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PHOTOGLOW TUBE

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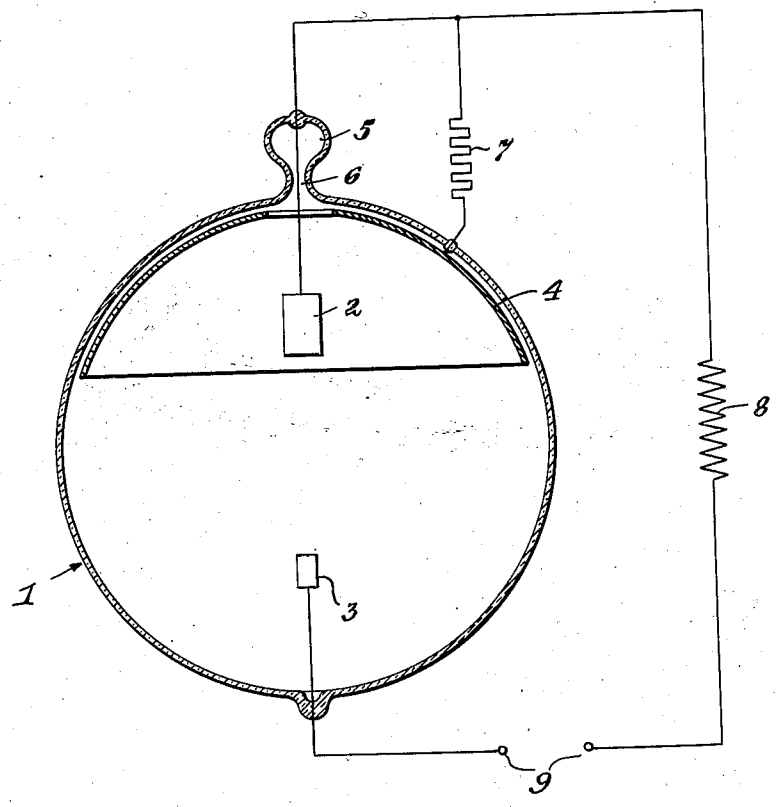


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## PHOTOGLOW TUBE

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The invention relates to electric discharge devices and especially to a photoglow tube.

An object of the invention is to provide a photo-sensitive device in which a photo-sensitive layer acts merely to start a glow discharge between other main electrodes.

Other objects and advantages of the invention will be apparent from the following description and drawing, in which: the figure is a cross-section through a preferred embodiment of the invention.

The invention concerns a tube in which the photosensitive electrode is not included in the load circuit in operation. The photo-sensitive electrode merely serves for the liberation of electrons which are given off on the irradiation thereof by light and by which the ignition voltage between the electrodes of the main discharge is reduced. In particular, the anode is arranged opposite the main cathode for the photo-cathode at such a distance that the discharge in operation occurs only between the main cathode and anode. The potential of the photo-electric layer is not changed by the irradiation of the light. The photo-electric layer on such irradiation of light merely yields the electrons lowering the ignition voltage but in operation, the photo-sensitive layer does not take part in the main discharge and manifests no influence upon it.

The figure illustrates a preferred embodiment of the invention. The glass vessel 1 is filled with a rare gas at low pressure and has the main operating cathode 2 and the anode 3 arranged therein. A part of the vessel wall in the vicinity of the operating cathode is preferably provided with a photo-sensitive layer 4 thereon. Preferably, this photo-sensitive layer at least partially encloses the space containing the main operating cathode 2. This operating cathode 2 is connected through the power consuming apparatus or load 8 and the source of electromotive force 9 with the anode 3 of the discharge device.

