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L. B. HEADRICK
FOUR-COLOR KINESCOPE
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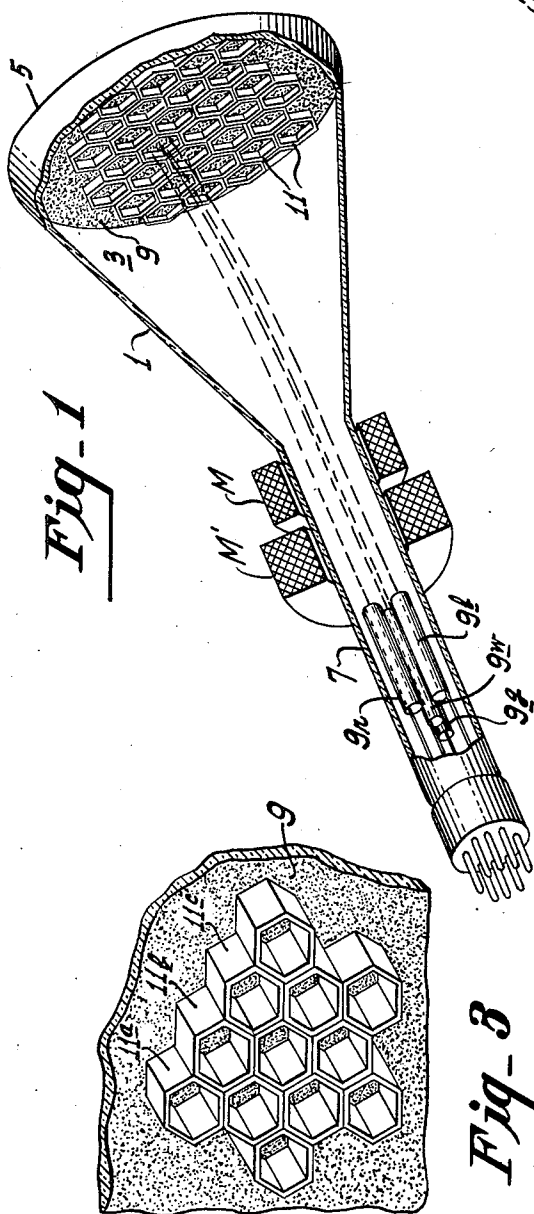


Fig-1

Fig-3

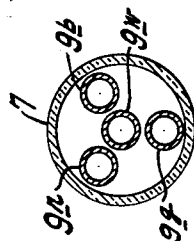


Fig-2

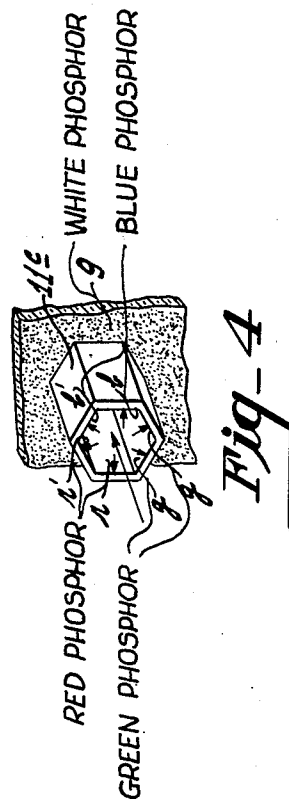


Fig-4

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FOUR-COLOR KINESCOPE

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5 Claims. (Cl. 313—70)

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This invention relates to cathode-ray tubes and particularly to improvements in multi-color kinescopes of the kind containing a target assembly made up of a plurality of ray-sensitive screen elements, one of which serves to produce a black-and-white representation of the detail of a multi-color image and the other to produce the various primary and natural color-components of said image.

It is appreciated by those skilled in the art to which this invention appertains that in order to transmit a color-image with a high degree of fidelity, the color-video signals must contain a large number of relatively high frequency components. In order to accommodate video signals of such a character in a band-width of approximately 4 mc. the principle of "mixed" high frequencies has been used. One such system is described in the copending application of Alda V. Bedford, Serial No. 117,363, filed September 23, 1949. In said system the relatively high frequencies of the transmitted video signals represent the high definition or "detail" of the televised image and the relatively low frequency component represents the color information.

As described by Albert Rose in copending application Serial No. 188,503, filed October 5, 1950, it is advantageous to separate the high from the low frequency components of "mixed high" signals at the receiver and to employ said components as separate control voltages for two or more electron-guns. In such a receiving system the electron-gun controlled by the high-frequency video component sketches the "detail" upon a black-and-white screen and the beam from the other gun generates the colors by impinging upon another screen made up of color-phosphor elements. When the "images" on the two screens are viewed simultaneously the observer sees a composite image, in its natural colors, of the scene or object being televised.

One very real advantage of the Rose receiving system is that its reproducing apparatus does not require the fineness of structural detail that is required in color-image reproducing systems wherein the "mixed high" video signal is not divided into its separate components at the receiver.

In one embodiment of the Rose invention the "detail" or black-and-white image is produced on the screen of a conventional kinescope and the colors are produced in a second kinescope having a red, blue and green phosphor screen. The separate images are optically combined with the aid of a mirror. In another embodiment,

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Rose employs a single tube containing a two-sided viewing screen. Here the picture "detail" is drawn in black-and-white on the obverse face of the screen by the pencil of rays from the high-frequency gun and the color-information is generated on the rear face of said screen by the impact thereon of the rays from the low frequency gun or guns.

Irrespective of the advantages of the Rose receiving system it may be said generally that its color-image reproducing apparatus does not lend itself readily to installation in television sets designed for use in the home. This is so because neither a double-ended kinescope nor a plural tube and mirror assembly can be accommodated in a cabinet of conventional design.

