the envelope to properly sensitize the silver particles, and that no excess of the vapor be introduced which will deposit upon the insulated parts of the envelope and cause leakage currents.
35 The active metals usually selected for activating the light sensitive surface are taken from the alkali metal group, caesium being found to be one of the most practical.

According to my invention a getter containing a predetermined amount of the alkali metal consists of a mixture, preferable in powdered form, of the desired amount of the active metal and a primary reducing agent such as zirconium or tantalum, preferably powdered, and a second-
45 ary reducing agent, such as powdered aluminum. It has been found that pellets made of this mixture give a uniform yield of active metal vapor, the quantity of which is easily determined by the quantity of the metal compound added to the
50 mixture.

While the precise chemical changes and reactions that take place during the flashing of my novel getter pellet are not known, it is believed that two chemical reactions take place, the first
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being between the alkali metal compound and the zirconium at a relatively low temperature to substantially reduce the compound, and a second between the aluminum and the products of the first reaction which carries the first reaction to completion. Tests show that the use of zirconium alone as a reducing agent produces a lower and less uniform yield of the active metal vapor.

Caesium is generally used for activating light responsive photoelectric surfaces, but because of its activity it must be introduced into the getter mixture as a compound, preferably caesium chromate or caesium dichromate. Iconoscope tubes, at present known as RCA G-7307A, having a bulb diameter of eight inches with a mosaic of about twenty square inches, have been successfully activated with two or three of my novel pellets, each weighing about forty milligrams. Each pellet consists of two parts by weight of caesium chromate, eight parts by weight of zirconium powder, and one part by weight of aluminum powder. The caesium chromate may be obtained in solution from a solution of caesium chloride and silver chromate, then evaporated to dryness preferably freed of the chlorides, and ground to a particle size which will pass through a two hundred mesh screen. As one reducing agent, the zirconium may be finely powdered chemically pure metal and the aluminum may be commercially pure finely powdered metal with the oil residue removed by ether and vacuum baking. The caesium chromate, zirconium, and aluminum powders are placed in a mortar with sufficient organic liquid binder, such as menthenol, to make a thick paste and are mixed thoroughly with a spatula using care to keep them wet to prevent ignition by friction between the caesium chromate and zirconium. This material is then dried and formed into pellets of the desired weight.

While the proportions of the powders above mentioned have been found to produce satisfactory results, these proportions may be varied within reasonable limits with satisfactory results and without departing from the spirit of this invention.

I claim:

1. An electron discharge device comprising the combination of a sealed evacuated envelope, a thermionic cathode, an anode, and a charge in said envelope comprising a mixture of a compound of an alkali metal, a first reducing agent comprising about 73% of the mixture capable of liberating most of the alkali metal, a second reducing agent comprising about 10% of the mixture having a reaction temperature higher than said first reducing agent for completing the reduction of the compound.

2. A getter for electric discharge devices comprising a mixture of about two parts by weight of a powdered oxygen compound of alkali metal, one part by weight of aluminum and about eight parts by weight of zirconium.

3. A getter for electron discharge devices comprising a mixture of an oxygen compound of chromium and caesium reducible with liberation of caesium, and zirconium and about nine per cent of the mixture of aluminum.

4. A getter for electron discharge devices comprising a mixture by weight of two parts of powdered caesium chromate, about eight parts of powdered zirconium, and about one part of powdered aluminum.

5. A getter consisting of a powdered mixture of about two parts by weight of an oxygen compound of caesium and chromium, about one part by weight of aluminum, and about eight parts by weight of tantalum.

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