April 2, 1940. G. F. BRETT 2,195,444

LUMINESCENT SCREEN

Filed July 17, 1937

Fig. 1

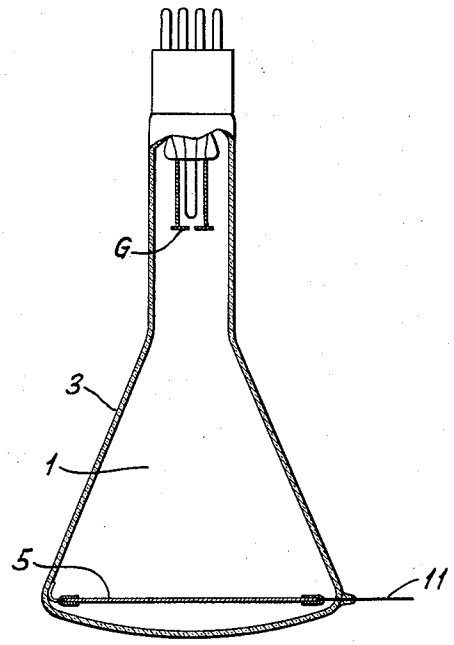


Fig. 2

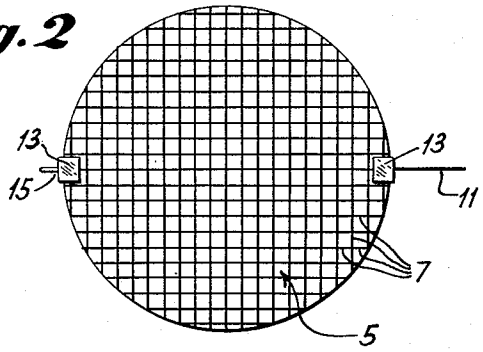
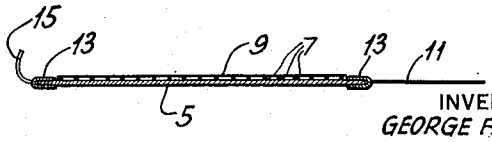


Fig. 3



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Patented Apr. 2, 1940 2,195,444

UNITED STATES PATENT OFFICE

2,195,444

LUMINESCENT SCREEN

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Application July 17, 1937, Serial No. 154,130
In Great Britain July 27, 1936

4 Claims. (Cl. 250—27.5)

This invention relates to cathode ray tubes of the oscillograph type, that is to say, to cathode ray tubes wherein the electron beam is projected on to a luminescent or fluorescent screen to cause visible light effects.

A difficulty frequently encountered in cathode ray tubes of the oscillograph type, more especially in those relatively small cathode ray tubes now coming into increasing use and operating with relatively small voltages—300 volts or less—is that the fluorescent screen which is bombarded by the electron beam tends to charge up due to the fact that the secondary electrons escaping from the screen are not equal in number to the incident electrons in the beam.

One known method of meeting this difficulty is to constitute the fluorescent screen by a deposition of fluorescent material on a metal place which is maintained at or near anode potential or on a semi-transparent metalized layer. Where a solid metal "back plate" is used for the fluorescent material there is the disadvantage that the screen can be viewed only from the electron gun side, i. e. only from the front, and this is often inconvenient and sometimes unsatisfactory since it involves that the screen is viewed through the envelope of the tube. The expedient of depositing the fluorescent material upon a thin film or metalized layer which is semi-transparent is that although in this case the screen can be viewed from the back, loss of light by absorption in the semi-transparent metallic layer is inevitable. Moreover, the preparation of such a semi-transparent layer involves a fairly complicated process adding considerably to the cost of production.

The object of the present invention is to avoid the disadvantages above referred to.

According to the present invention the fluorescent screen of a cathode ray tube is constituted by a layer of fluorescent material deposited upon a grid or mesh work of lines of conductive material in turn located upon a transparent insulating backing. The grid or mesh work is preferably of a predetermined pattern, such as will be of advantage having regard to the intended use of the tube; e. g. the grid or mesh work may consist of a system of conductive lines crossing one another like the mutually perpendicular lines in ordinary squared graph paper, or it may consist of a series of radial and circular lines, like those on what is sometimes termed circular graph paper. Preferably the transparent insulating backing is not constituted by the envelope of the tube but consists of a mica or similar carrier mounted within the tube envelope.

