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METHOD FOR OPTIONALLY ALTERING THE AFTER-GLOW PERIOD OF PHOSPHORESCENT SCREENS

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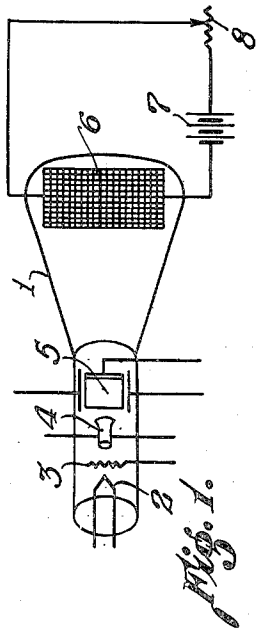


Fig. 1.

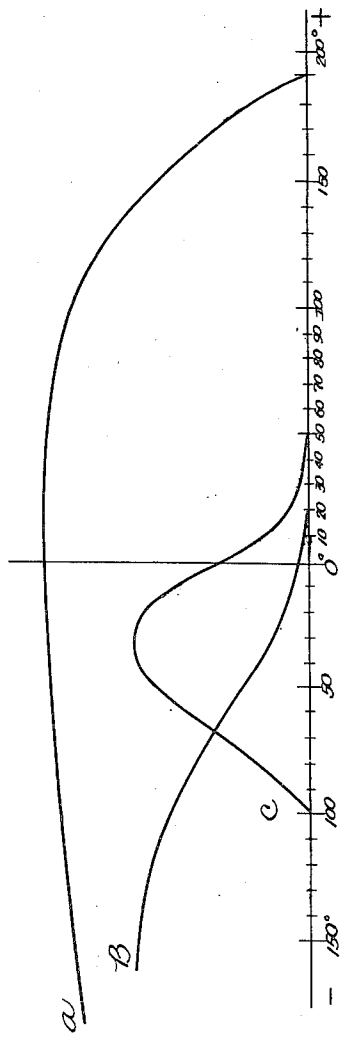


Fig. 2.

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METHOD FOR OPTIONALLY ALTERING THE AFTER-GLOW PERIOD OF PHOSPHORESCENT SCREENS

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5 Claims. (Cl. 250—27.5)

The invention relates to a method for optionally altering the after-glow period of phosphorescent screens, especially those used in cathodc ray tubes.

Such optional control of the after-glow period is of the greatest significance when rapidly varying phenomena are to be rendered visible or delineated, whether it be because the after-glow is entirely undesired or, as occurs in television practice, because it should have varying optimum duration depending on the delineation method used.

Attempts have heretofore been made to control the after-glow by suitable choice and mixture of the luminous substance used. It is, however, very difficult to achieve a perfect result in this manner.

It is known that each phosphorescence band of a phosphorescent substance when energized by light has an upper instantaneous condition. By this is meant the temperature above which the phosphorescence of the band passes into fluorescence, that is, where it no longer shows after-glow.

In accordance with the present invention the phosphorescence is entirely or partially converted into fluorescence by excitation by means of cathode or Roentgen rays, and this is effected by heating the phosphorescent material up to near the corresponding upper instantaneous condition existing for the cathode or Roentgen ray excitation. By suitably choosing the temperature above or below the upper instantaneous condition, the after-glow may be either entirely suppressed or decreased in a desired manner.

The heating of the phosphorescent material to the working temperature may be effected by placing the screen material for example on a sheet of metal, for example of chromium-nickel alloy, which is adapted to be electrically heated. The temperature is preferably measured with the aid of a thermo-element attached to the sheet of metal as by means of spot welding. It is also possible to attain the temperature of the upper instantaneous condition by heating the phosphorescent material by cathode ray bombardment. Furthermore, the temperature of the upper instantaneous condition can be attained by preheating with the above-described arrangement and then first attaining the operative temperature by the impact of cathode rays. By using the center of the phosphorescence for fluorescent illumination purposes, an increase in instantaneous luminosity may be obtained at the same time.