The discharge between the main electrodes is started by irradiation of the photo-electric layer 4 with light. The emission of electrons from this photo layer 4 in response to light produces a stream which is attracted towards the anode 3 and produces ions by collision with the rare gas in the paths of these electrons. At a fixed light intensity, the gas in the space before the anode becomes sufficiently ionized to create the ignition of a discharge between the anode 3 and the working cathode 2. The space between the main electrodes 2 and 3 and the space between the anode 3 and the photo-electric layer 4 is such that the main discharge is confined to the space between the anode 3 and the working cathode 2. The distance between the main electrodes is smaller than the distance between the anode and the part of the photo-electric layer lying nearest to the anode. A distance ratio of 1 between the anode and main cathode to 1.5 between the anode 3 and the photo-electric layer 4 is especially advantageous, or stated in other words, the main cathode is of the order of two thirds the distance from the anode that the nearest photo-sensitive layer is located therefrom. By utilizing a ratio of this order, the photo-electric layer 4 is practically not loaded at all in operation because of the high current density of ions before the anode favor the passage of a discharge between the closer spaced main electrodes so that the ignition occurs between these main electrodes instead of between the anode and photo-electric layer.

The high current density before the anode obviously occurs due to the high concentration of metastable atoms which appear before the anode and result in a lowering of the ignition voltage to a fairly high percentage, for example, 30 to 35%. In order to maintain this high concentration, it is important that the metastable atoms meet no extended surfaces on which they can release their charge and accordingly, the anode is given the smallest possible active surface.

The dish-shaped form of the photosensitive layer illustrated in the drawing, is especially advantageous. The electrons from this layer travel a path that quickly merges with the discharge path from the operating cathode to the anode.

The working cathode 2 can be either a cold cathode or an oxide-heated cathode. In case an oxide coated cathode is utilized, it may be protected by a suitable screen so that the discharge between the main electrodes will not occur until a sufficiently strong electron current is produced from the photo-electric layer 4 by the beam of light to reduce the ignition voltage to an amount to establish the discharge between the main electrodes.

The ohmic resistance 7 in the circuit of the photo-electric layer 4 need not be large since it merely serves for the protection of the photo-electric current against over-voltages. In connecting such a resistance for limitation of the photo-electric current, it is necessary to sufficiently insulate the main cathode 2 and the photo-electric layer or cathode 4 from one another. As illustrated in the preferred embodiment, the sealing-in zone for the main cathode lead-in wire has an appendage bulb 5 to the

main glass container bulb which is connected thereto by a constricted passage 6. The vaporized photo-layer can then produce no short-circuit with the operating cathode current lead wire because the photo-electric layer will not extend over the walls of the appendage 5 to make a short-circuit with the lead-in wire of the main cathode 2.

The sensitivity of the tube can be regulated by proper selection of the applied voltage. If the applied voltage lies considerably under the ignition voltage of the discharge device in the dark, then the sensitivity will be less. The sensitivity of the tube will become greater the nearer the applied voltage approaches the ignition voltage of the tube in the dark. The sensitivity of the arrangement of the preferred embodiment is very great so that materials may be chosen for the photo-electric coating which are more mechanically resistant but which have less photo-electric sensitivity than other materials. In other words, the special arrangement of the electrodes as disclosed in the drawing permits the selection of materials that are not so easily destructible. Good results were obtained with photo-electric layers of metallic barium and potassium oxide.

The tube is suited as well for connection in direct current as in alternating current circuits. In the latter case, there is an advantage that the discharge is extinguished on the ending of the light action on the photo-electric layer. This result is also obtained if the tube is operated in the well-known "Kipp" or relaxation oscillation connection.

While the photo-electric layer 4 can be placed on the interior glass wall of the vessel and partly enclosing at least the cathode 2, it can also be placed on other supporting bodies such as that of a screen supported from the wall of the main bulb. In face, other variations can be made in the form and arrangement of the preferred embodiment illustrated without departing from the spirit of the invention.

I claim:

1. A discharge device comprising a container, a dish-shaped photo-sensitive layer therein, an operating cathode axially aligned within said photo-sensitive layer and insulated therefrom, an anode spaced from said layer and operating cathode, said anode located on substantially an extension of the axis of said dish-shaped photo-sensitive layer.

2. A discharge device comprising a container, a dish-shaped photo-sensitive layer therein, an operating cathode axially aligned within said photo-sensitive layer and insulated therefrom, an anode spaced from said layer and operating cathode, said anode located on substantially an extension of the axis of said dish-shaped photo-sensitive layer, said anode being located nearer to said cathode than to the nearest portion of the photo-sensitive layer.

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