Referring to the drawing, in which

Fig. 1 shows a cathode ray tube, embodying my invention,

Fig. 2 shows a plan view of a screen embodying my invention depicting the mesh work of conducting material on the surface of the transparent support member and the resilient support members attached thereto; and

Fig. 3 shows in elevation the screen and support means.

The invention will be described in detail.

In one way of carrying out the invention a cathode ray tube 1, which may have an envelope 3 of any desired shape—for example the conventional approximately conical shape—is provided with a fluorescent screen the support member 5 for which is constituted by a disc of thin transparent mica of about the same diameter as the screen end of the tube envelope. This mica is thin enough to permit of its being folded or bent sufficiently to be inserted into the tube via the neck. Before any fluorescent material is deposited upon this disc of mica it is first ruled with some conducting material, such as graphite or so-called "liquid silver," or "liquid gold." The two latter materials are particularly convenient since they permit of the ruling being accomplished by means of an ordinary draughtsman's pen. These lines 7 are ruled in two directions at right angles to one another, for preference equidistantly, to give a graph paper appearance. Squares of a side of 5 mm. are convenient. The mica 5 is then heated for a few minutes to burn off any organic matter, leaving a metallic deposit where the lines are located, e. g. a deposit of gold, silver or platinum. A piece of nickel foil attached to a wire is then clipped to the periphery of the mica so as to make good electrical contact with one or preferably a plurality of the conductive lines where they reach the edge of the disc. It will be seen that by virtue of the intersections between the lines, the wire will be in conductive connection with every part of the mesh work constituted by the lines. Fluorescent material 9 is then deposited on the disc over the lines thereon. Alternatively, and in accordance with a modification of the invention, the mica disc is ruled with lines and then a very thin layer of "liquid metal" e. g. "liquid silver" or "liquid gold" is painted or rubbed evenly over the surface. After heating for a few minutes a very thin, practically completely transparent metallic layer covers the mica. This layer is so thin (except where the lines occur) that it can hardly be regarded as exactly conductive, but, with certain fluorescent

materials its presence is found to give greater stability to the fluorescent spot. The layer of the fluorescent material is deposited on the top of the metal.

The screen end of the envelope of the tube is provided with a hole at or near its periphery and the wire 11 attached to the mica disc is pushed through this hole from the inside of the envelope, the said wire being inserted in the neck end of the envelope, which at this stage of manufacture, is still open. The mica with its mesh work and superimposed fluorescent layer is now bent or folded and inserted into the neck of the tube, being pulled along the tube into its proper position at the end thereof by the wire. When the mica is in position with the fluorescent side thereof facing the neck end of the tube, the aperture through which the wire passes is sealed off leaving a connection which can be connected to a point at any desired potential.

For further rigidity the periphery of the mica disc is preferably provided with one or more small spring members 13 and 15 which may be folded nickel tabs with short wires attached, which press against the sides of the envelope of the tube.

The manufacture of the tube may then be completed in the ordinary well known way.

The invention is not limited to the use of any particular "graph" formation—e. g. concentric circles could be used instead of squares, the separate circles being joined by one or more radial lines. Again any suitable conducting material may be used for the lines of the "graph."

An incidental advantage of the invention lies in the fact that a ruled scale is provided in the plane of movement of the fluorescent spot upon the screen, but the main advantage resides in the fact that the screen can be viewed from the back while, nevertheless, it will not charge up since the mesh work of lines provides a connection which may be fixed at any desired value of potential.

Having described my invention, what I claim is:

1. The method of making a luminescent screen having a transparent backing which includes the steps of depositing by ruling the backing with a conductive material mixed with organic material, applying heat to drive off the organic material, and depositing fluorescent material on the conductive material.

2. The method of making a fluorescent screen having a transparent backing which comprises the steps of depositing by ruling a mesh work of predetermined pattern of conducting material upon the backing, superimposing a transparent metallic layer upon the mesh work and backing, and superimposing fluorescent material upon the transparent metallic layer.

3. In combination, a cathode ray tube, having an envelope and cathode ray beam developing means, a transparent support member, a mesh of conducting material deposited upon one face of the transparent support, luminescent material deposited upon the mesh and the transparent support member, and resilient means for mounting the support member within the envelope.

4. In combination, a cathode ray tube having an envelope and cathode ray beam developing means, a transparent support member having a mesh work of conducting material ruled on one surface thereof and a layer of luminescent material superimposed on the ruled surface, resilient means for positioning the support member within the envelope, and a connection from outside the envelope to the mesh work of conducting material.

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