Accordingly, an object of the present invention is to provide an improved color-image reproducing apparatus which shall possess all of the advantages of the above described Rose apparatus, and one further characterized by its unitary and relatively compact structure, whereby said apparatus may be housed in a television cabinet of standard form and dimensions.

Another and important object of the present invention is to provide an improved 4-color target-assembly for color-kinescopes, and one free from parallax and color-alignment problems.

The foregoing and other objects are achieved in accordance with the invention by the provision of a color-kinescope having a target assembly comprising a transparent viewing-screen which is coated all over its rear or target surface with a black-and-white phosphor (e. g. "P4") and is provided adjacent to the same side with a multiplicity of target elements having a plurality of surfaces made up of color-phosphors that exhibit respectively different color-response characteristics when struck by electrons. Here the colors are imposed directly upon the black-and-white "high detail" image, instead of indirectly (as through the glass or by the use of a mirror), thus obviating alignment problems and the possibility of parallax.

Since the electron-beams are all directed upon the same side of the target assembly, said assembly and its battery of electron-guns may be contained in an envelope of standard shape, if desired.

The invention is described in greater detail in connection with the accompanying drawing, wherein:

Fig. 1 is a view in perspective, partly sectioned of a four-gun, four-color kinescope constructed

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in accordance with the principle of the invention;

Fig. 2 is a transverse sectional view of the gun-assembly of the kinescope of Fig. 1;

Fig. 3 is a fragmentary view in perspective of the color target assembly of the kinescope of Fig. 1; and

Fig. 4 is a view in perspective, from the gun-side of the screen assembly, showing a portion of the white-phosphor target and a single cell of the color-phosphor target; the drawing being marked to show the different paths of approach of the several beams to said target parts.

In the drawing, wherein line reference characters represent the same or corresponding parts in all figures, 1 designates an evacuated envelope having a bulbous portion or main chamber 3 which terminates at one end in a transparent face plate or window 5 and, at its opposite end, in a rearwardly extending axial neck portion 7.

The inner face of the window 5 serves as the foundation surface of the four-color screen or "target" of the invention. Alternatively, a separate foundation plate, not shown, may be used. In either event, the target assembly comprises a translucent white-phosphor coating 9 on the inner face of the foundation "plate" and a metal "honeycomb" structure, indicated generally at 11, suitably supported on or adjacent to the white-phosphor coating 9.

The honeycomb portion 11 of the target-assembly comprises a bank of hollow metal cells 11a, 11b, etc. arranged in contiguous rows. The cells are hexagonal in cross-section and two adjacent ones of the six inner faces of each cell are allotted to the production of each of the three "primary" colors. Thus, as shown in Fig. 4, the inner faces which are designated *r*, *r'* are coated with a phosphor material that emits red light when struck by electrons, and the other pairs of inner faces *b-b'*, *g-g'* are provided with suitable "blue" and "green" phosphor coatings, respectively.

The source of electrons for activating the white phosphor portion 9 of the target assembly comprises an electron-gun 9w mounted on the long central axis of the envelope within the neck 7. Three other guns 9r, 9b and 9g are mounted Δ-fashion (i. e. 120° apart) about the "white" gun 9w and serve, respectively, to activate the "red" (*r-r'*), blue (*b-b'*) and green (*g-g'*) phosphor deposits on the inner faces of the cellular portion 11 of the target-assembly 9-11.

A magnetic deflection coil M on the neck 7 of the tube serves to impart the requisite scanning movement to all four of the electron beams. A "beam-convergence" coil M', closer to the battery of guns, may be used to ensure that all four beams maintain their correct relative positions throughout the scanning raster.

From the foregoing description it will be apparent that the present invention provides an improved color-kinescope of a kind capable of

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utilizing both the "high" and "low" frequency components of so-called "mixed-high" signals, and one characterized by its unitary and relatively compact structure.

What is claimed is:

1. A target-assembly for a color-kinescope, said assembly comprising: a foundation plate having a target surface consisting essentially of a phosphor material that exhibits a substantially white color-response characteristic when struck by electrons, in combination with a multiplicity of target elements extending in a direction substantially normal to said white phosphor surface, each of said target elements having a plurality of faces consisting essentially of respectively different phosphor materials that exhibit different color-response characteristics when struck by electrons.

2. A target assembly in accordance with claim 1 and wherein each of said target elements has at least three phosphor faces each individual to one of the primary-color phosphor materials.

3. A target assembly in accordance with claim 1 and wherein said target elements comprise a multiplicity of cell-like members each having an open-end for the reception of electrons and a closed-end comprising the target surface of said transparent foundation.

4. A target-assembly in accordance with claim 3, and wherein said cell-like members are hexagonal in cross-section; two of the inner faces of each cell consisting essentially of phosphor materials that exhibit red, blue and green color-response characteristics, respectively, when struck by electrons.

5. A color-kinescope comprising an evacuated envelope containing a viewing screen having an electron-sensitive target surface consisting essentially of a phosphor material that exhibits a substantially "white" color response characteristic when struck by electrons, a beam-source of electrons mounted in a position to scan said phosphor-surface and thus to produce a "black-and-white" image thereon, a second electron-sensitive target surface mounted adjacent to said first mentioned surface and extending in a direction substantially normal thereto, said second surface consisting essentially of a phosphor material that exhibits a primary-color response-characteristic when struck by electrons, and a second beam source of electrons mounted for bombarding said second electron-sensitive surface and thus to endow said "black-and white" image with a primary-color component.

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