In the drawing,

Figure 1 illustrates one form of cathode ray tube adapted for utilizing the method of the invention; and

Figure 2 illustrates graphically the conditions occurring in the case of a material selected by way of example.

Referring to Figure 1, the envelope 1 houses a cathode 2, a control grid 3, an anode 4, deflecting plates 5 and a phosphorescent screen 6. The latter comprises conductive supporting means having a phosphorescent coating. A heating current is passed through screen 6 from source 7, and the heating or polarization is controlled by rheostat 8.

In Figure 2, the curves indicate the duration of the after-glow in relation to the temperature for the various phosphorescence bands of a Zn-S-Mn material. The bands are designated as usual as *a*, *b* and *c* bands. The after-glow of the *a* band of this phosphorescent material starts at about +190° C., and the duration of the after-glow rises very strongly up to +100°. From this temperature on the band after-glows up to —170° in a strong and continuous manner.

The blue *b* band is in its upper instantaneous condition even at room temperature; at —30° C. it starts to after-glow and at —150° is still very prolonged.

The *c* band after-glows at +20° to a very short extent, and at +50° it ceases. It has its longest after-glow at —30° and its lower instantaneous condition at —100°. If the phosphorescence of the *c* band is to be used, the material must be heated to at least above 50° C., since the upper instantaneous condition for the *c* band is +50° and is room temperature for the *b* band. If the material is heated still further, the after-glow period of the *c* band may be varied since it first passes into the upper instantaneous condition at +190°. In this case the upper limit temperature for the two other bands has already been exceeded, that is, they glow no longer. It is thus possible, by plotting the operative temperature against the temperature of the highest upper instantaneous condition, to suppress all of the undesired bands present in the phosphorescent material used. Furthermore, the operative temperature can be so selected when several bands are present that the phosphorescence of a band is transformed into fluorescence.

For photographic purposes, and by suitably selecting the temperature, the result can be produced that only all photographically active bands of the material become free from after-glow, whereas the photographically non-active ones

become phosphorescent. But even these can be rendered free from after-glow. Finally, by suitable choice of added ingredients, the quantity of metal used, the duration of heating and the heating temperature used when preparing the material, such bands may be obtained possessing the upper instantaneous condition at which it is desired to operate.

A screen may for example be used as a support for the phosphorescent material and this screen may be heated electrically or by means of eddy currents in order to bring the phosphorescent material to the necessary working temperature. When an electrically heated screen is used the screen itself is preferably traversed by the current.

Admixing the phosphorescent material with conducting particles has also been found to be advantageous in using the method of the invention.

Having thus described my invention, I claim:

1. The method of operating a cathode ray tube having a luminescent screen which comprises polarizing said screen to a temperature equal to the upper limit at which said screen remains phosphorescent, and bombarding said screen with cathode rays to produce a fluorescent response.

2. The method of operating a cathode ray tube having a luminescent screen which comprises polarizing said screen to a temperature equal to the upper limit at which said screen remains in part phosphorescent, and scanning a modulated cathode ray beam across said screen to produce a partially phosphorescent and partially fluorescent image.

3. The method of operating a cathode ray tube having a luminescent screen which comprises polarizing said screen to a temperature equal to the upper limit at which said screen remains phosphorescent by means of unmodulated cathode rays, and directing modulated cathode rays upon said screen to produce a fluorescent image.

4. The method of operating a cathode ray tube having a luminescent screen which comprises polarizing said screen to a temperature equal to the upper limit at which said screen remains phosphorescent by means of heating current passing through said screen, and scanning modulated cathode rays across said screen to produce a fluorescent image.

5. Method of operating a cathode ray tube having a luminescent screen of Zn-S-Mn material which comprises polarizing said screen to a temperature at which the response at certain colors becomes fluorescent, and bombarding said screen with cathode rays to produce an image.

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